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USACE / NAVFAC / AFCESA / NASA **UFGS-34 71 13.19 (February 2020)**

Preparing Activity: USACE **Superseding**
UFGS-34 71 13.19 (April 2008)
UFGS-34 41 26.00 10 (February 2009)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2021
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DIVISION 34 - TRANSPORTATION

SECTION 34 71 13.19

CRASH RATED ACTIVE VEHICLE BARRIERS AND CONTROLS

02/20

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Appendix A

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USACE / NAVFAC / AFCESA / NASA **UFGS-34 71 13.19 (February 2020)**

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SECTION 34 71 13.19

CRASH RATED ACTIVE VEHICLE BARRIERS AND CONTROLS
02/20

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NOTE: This guide specification covers the requirements for the design of a crash rated active vehicle barrier system where the crash rated active vehicle barriers can consist of a portable, semi-permanent, permanent, power-assisted or manually deployed crash rated active vehicle barriers, covers the active vehicle barrier control system, and non-crash rated actuated traffic arms. Designer should consult UFC 4-022-01 Entry Control Facilities Access Control Points at UFC 4-022-01 and for Army projects consult the Access Control Point Standard and Standard Design Criteria. This specification supercedes previous versions of 34 71 13.19 Active Vehicle Barriers and replaces 34 41 26.00 10 Access Control Point Control System.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard UFC 1-300-02 when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).
****

PART 1 GENERAL
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NOTE: The design of an access control point/entry control facility (ACP/ECF) must be fully engineered

to ensure compliance with the appropriate Army, Navy or Air Force Standards for ACPs/ECFs. Using these standards and criteria, the designer must prepare an ACP/ECF project specific design including the drawings as indicated herein. The project specific drawings along with this edited performance specification must be included in the procurement documents for the ACP/ECF crash rated active vehicle barrier (AVB) control system.

Drawings must identify the following: active and passive vehicle barrier locations, overspeed and wrong way detection zones, Closed Circuit Television (CCTV) camera coverage areas, Intrusion Detection Sensor and tamper switch locations, duress alarm locations, traffic signal and warning beacon locations, actuated traffic arm locations, and incidental construction. Provide active barrier control panels locations and layouts and sequence of operation.

Army Project: ACP Standard Design Drawings can be used in the development of the requirements herein. However, if changes to the control panels from the drawings are made, the designer is responsible for ensuring the changes are reflected.
****

1.1 REFERENCES

****
NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.
****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO GDHS-5	(2011, Errata 2012) A Policy on Geometric Design of Highways and Streets

AASHTO LTS	(2013; Errata 2013) Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals
AASHTO RSDG-4	(2011; Errata 1 2012; Errata 2 2015) Roadside Design Guide

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2020) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A106/A106M	(2019a) Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service
ASTM D4956	(2013) Standard Specification for Retroreflective Sheeting for Traffic Control
ASTM F2656/F2656M	(2020) Standard Test Method for Crash Testing of Vehicle Security Barriers

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 142	(2007; Errata 2014) Recommended Practice for Grounding of Industrial and Commercial Power Systems - IEEE Green Book
IEEE C37.90	(2005; R 2011) Standard for Relays and Relay Systems Associated With Electric Power Apparatus
IEEE C37.90.1	(2013) Standard for Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus
IEEE C62.41.1	(2002; R 2008) Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits
IEEE C62.41.2	(2002) Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)

IEC 60068-2-27	(2008; ED 4.0) Environmental Testing - Part 2-27: Tests - Test Ea and Guidance: Shock
IEC 60068-2-30	(2005; ED 3.0) Environmental Testing - Part 2-30: Tests - Test Db: Damp Heat, Cyclic (12 H + 12 H Cycle)

IEC 61000-4-5	(2017) Electromagnetic Compatibility (EMC) - Part 4-5: Testing and Measurement Techniques - Surge Immunity Test
IEC 61131-3	(2013) Programmable Controllers - Part 3: Programming Languages

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO ISO/IEC 17025	(2017) General Requirements for the Competence of Testing and Calibration Laboratories

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(2018) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA ICS 1	(2000; R 2015) Standard for Industrial Control and Systems: General Requirements
NEMA ICS 2	(2000; R 2005; Errata 2008) Industrial Control and Systems Controllers, Contactors, and Overload Relays Rated 600 V
NEMA ICS 4	(2015) Application Guideline for Terminal Blocks
NEMA MG 1	(2018) Motors and Generators
NEMA TC 2	(2020) Standard for Electrical Polyvinyl Chloride (PVC) Conduit
NEMA TS-1	(1989; R 2020) Traffic Control Systems (not recommended for new designs)
NEMA TS-2	(2016) Traffic Controller Assemblies with NTCIP Requirements - Version 03.07

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2020; ERTA 20-1 2020; ERTA 20-2 2020; TIA 20-1; TIA 20-2; TIA 20-3; TIA 20-4) National Electrical Code

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE J517	(2020) Hydraulic Hose

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2014) Safety and Health Requirements Manual

U.S. DEPARTMENT OF DEFENSE (DOD)

DOD 8500.01	(2014; Change 1-2019) Cybersecurity
DOD 8510.01	(2014; Change 1-2016; Change 2-2017) Risk

	Management Framework (RMF) for DoD Information Technology (IT)

U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA)

MUTCD	(2009; Rev 2012) Manual on Uniform Traffic Control Devices
NCHRP 350	(1993) Recommended Procedures for the Safety Performance Evaluation of Highway Features

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

21 CFR 1040	Performance Standards for Light-Emitting Products
29 CFR 1910	Occupational Safety and Health Standards
47 CFR 15	Radio Frequency Devices

UNDERWRITERS LABORATORIES (UL)

UL 486A-486B	(2018) UL Standard for Safety Wire Connectors
UL 508	(2018) UL Standard for Safety Industrial Control Equipment
UL 651	(2011; Reprint Mar 2020) UL Standard for Safety Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
UL 796	(2016) UL Standard for Safety Printed-Wiring Boards
UL 1059	(2019; Reprint Jun 2020) UL Standard for Safety Terminal Blocks
UL 1076	(2018) UL Standard for Safety Proprietary Burglar Alarm Units and Systems

1.2 ABBREVIATIONS & DEFINITIONS

1.2.1 Abbreviations

a. ACP - Access Control Point
b. AIE - Automated Installation Entry
c. AVB - Active Vehicle Barrier
d. AVBCS - Active Vehicle Barrier Control System
e. BMS - Balanced Magnetic Switch
f. CCTV - Closed Circuit Television System
g. CPU - Central Processing Unit (Computer)
h. CSMS - Central Security Monitoring Station (e.g., Installation Police Station)
i. CVT - Contractor Verification Test
j. DTS - Data Transmission System
k. ECF - Entry Control Facility
l. EFO - Emergency Fast Operate (active barrier emergency fast close

control)
m. FAT - Factory Acceptance Test
o. IDS - Intrusion Detection System
p. PLC - Programmable Logic Controller
q. PVT - Performance Verification Test
r. RSM - Remote Status Monitor
s. SDC - Standard Design/Criteria
t. SDDC - Surface Development and Distribution Command
u. SDDCTEA - Surface Development and Distribution Command Traffic Engineering Agency
v. TCU - Traffic Controller Unit
w. UPS - Uninterruptible Power Supply
x. VCC - Visitors Control Center
y. VPD - Vehicle Presence Detector

1.2.2 Definitions

Command & Control. Command & Control function refers to location the main guard will be located to oversee the activity at the ECF/ACP. This is typically the Gatehouse, but not in all cases.

Crash-rated active vehicle barrier. Crash-rated active vehicle barrier and active vehicle barrier in this specification refer to a vehicle barrier that has been tested to impede or stop a vehicle of a specific weight and speed. The barrier is operable either manually or through electrical controls.

1.3 SUBMITTALS

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NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a “G” to an item, if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.
****

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Overall System Drawings; G[, [_____]]

Point to Point Wiring Information; G[, [_____]]

TRAFFIC CONTROL PLANS; G[, [_____]]

crash rated active vehicle barrier system; G[, [_____]]

Installation; G[, [_____]]

Electrical Work; G[, [_____]]

SD-03 Product Data

Major Components; G[, [_____]]

Data Package; G[, [_____]]

CRASH RESISTANCE: DEMONSTRATION OF COMPLIANCE; G[, [_____]]

Hydraulic Fluid manufacturer's data; G[, [_____]]

SD-05 Design Data

traffic signal support design calculations; G[, [_____]]

UPS Calculations; G[, [_____]]

Generic Design and Contract Revisions; G[, [_____]]

SD-06 Test Reports

Crash Test Reports; G[, [_____]]

Current Site Conditions; G[, [_____]]

KEY CONTROL PLAN; G[, [_____]]

Factory Acceptance Test; G[, [_____]]

Factory Acceptance Test Report; G[, [_____]]

Contractor Verification Test; G[, [_____]]

Contractor Verification Test Report; G[, [_____]]

Performance Verification Test (PVT); G[, [_____]]

Performance Verification Test Report; G[, [_____]]

Endurance Test; G[, [_____]]

Final Report; G[, [_____]]

SD-07 Certificates

COMPONENT CERTIFICATION; G[, [_____]]

Cybersecurity Equipment Certification; G[, [_____]]

Cybersecurity Installation Certification; G[, [_____]]

Installation Superintendent Qualifications; G[, [_____]]

Project Manager Qualifications; G[, [_____]]

TECHNICAL SPECIALISTS QUALIFICATIONS; G[, [_____]]

SD-08 Manufacturer's Instructions

Manufacturer Repair of Coatings Instructions; G[, [_____]]

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals; G[, [_____]]

OPERATING AND MAINTENANCE INSTRUCTIONS; G[, [_____]]

Submit operation and maintenance data in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA, Controls O&M Data Package and the requirements herein.

1.4 INSTALLATION PACKAGE

Submit Installation package [120][150] days after receipt of the Notice to Proceed. The installation package consists of the overall system drawings, major components and data package.

1.4.1 Overall System Drawings

Include the following in overall system drawing package:

a. Functional System Block Diagram, identifying all major equipment including interconnection between components specified herein and those furnished under other sections and communications protocols.

(1) Indicate control/signal and data communication paths and identify PLCs, control interface devices, and media to be used

(2) Describe characteristics of network and other data communication lines.

(3) Describe methods used to protect against power outages and transient

voltages including types and ratings of isolation and surge suppression devices used in data, communication, signal, control, and ac and dc power circuits.

b. Block and Wiring Diagrams of each subsystem.

c. Drawing showing equipment layout in the Command & Control including the Master control panel, UPS, and other hardware intended to be located in the Command & Control.

d. Drawing showing equipment layout around the crash rated active vehicle barriers including the crash rated active vehicle barriers, active vehicle barrier control box(es), vehicle presence detectors, stop lines, traffic signals, warning beacons (wig-wag warning signals) (if applicable), and actuated traffic arms (if applicable).

e. A signing and pavement marking plan.

f. Drawing showing layout and dimensions of the each individual active vehicle barrier operating panels.

g. Touchscreen Audible Tones and Visual Indications if used. Include the following material for use at touchscreen video control panels:

(1) Audible indication, notification, and alarm tones.

(2) Visual materials for touchscreen video control panel display screens, complete with proposed shapes, colors, scale, and textual content. Provide the following: graphics, including maps; icons; dialog boxes; and help messages, prompts and instructions. Provide material in color.

h. Tamper switch locations for AVBCS related cabinets and operating panels.

i. Vehicle presence[, overspeed,] [and wrong-way] detector locations, set-points, and sensor detection patterns. Include descriptions of the security strategy for detecting potential threat vehicles, the coverage and operation of the sensors, and the human machine interfaces for overspeed and wrong way alarms.

j. Details of connections to power sources, including power supplies and grounding.

k. Preliminary point-to-point wiring database. Preliminary submittals is to provide sufficient detail to ensure the final database has all the appropriate information. Provide details such as the legend to be used for the different wiring types, alphanumeric numbering scheme, abbreviations to be used, and the layout of the database. Provide an example of a small section of the system showing the point-to-point wiring.

1.4.2 Point to Point Wiring Information

Final point-to-point wiring diagram of complete interconnected system including database listing of wire numbers, to and from designations, and wire characteristics.

1.4.3 Major Components

****
NOTE: Delete items not in the project.
****

Submit the following for approval:

a. Active Vehicle Barrier Controls to include pushbuttons, indicating lights, switches and panels.

b. Programmable Logic Controller.

c. Traffic Signs: powered and unpowered.

d. Traffic signals and traffic signal supports.

e. Warning Beacons (wig-wags).

f. In-pavement lights.

g. Alarm display panels.

h. Sequence of Events Recorder.

i. Cable and wiring used for the data transmission.

j. Surge protection device.

k. Cabinets and other main components needed to make a complete system.

l. Tamper switches.

[m. Actuated traffic arms.
]
[n. Touch screens, if allowed.
]
[o. Equipment used for presence detection.
]
[p. Wrong-way detection.
]
[q. Overspeed detection.
]

1.4.4 Data Package

****
NOTE: The acquisition of all technical data, data bases and computer software items that are identified herein will be accomplished strictly in accordance with the Federal Acquisition Regulation (FAR) and the Department of Defense Acquisition Regulation Supplement (DOD FARS). Those regulations, as well as the Air Force, Navy, Army and Corps of Engineers implementations thereof, should also be consulted to ensure that a delivery of critical items of technical data is not inadvertently lost. Specifically, the Rights in Technical Data and Computer Software Clause, DOD FAR 52.227-7013, and the Data Requirements Clause, DOD FAR 52.227-7031, as well as any requisite software licensing agreements will be made a part of the

CONTRACT CLAUSES or SPECIAL CONTRACT REQUIREMENTS. In addition, the appropriate DD Form 1423 Contract Data Requirements List, will be filled out for each distinct deliverable data item and made a part of the contract. Where necessary, a DD Form 1664, Data Item Description, will be used to explain and more fully identify the data items listed on the DD Form 1423. It is to be noted that all of these clauses and forms are required to ensure the delivery of the data in question and that such data is obtained with the requisite rights to use by the Government.

Include with the request for proposals a completed DD Form 1423, Contract Data Requirements List. This form is essential to obtain delivery of all documentation. Each deliverable will be clearly specified, both description and quantity being required.

****

1.4.4.1 Delivery

Deliver all items of computer software and technical data (including technical data which relates to computer software), which is specifically identified in this specification in accordance with the CONTRACT CLAUSES, SPECIAL CONTRACT REQUIREMENTS, and in accordance with the Contract Data Requirements List (CDRL), DD FORM 1423, which is attached to and thereby made a part of this contract. Identify all data delivered by reference to the particular specification paragraph against which it is furnished.

1.4.4.2 Technical Data and Software

Include the following in the data package:

a. Communications speeds and protocol descriptions.

b. Operator commands.

c. Alarm and system messages and printing formats.

d. Start-up and shut-down operations including system and database backup operations.

e. Expansion capability and method of implementation.

f. Sample copy of sequence of events report.

g. Color print of the graphical user interface (GUI) screens (when used) on 216 x 292 mm 8-1/2 by 11 inch paper.

h. System data entry requirements.

i. User enrollment.

j. System and application software descriptions.

k. Recovery and restart procedures.

l. Use of report generator and generation of reports.

1.4.4.3 Active Vehicle Barrier Controls

Describe operation of the different barrier control operating modes to include normal and emergency operation, barrier control switches, [actuated traffic arms,] [overspeed,] [wrong-way,] traffic signals, warning beacons, and vehicle presence detectors. Include description of security strategy for defeating a threat vehicle and the SDDC approved barrier safety scheme for protecting innocent vehicles from barrier operations.

1.5 TRAFFIC CONTROL PLANS

1.5.1 Traffic Control Plan for the maintenance of traffic during construction

****
NOTE: Army Projects choose the bracketed option.
****

Provide a Traffic Control Plan for maintenance of traffic during construction[per Section 08C of EM 385-1-1].

1.5.2 Traffic Control Plan During Crash Rated Active Vehicle Barrier Maintenance

Describe plans for taking one or more active barriers out of service for maintenance or testing purposes, while other barriers at the ACP/ECF remain in service. As a minimum, include requirements for traffic signal indications, for bagging signal heads, and for temporary passive barriers and signage, e.g., Type 3 passive barriers, per MUTCD. Include both short term (less than an hour) and long term plans.

1.6 COMPONENT CERTIFICATION

Provide certifications from the manufacturers of the following equipment as part of the data package: crash rated active vehicle Barrier, [programmable logic controller (PLC),] [traffic arm,] warning signal, annunciator, sequence of events recorder, and all sensors including [overspeed,] [wrong-way,] [and]vehicle presence.

1.7 CYBERSECURITY EQUIPMENT CERTIFICATION

****
NOTE: Coordinate equipment certification with Government's cybersecurity requirements and interpretations. Verify that the system includes remote control or remote access capability.
****

Furnish a certification that control systems are designed and tested in accordance with DOD 8500.01, DOD 8510.01, Section 25 05 11 CYBERSECURITY OF FACILITY RELATED CONTROL SYSTEMS, and as required by individual Service Implementation Policy.

1.8 OPERATION AND MAINTENANCE MANUALS

Submit finalized manuals bound in hardback, loose-leaf binders within 30 days after completing the Endurance test. Update the draft copy used during site testing with any changes required prior to final delivery of the manuals. Identify each manual's contents on the cover. Include in

each manual the names, addresses, and telephone numbers of each subcontractor installing equipment and systems, and the nearest service representative for each item of equipment. Provide each manual with a table of contents and tab sheets. Place tab sheets at the beginning of each chapter or section and at the beginning of each appendix. Include modifications made during installation, checkout, and acceptance in the final copies delivered after completion of the endurance test. Provide the number of copies of each manual to be delivered per DD FORM 1423.

1.8.1 Software Manual

In the software manual describe the functions of all software and include all other information necessary to enable proper loading, testing, and operation. As a minimum, include in the manual the following:

a. Definition of terms and functions.

b. Use of system and application software.

c. Procedures for system initialization, start-up and shutdown.

d. Alarm reports.

e. Reports generation.

f. Database format and date entry requirements.

g. Directory of all disk files.

h. Description of all communication protocols, including data formats, command characters, and a sample of each type of data transfer.

1.8.2 Hardware Manual

As a minimum, describe all equipment furnished in the hardware manual and include the following:

a. General description and specifications.

b. Installation and checkout procedures.

c. Equipment electrical schematics and layout drawings.

d. System schematics and layout drawings.

e. Alignment and calibration procedures.

f. Manufacturer's repair parts list indicating sources of supply.

1.8.3 Functional Design Manual

Identify the operational requirements for the system and explain the theory of operation, design philosophy, and specific functions within the functional design manual. Include a description of hardware and software functions, interfaces, and requirements for all system operating modes.

1.8.4 Maintenance Manual

Include descriptions of maintenance for all equipment including

inspection, periodic prevention maintenance (include specific time intervals for each recommended preventative maintenance tasks), fault diagnosis, and repair or replacement of defective components in the maintenance manual.

1.8.5 Application Software

****
NOTE: Army projects. Choose the option USACE Protective Design Center.
****

Provide a copy of the software installation package on optical disk that runs the control program. Provide on optical disk, separate from the operating system software, the complete program or image of the installed software, with all custom changes and configuration data specific for the installed system. At the end of project, after the endurance test is complete, provide complete sets of optical discs. [Provide one set of discs to the USACE Protective Design Center.Provide one to be turned over to the User.]

1.8.6 Final System Drawings

Maintain a separate set of drawings (including site, civil, electrical, mechanical, structural, and architectural plans, elevations, and details), elementary diagrams, wiring diagrams, and control diagrams of the system to be used for final system drawings. This set is to be accurately kept up-to-date with all changes and additions to the AVBCS and to be delivered to the Government with the final endurance test report. In addition to being complete and accurate, this set of drawings is to be kept neat and not be used for installation purposes. Furnish final drawings with the endurance test report on optical disk in [Microstation latest Version] [or] [AutoCAD latest version][_____] format.

1.9 CRASH RESISTANCE: DEMONSTRATION OF COMPLIANCE

****
NOTE: Prior to February 1, 2009 both DOS and DOD certified crash rated active vehicle barriers were based on test reports submitted by a manufacturer. Barriers tested prior to February 1, 2009 and subsequently certified by DOS are included in a final published list for use by others. DOD will continue to certify and publish their own certified list. Both of these lists may be found by pointing your web browser to https://pdc.usace.army.mil/library

DOD requires all crash-rated active vehicle barriers (anti-ram) be on the DOD list.

****

Submit the following as demonstration of compliance with the specified crash resistance requirements for each crash rated active vehicle barrier proposed for this project.

1.9.1 DOD Letter of Certification

Submit a DOD Letter of Certification for crash-rated active vehicle

barrier with a configuration identical to the as tested crash rated active vehicle barrier being provided. DOS Letter of Certification is allowed; however, the crash-rated active vehicle barrier must be on the DOD anti-ram vehicle barrier list.

1.9.2 Crash Test Report

****
NOTE: This paragraph is required for those barriers not on the DOD list.
****

Submit a crash test report for crash-rated active vehicle barrier with a configuration identical to the as tested crash rated active vehicle barrier being provided, from a DOS approved testing laboratory or a testing laboratory accredited by a nationally recognized testing agency in accordance with ISO ISO/IEC 17025. This report is only required for crash-rated active vehicle barriers that are not on the DOD list. The information is to be submitted with the barrier submittal and is to show an approved crash test per ASTM F2656/F2656M.

****
NOTE: Include the following bracketed statement if a fixed length barrier is specified. On Army projects, the Protective Design Center is required to review the submittal. See the following link: https://pdc.usace.army.mil/
****

[1.9.3 Different Length

The only exception to the requirement that the tested crash rated active vehicle barrier be identical to the as tested crash rated active vehicle barrier being provided is the barrier's length. If a length other than that tested is required, the length of the required crash rated active vehicle barrier must represent an interperloation between the successfully tested lengths of crash rated active vehicle barriers that are identical in all other ways. The tested shorter crash rated active vehicle barrier and the tested longer crash rated active vehicle barrier must be identical in construction and testing conditions before the alternate length can be considered. If the length of the required barrier for this project is different than the length tested, provide Crash Test Reports for identical barriers at the maximum/minimum width conditions as required by ASTM F2656/F2656M section 8.2.5. In addition to the test report, provide a letter written by the manufacturer clearly stating that the alternate length crash rated active vehicle barrier is to be constructed in the same manner as the tested barriers. [The crash test reports are to be submitted to the Protective Design Center, Omaha US Army Corps of Engineers for review.]

]1.9.4 Engineering Analysis

Engineering analysis is not an acceptable form of Demonstration of Compliance.

1.9.5 Retrofitted Barrier Systems

Manufacturer is to provide additional documentation that indicates DOD, DOS or ASTM required ratings have been maintained for any barriers that were originally configured and tested with hydraulic systems, but have

been revised or retrofitted to be electric (electromechanical). Provide sufficient information to compare the hydraulic system with the electric system to ensure the change in actuation does not change the ability of the barrier to maintain its tested rating. Manufacturer is to provide a response on company letter head stating that the rating is still valid along with the supporting material.

Provide documentation from the manufacturer that ensures the motor and actuator is sized sufficiently for long term use given the weight of the barrier and the response time requirements. In addition, ensure the electrical components are adequate for the environment as covered elsewhere in this specification.

1.10 QUALITY CONTROL

****

NOTE: The prime contractor will have quality control managers and representatives as a part of their contract requirements. This additional level should only be considered on larger projects or on projects with unique control requirements. The main intention of this portion is to have one main person below the Prime contractor that is responsible for coordinating all the systems involved with the work in this specification. Edit or delete paragraphs as required for the project.

****

1.10.1 Project Manager Qualifications

Designate a Project Manager for all work under this specification. The Project Manager is to provide technical and managerial leadership to all contractor personnel and subcontractors during the design, manufacturer, and installation phases of this specification. This person serves as the single point of contact for the General Contractor for all work required in this specification. The Project Manager must have a minimum of 5 years of experience in the design, manufacture, and installation of similar systems.

1.10.2 Installation Superintendent Qualifications

Designate an Installation Superintendent responsible for onsite installation team direction and leadership. First line supervision of tradesmen and subcontractors is provided by the Superintendent. The Superintendent is responsible for job planning and coordination between the work with trades, subcontractors, vendors, and site personnel. The Superintendent is responsible for scheduling materials, equipment, and labor to maintain the flow of work commensurate with the task schedule. The Superintendent administers and executes the provisions of the Accident Prevention Plan. The Superintendent must have a minimum of 5 years of experience in the installation, operation, and testing of similar systems. The Project Manager and the Installation Superintendent can be the same individual.

1.11 TECHNICAL SPECIALISTS QUALIFICATIONS

Provide the services of technical specialists for the crash rated active vehicle Barriers and the related control system. Submit names and qualifications for each of the technical specialists involved. The technical specialists are to have a minimum of 3 years of experience in

the installation, operation, and testing of all components, software, and interconnecting wiring of their particular equipment/subsystem. The presence of each technical specialist is required during Factory Tests of the system, during installation in the field, and serves as the Contractor's Commissioning Specialist for their designated equipment/subsystem for the commissioning tests as specified.

1.12 KEY CONTROL PLAN

Key control plan for all Contractor provided enclosures requiring locks and all keyed control switches. Provide a key control plan that includes the following: 1) Procedures that will be used to log and positively control all keys during installation. 2) A listing of all keys and where they are used. 3) A listing of all persons allowed access to the keys.

1.13 DELIVERY, STORAGE, AND HANDLING

Protect components delivered to site and/or placed in storage from the weather, humidity (and humidity variation), temperature (and temperature variation), dirt and dust, or other contaminants. Store structural materials on sleepers or pallets and protect them from rust and objectionable materials such as dirt, grease, or oil. Handle all components to protect finish and coatings from scuffs, abrasions or other damage. Excessive damage to factory applied finishes and coatings is cause for rejection. Provide all other delivery, storage and handling protections as recommended by the manufacturer.

1.14 PROJECT/SITE CONDITIONS

****

NOTE: Edit with actual site conditions if more stringent then the default values.

****

1.14.1 Environmental Conditions

All materials, equipment and installation techniques must be appropriate for the prevalent environmental conditions at the installation location. Installation is to be in conformance with manufacturer's written environmental requirements. Submit Manufacturer's Environmental Requirements.

1.14.2 Exterior Conditions

House all components mounted in locations exposed to weather in corrosion-resistant enclosures with appropriate environmental protection. Improper housing design is not to cause a degradation in component performance.

Provide components (those installed outside or in an enclosure exposed outside) that meet the following ambient conditions:

a. Temperature: [-32 to 60][_____]degrees C[-25 to 140][_____]degrees F;

b. Pressure: Sea level to 4,573 m 15,000 feet above sea level;

c. Solar radiation: Six hours of solar radiation at dry bulb temperature of 60 degrees C 120 degrees F including 4 hours of solar radiation at 0.00112 watts per square mm 104 watts psf;

d. Sand and dust: Wind driven for up to [9.6][_____] km/hour [6][_____] mph;

e. Rain: 50 mm 2 inches per hour and 125 mm 5 inches per hour cyclic with wind plus one period of 300 mm 12 inches per hour;

f. Humidity: 5 to 95 percent;

g. Fungus: Warm, humid atmosphere conducive to the growth of heterotrophic plants;

h. Salt fog: Salt atmosphere with 5 percent salinity;

i. Snow: Snow loading of 234 kg/square m 48 pounds psf per hour; blowing snow of 22.5 kg/square m 4.6 psf per hour;

j. Ice accretion: Up to 13 mm 1/2 inch of radial ice;

k. Wind: Up to 80 km/h 50 mph with gusts to 106 km/h 66 mph, except that fence sensors are to detect intrusions up to 56 km/h 35 mph; and

l. Acoustical noise: Components are to suitable for use in high noise areas above 110 dB, such as flight lines, run up pads, and generator sites without adversely affecting their performance.

m. Elevation. [_____] m [_____] feet

1.14.3 Interior Conditions

Provide equipment, which is installed in environmentally protected interior areas, that meet the performance requirements specified for the following ambient conditions:

a. Temperature: 0 to 50 degrees C 32 to 120 degrees F. Components installed in unheated security protected areas must meet performance requirements for temperatures as low as -17 degrees Czero degrees F;

b. Pressure: Sea level to 4,573 m 15,000 feet above sea level;

c. Relative humidity: 5 to 95 percent;

d. Fungus: Provide system components located in fungus growth inductive environments with a treatment to provide fungus resistance. Treatments cannot include mercury, materials increase the flammability of the material or surface being treated or cause skin irritation or other injury to personnel handling it during fabrication, transportation, operation, or maintenance of the equipment, or during use of the finished items when used for the purpose intended; and

e. Acoustical noise: Provide components suitable for use in high noise areas above 100 dB, such as boiler rooms, power plants, and foundries without adversely affecting their performance.

****

NOTE: Barriers control systems that are not normally being used to meter traffic can delete the first sentence.

****

1.14.4 Traffic Flow

[Crash rated active vehicle Barriers are to be able to meet the cycle frequency of [_____] vehicles per [hour][day][week][month].]Typical vehicle speed over the barrier is expected to be [_____] kph[_____] mph."

1.14.5 Site Power Supply

Power supply at the site will be [[____V] [_ phase] and is located] as shown on the drawings.

1.14.6 Current Site Conditions

Prepare and submit a report on "Current Site Conditions", within 75 days of Notice to Proceed, to the Government documenting site conditions that significantly differ from the design drawings and include any conditions on the design documents that would negatively affect performance of the system to be installed. Provide specification sheets, or written functional requirements to support the findings, and a cost estimate to correct those site changes or conditions. Do not perform any field work until the "Current Site Conditions" report is approved by the Government. Do not correct any deficiencies identified in the report without written permission from the Contracting Officer. Review of this package is to be by the designer of record and the local government construction manager.

1.14.7 Generic Design and Contract Revisions

Contract drawings show generic power circuits and voltage configurations for the crash rated active vehicle barriers, sump pumps, heaters, roadway heat tape, and associated. Contractor is responsible for revising the circuit breakers (size and configuration), backup power supplies, conductors and conduit for the specific crash rated active vehicle barrier system the contractor has chosen. Any changes required are the responsibility of the contractor at no cost to the government. Changes required need to be submitted under the paragraph CONTRACT MODIFICATIONS.

1.15 MAINTENANCE AND SERVICE

1.15.1 Description of Work

The adjustment and repair of the system includes all vehicle barriers and systems installed under this specification. Provide and perform all repair, calibration, and other work in accordance with the manufacturer's documentation and instruction. Responsibility is limited to Contractor installed equipment.

1.15.2 Service Personnel

Certify service personnel in the maintenance and repair of the specific type of equipment installed and qualified to accomplish work promptly and satisfactorily. Advice the Government in writing of the name of the designated service representative, and of any change in personnel.

1.15.3 Schedule of Work

Perform two minor inspections at 6 month intervals (or more often if required by the manufacturer), and two major inspections offset equally between the minor inspections to effect quarterly inspection of

alternating magnitude.

1.15.3.1 Minor Inspections

Include visual checks and operational tests of crash rated active vehicle barriers (cleaning pit if necessary), [actuated traffic arms,]traffic signals, console equipment, peripheral equipment, local processors, sensors, and electrical and mechanical controls as part of the minor inspections.

1.15.3.2 Major Inspections

Major inspections includes work described under paragraph Minor Inspections and the following work:

a. Clean interior and exterior surfaces of all system equipment and local processors, including monitors, keyboards, and console equipment.

b. Perform diagnostics on all equipment.

c. Check, walk test, and calibrate each sensor.

d. Run all system software diagnostics and correct all diagnosed problems.

e. Resolve any previous outstanding problems.

f. Purge and compress data bases.

g. Review network configuration.

1.15.3.3 Scheduled Work

Perform scheduled work during regular working hours, Monday through Friday, excluding federal holidays.

1.15.4 Operation

The applicable portion or portions from the performance verification test procedures are to be used after all scheduled maintenance and repair activities to verify proper component and system operation.

1.15.5 Records and Logs

Maintain records and logs of each performed task and organize cumulative records for each component and for the complete system chronologically resulting in a continuous log to be maintained for all devices. Provide a log that contains all initial settings. Ensure logs are kept and available for inspection onsite, demonstrating that planned and systematic adjustments and repairs have been accomplished for the system.

1.15.6 System Modifications

Make any recommendations for system modification in writing to the Government. Prior approval of the Government is required before any system modifications are made. Updating of the operation and maintenance manuals as well as any other documentation affected is required after any modification is made to the system.

1.15.7 Software

Provide a description of all software updates to the Government, who will then decide whether or not they are appropriate for implementation. After notification by the Government, implement the designated software updates and verify operation in the system. Accomplish updates in a timely manner, fully coordinated with system operators, and ensure all data is incorporated into the operation and maintenance manuals, and software documentation. Make a system image file prior to implementing any software update so the system can be restored to its original state if the update adversely affects system performance.

1.16 WARRANTY

****

NOTE: The standard warranty period is one year. If desired a two year period can be specified; however, there will need to be a separate line item for bidding and is paid with a separate funding source.

****

Provide all labor, equipment, and materials required to maintain the entire system in an operational state as specified, for a period of [one year][two years] after formal written acceptance of the system to include scheduled and nonscheduled adjustments. Contractor is responsible for ensuring the barriers are properly exercised and maintained per the manufacturer instructions until accepted by the Contracting Officer.

1.16.1 Warranty Service

****

NOTE: In some cases the designer may determine a less rapid response time is acceptable when weighed against the cost of the service. When editing consider the location of the project in relationship to available personnel.

****

The Government initiates service calls to the Contractor when the system is not functioning properly. Qualified personnel must be available to provide service to the complete system. Furnish the Government with a telephone number where the service supervisor can be reached at all times. Warranty service is to comply with 01 78 00 CLOSEOUT SUBMITTALS and the with the following codes:

a. First Priority Code 1. Perform onsite inspection to evaluate situation, and determine course of action within [24][_____] hours, initiate work within [12][24][_____] hours and work continuously to completion or relief.

b. Second Priority Code 2. Perform onsite inspection to evaluate situation, and determine course of action within [2][4][_____] days, initiate work within [24][48][_____] hours and work continuously to completion or relief.

c. Third Priority Code 3. All other work to be initiated within [4][7][_____] work days and work continuously to completion or relief.

d. The "Construction Warranty Service Priority List" is as follows:

Code 1-crash rated active vehicle barrier system (controls and barrier)

(1) Mechanical or electrical equipment failure that prevents the crash rated active vehicle barrier from opening or closing through the controls.
(2) Active vehicle barrier control system is unable to reset.
(3) Active vehicle barrier control system is unable to operate the crash rated active vehicle barriers properly.

Code 2-Active vehicle barrier system (controls and barrier)
(1) A single traffic signal is not operational.
(2) Problem associated with the vehicle presence detection system (typically safety loops).
(3) Problem associated with sequence event recorder.
(4) Crash rated active vehicle barrier opens and closes, but does not perform the operation in a smooth manner.
(5) Problem associated with wrong-way detection system.
(6) Problem associated with overspeed detection system.

Code 3-Active vehicle barrier system (controls and barrier)
(1) Warning beacon(s) is not operational.
(2) Active vehicle barrier warning light(s) or in-pavement light(s) are not operational.
(3) Any item associated with a control system malfunction (example indicating light or warning buzzer) that does not have a direct impact on operating the crash rated active vehicle barriers.

1.16.2 Service Call Requests

Record separately each service call request, as received. Provide a form that includes the serial number identifying the component involved, its location, date and time the call was received, specific nature of trouble, names of service personnel assigned to the task, instructions describing what has to be done, the amount and nature of the material to be used, the time and date work started, and the time and date of completion. Deliver a record of the work performed within 5 days after work is accomplished.

PART 2 PRODUCTS

****

NOTE: The following sections address the most common types of crash rated active vehicle barriers. While the systems listed cover most installations there may be custom assemblies which will still build on the basic systems presented here. Designers specifying custom systems may select the most appropriate crash rating language and insert aesthetic and other requirements as appropriate.

****

2.1 SYSTEM DESCRIPTION

Furnish and install a complete and functional crash rated active vehicle barrier system for the ACP/ECF including crash rated active vehicle barriers, active vehicle barrier controls, traffic signals, traffic signal controls, traffic warning signals, traffic signs and pavement markings, [actuated traffic arms,][vehicle overspeed detectors,][wrong-way detectors,]vehicle presence detectors, tamper switches, alarm displays, sequence of events recorder, data transmission, and all interconnecting conduit and wiring. Crash rated active vehicle barrier types covered by this specification include [retractable bollards,] [retractable barriers,]

[crash beams,] [active net barriers] [crash gates,] [portable barriers].

2.2 CRASH RATED ACTIVE VEHICLE BARRIER SAFETY SCHEME

****

NOTE: Select one or more of the following barrier safety schemes as appropriate. Include the appropriate Appendix, at the end of this specification. If not using one of the designed safety schemes, then revise paragraph as appropriate.

****

Install and program the [Hybrid Beacon Conventional (Signs and Signals)][Full Containment][High Efficiency Presence Detection] [Stop Control] safety scheme, as approved by the Surface Development and Distribution Command (SDDC) to ensure the safety of innocent motorists. See Appendix A [and the contract drawings]for the required features and operational sequences of this safety scheme.

2.3 CRASH RATED ACTIVE VEHICLE BARRIER FEATURES

2.3.1 Impact Conditions

****

NOTE: Performance levels are based on the following:

Crash Resistance is defined by a combination of the Impact Condition (size and velocity of the design vehicle) and the allowable Penetration Distance.

This UFGS addresses three crash rating standards:

ASTM F2656/F2656M, Standard Test Method for Vehicle Crash Testing of Perimeter Barriers

US Department of State SD-STD-02.01, Revision A, Test Method for Vehicle Crash Test of Perimeter Barriers and Gates, 2003

US Department of State SD-STD-02.01, Specification for Vehicle Crash Test of Perimeter Barriers and Gates, 1985

Barriers tested prior to February 1, 2009 are to comply with to one of the two DOS standards;barriers tested after February 1, 2009 are to comply with ASTM F2656/F2656M.

ASTM Impact Condition:
ASTM F2656/F2656M Impact Conditions are listed in Table 1 of ASTM F2656/F2656M and are defined by a letter designation for the test vehicle (SC = Small Passenger Car (1,100 kg (2,340 lbs)); FS = Full Size Sedand (2,100 kg (4630 lbs); PU = Pickup Truck (2,300 kg (5,070 lbs)); M = Standard Test Truck (6,800 kg (15,000 lbs)); and H = Heavy Goods Vehicle(29,500 kg (65,000 lbs))) and the nominal velocity in miles per hour. The ASTM F2656/F2656M Impact Conditions are as follows:

Designation	Nominal Test Vehicle	Nominal Velocity
SC30	1,100 kg)(2,340 lbs)	30 mph (50 km/h)
SC40	1,100 kg)(2,340 lbs)	40 mph (65 km/h)
SC50	1,100 kg (2,340 lbs)	50 mph (80 km/h)
SC60	1,100 kg (2,340 lbs)	60 mph (100 km/h)

FS30	**2,100 kg (4,630 lbs)**	**30 mph (50 km/h)**
FS40	**2,100 kg (4,630 lbs)**	**40 mph (65 km/h)**
FS50	**2,100 kg (4,630 lbs)**	**50 mph (80 km/h)**
FS60	**2,100 kg (4,630 lbs)**	**60 mph (100 km/h)**
PU30	**2,300 kg (5,070 lbs)**	**30 mph (50 km/h)**
PU40	**2,300 kg (5,070 lbs)**	**40 mph (65 km/h)**
PU50	**2,300 kg (5,070 lbs)**	**50 mph (80 km/h)**
PU60	**2,300 kg (5,070 lbs)**	**60 mph (100 km/h)**
M30	**6,800 kg (15,000 lbs)***	**30 mph (50 km/h)**
M40	**6,800 kg (15,000 lbs)***	**40 mph (65 km/h)**
M50	**6,800 kg (15,000 lbs)***	**50 mph (80 km/h)**
H30	**29,500 kg (65,000 lbs)**	**30 mph (50 km/h)**
H40	**29,500 kg (65,000 lbs)**	**40 mph (65 km/h)**
H50	**29,500 kg (65,000 lbs)**	**50 mph (80 km/h)**

*** The Medium-duty Truck has the same inertial weight as the DOS test vehicle.**

DOS Impact Conditions:
DOS Impact conditions are listed in Table 1 of DOS SD-STD-02.01, Revision A and in Section 5.0 DOS SD-STD-02.01. The impact conditions are as follows:

Designation	**Test Vehicle**	**Nominal Velocity**
K4	**6,800 kg (15,000 lbs)***	**30 mph (50km/h)**
K8	**6,800 kg (15,000 lbs)***	**40 mph (65km/h)**
K12	**6,800 kg (15,000 lbs)***	**50 mph (80 km/h)**

*** This is the same inertial weight as the ASTM F 2656 Medium-duty Truck; K4 = M30, K8 = M40 and K12 = M50.**

Designer to fill in the required ASTM F2656/F2656M Impact Condition and DOS rating (if applicable).

The crash rated active vehicle barriers are to withstand an impact corresponding to [ASTM F2656/F2656M, Impact Condition OF [M50][M40][M30][SC30][SC40][SC50][SC60][FS30][FS40][FS50][FS60][PU40][PU50][PU60][H30] where the letter(s) correspond to the test vehicle and the last two digits correspond to the test velocity in mph][or][DOS [K12][K8][K4]].

2.3.2 Penetration Rating
****

NOTE: The Penetration Rating defines the permissible distance that the design vehicle may travel beyond the pre-impact inside edge of the barrier under the specified Impact Conditions.

The most current Penetration Rating system is from ASTM F2656/F2656M (Table 2). The penetration rating is based on the dynamic penetration of the test vehicle as shown in the following table.

Designation	**Dynamic Penetration Rating**
P1	**<= 1 m (3.3 feet)**
P2	**1.01 to 7 m (3.31 to 23 feet)**
P3	**7.01 to 30 m (23.1 to 98.4 feet)**

The DOS SD-STD-02.01 Revision A standard does not include a variable penetration rating system and passes only barriers that limit penetration of the front edge of the cargo bed to one meter beyond the pre-impact, inside edge of the barrier. This is roughly equivalent to an ASTM F2656/F2656M P1 rating.

Insert one of the "P" ratings from the above chart.

Energy absorbing barriers (net style) will allow a greater penetration the longer the barrier i.e. the more lanes it covers. Be sure to edit accordingly to account for the longer penetration distance.
****

[When subjected to the specified Impact Condition, vehicle barriers are to respond with Penetration Rating equal to or better than [P1][P2][P3]as defined in ASTM F2656/F2656M.]
****

NOTE: NOTE: A previous Penetration Rating system was presented in the 1985 DOS SD-STD-02.01. While this penetration rating system has not been used by DOS since 2003, it is still used by the DOD. Some of the early barrier systems were tested to this standard and the designer may therefore decide to include barriers with penetration ratings certified under 1985 DOS ST-STD-02.01 as an option in the specification. The 1985 DOS ST-STD-02.01 rating system should only be included in addition to the ASTM rating system.

Designation	Dynamic Penetration Rating	Meets ASTM Designation Rating
L3.0	<= 3 feet	P1
L2.0	<= 20feet	P2
L1.0	<= 50feet	P3

The 1985 DOS SD-STD-02.01 also includes an L4.0 penetration rating for distances exceeding 50 feet, but barriers with this rating are not included on the DOD list of certified barriers. It is recommended that the following paragraph be included to reduce the potential for confusion with barriers tested prior to 2003. Insert the "L" rating which corresponds with the "P" rating included in the above paragraph. If appropriate, identify each barrier with its own rating.

****

[For DOD certified barriers, use the Penetration Rating of [L3.0][L2.0][L1.0] or better.]

2.3.3 Operators

[Provide manual crash rated active vehicle barriers.] [Provide [electric (electromechanical)] [or] [hydraulic][or] [pneumatic] crash rated active vehicle barriers.]

2.3.4 Vehicle Loads

All roadway components are to be capable of supporting a 14515 kg 32,000 pound axle load or a 7257.5 kg 16,000 pound wheel load. Provide a load design in accordance with AASHTO GDHS-5.

[2.3.5 Bicycle Safety

For bicycle safety, do not make grooves greater than 13 mm 1/2-inch wide and 152 mm 6-inches long parallel to the drive path.

]2.3.6 Roadway Obstruction

When a barrier is in the "Access Allowed" position, no element in the drive path is to extend above the surrounding grade. Taper all changes in grade.

2.3.7 Dimension Requirements

****

NOTE: Include dimensional requirements for applicable crash rated active vehicle barriers. Minimum and maximum widths, heights and spacing should be specified to suit site conditions and the threat vehicle characteristics.

****

Provide crash rated active vehicle barrier dimensions with the same dimensions of the barrier tested in the Proof of Performance test(s) and as documented [in the Crash Test Report] [and described in the DOS or DOD] Certification Letter. [Additional requirements are listed below.]

2.3.7.1 Bollard Height

****

NOTE: The bollard height cannot be less than the as tested condition. Bollard heights vary in range for different manufacturers and associated barriers. The minimum bollard height specified must be sufficient to completely engage the frame rails of the threat vehicle.

****

Minimum height of bollards is not be less than the as tested condition[or [_____] m [_____] feet].

2.3.7.2 Bollard On Center Spacing

****

NOTE: The on center spacing of individual bollards ensures that the design-sized vehicle will not gain access between the bollard systems and when approaching perpendicular to the bollard system will impact at least one bollard. Spacing cannot exceed the spacing in the as tested condition, typical on center spacing ranges from [0.91 m][3 ft] to [1.5 m] [5 ft]. Consult criteria for spacing limitations.

****

Maximum on center spacing of bollards is not more than the as tested condition[or [0.9][ ] m [3 feet][__ feet]].

2.3.7.3 Structural Footprint Dimensions

****

NOTE: On some crash rated active vehicle barriers, the buttress structural footprint can be large and may not fit on all sites. If the site is confined and a buttress will be present then include the following paragraph; otherwise, delete.

****

Structural footprint dimensions are not to exceed [_____] mm[_____] inches wide (perpendicular to roadway) x [_____] mm[_____] inches long (parallel to roadway) Test crash rated active vehicle barrier buttress at the same rating specified. Configure barrier so that there is a minimum roadway width of [_____] mm[_____] inches between buttresses structural footprint or roadside support system.

2.3.7.4 Clear Distance

Configure barrier so that there is a clear distance of [_____] m[_____] feet between the buttresses structural footprint or roadside support systems.

2.3.7.5 Crash Rated Active Vehicle Barrier Length

****

NOTE: If active net crash rated active vehicle barriers are specified and the system length needs to be limited, include that information in the following paragraph).

****

Ensure system length does not exceed [_____] mm[_____] inches (perpendicular to roadway).

2.3.7.6 Portable Barrier Width

****

NOTE: Include the following bracketed statement if portable barriers are specified and the overall dimensions are to be limited.

****

Ensure overall system width, including all supporting structures and operating enclosures, is no more than [_____] mm[_____] inches.

2.3.8 Operation Speeds Excluding Crash Gates

****

NOTE: The normal time to transition from the "allow access" position to the "deny access" position should take into consideration operational and security plans and barrier configurations. Emergency Fast Operation (EFO) is the rapid deployment of the barrier to deny vehicle access.

Edit paragraph c below appropriately. Projects with hydraulic systems or pneumatic systems may not reverse. Also, those projects with final denial type barriers, as opposed to access control, typically do not need the barrier to be instantly reversible.

Paragraphs 'a', 'b', and 'c' are intended for all types of barriers but crash gates. Crash gates are a distance per time and not a flat time. Speeds for crash gates is covered in the paragraph on Crash Gates and are not suitable for an EFO operation. Crash beams that operate vertically, horizontally or slide typically do not have a speed association and are not suitable for EFO operation.
****

a. When in manual mode (normal mode), the time to transition to "deny access" is [3][8][_____] seconds or less and the time to "allow access" is [3][_____] seconds or less.

[b. Emergency Fast Operation (EFO) time is to be [2][_____] seconds or less.

c. When the barrier is transitioning from the "deny access" position to the "allow access" position, the barrier is to be reversible when EFO is initiated.
]

2.3.9 Failure Modes of Operation
****
NOTE: Include the following bracketed paragraph if powered crash rated active vehicle barriers are specified.

It may also be necessary to manually control the barrier to change the position to either the 'access allowed' or 'access denied' position.

For hydraulic and pneumatic barriers, a system of check valves and accumulator pumps (compressor for pneumatic) may be used for maintaining or changing the position of the barrier. A catastrophic failure of the hydraulic or pneumatic lines, depending on the location in the system where it occurs, may cause the barrier to be in the 'access allowed' position.
****

Design the system to remain in the last commanded position in the event of [[hydraulic,][pneumatic,][electrical,][or mechanical]] failure.

[a. Design the system so that unauthorized personnel cannot manually manipulate the barrier into the "access allowed" position in the event of a power outage. Locks and tamperproof screws and bolts are examples of acceptable means to prevent unauthorized access.
]

[b. Design the system to allow authorized personnel to manually manipulate the barrier into the "access allowed" and "access denied" position in the event of a power outage or operator failure. Barriers are to be capable of being raised and lowered using a recessed handle on the top surface of the barrier or a manual hydraulic pump or other means when the hydraulics or electric motors are not operational. The operation is to require no more than 267 N 60 pounds of force to operate.
]

[c. Provide check valves on [hydraulic][pneumatic] systems if loss of hydraulic pressure can result in the barrier moving to the "access

allowed" position.

]

[d. Design the system to maintain the barriers in the raised position, without inspection, for periods of time of up to 1 week. [If a hydraulic system is used, provide pressure relief valves to prevent overpressure. Continuous running of the motor to stay in the raised position, excluding the use of manual pinning to do so is not allowed.] [If a pneumatic system is used, provide pressure relief valves to prevent overpressure. Continuous running of the compressor to stay in the raised position, excluding the use of manual pinning to do so is not allowed.]

]

2.3.10 Manual (Non-Powered) Barrier Operation

****

NOTE: If specifying a manual barrier, include the following paragraph.

****

Barriers are to be capable of being raised and lowered using a recessed handle, rope or other means. The force required to open/close needs to be less than 267 N 60 pounds of force. Provide a lockable mechanism to secure the barrier in both the full "access allowed" and "access denied" positions.

2.3.11 Crash Rated Active Vehicle Barrier Foundations

****

NOTE: Many of the Crash Rated Active Vehicle Barriers (gates, retractable barriers, crash beams) have variations which include a shallow foundation or are surface mounted, for areas with multiple underground utilities or that have high water tables. If there are specific foundation depth requirements, include this paragraph by selecting the bracketed statement that is applicable to the project. Barriers such as drum or bollards will have deeper foundations.

****

[Foundation systems are to be shallow with required depths no more than [600 mm][_____] [24 inches][_____].] [Provide surface mounted crash rated active vehicle barriers.]

2.3.12 Lane Coverage

****

NOTE: In some instances, single fixed-width barriers are installed to protect more than one lane of traffic or multiple barriers are installed to protect a single lane of traffic. The following paragraph should be included when specifying fixed-width barriers. Designer is to fill in the number of lanes and the number of barriers. Note: ASTM F2656/F2656M section 8.2.5) discusses the impacts of single barriers protecting more than one traffic lane. The ASTM document suggests demonstrating performance for this configuration by performing impact tests at 1/3 points for 3 lanes, ¼ points for 4 lanes, etc. This testing is not included in this specification due lack of feasibility to require that crash rated active

vehicle barriers be identical to tested barriers, and also requiring testing based on actual lane configurations. There are too many potential permutations to require testing.
****

Provide and install a quantity of [_____] fixed-width barrier[s] to protect [_____] roadway lane[s].

2.3.13 SAFETY EQUIPMENT

Provide a safety bar with each retractable or raising crash beam barrier to secure the barrier in the open position during maintenance operations. Provide other equipment recommended for safety when working on the barrier.

2.4 CRASH RATED ACTIVE VEHICLE BARRIER(S)
****
NOTE: This section covers various types of crash rated active vehicle barriers. Delete those types of barriers not in the contract.
****

2.4.1 RETRACTABLE BARRIERS
****
NOTE: Retractable barriers consist of steel plates, rotating steel wedges or steel frames which rise to deny access and retract to allow access. Retractable barriers are generally installed with one barrier protecting a single traffic lane. When in the "access denied" position, retractable barriers provide limited pedestrian control. Retractable barriers are operated by hydraulic, pneumatic, electric, and manual means. Retractable barriers are available with standard depth, shallow depth, and surface mounted foundations.
****

In addition to meeting the design and performance requirements of this SECTION, retractable barrier systems are to conform to the following system-specific requirements.

[Barrier is to be electromechanical with no hydraulic fluid or pneumatics used.] [Barrier is allowed to be electromechanical or hydraulic.][Barrier is allowed to be electromechanical, hydraulic or pneumatics.]

2.4.1.1 Configuration

Retractable barriers are to be made of [steel plate][, rotating steel wedges][,or steel frames].

2.4.1.2 Buttresses
****
NOTE: retractable barriers can be configured with or without side buttresses. If space is limited, or for other reasons, it may be necessary to specify a configuration without buttresses. If so, include the following bracketed paragraph.
****

Do not provide above-grade buttresses with the retractable barriers.

2.4.1.3 Powered Retractable Barrier

****

NOTE: Based on peak hourly volumes, fill in number of cycles per hour that the barrier will be required to function (maximum 300 complete up/down cycles per hour). Barriers used in a final denial configuration (deployed upon a threat) do not need more than around 60 cycles per hour.

Most applications do not require the barrier to be reversible and some systems such as hydraulic may not be reversible. The standard safety schemes found in Appendix A do not require this feature. The reversible feature is provided on some barriers so that when a barrier is deploying and an event happens, such as a vehicle activates a safety loop, the barrier will stop and then open. Note that this time to stop and reverse to fully open will take time and may not prevent a vehicle impacting the crash rated active vehicle barrier.

****

Provide a retractable barrier that is capable of [_____] complete up/down cycles per hour. [Provide a retractable barrier where the motion of the barrier can be stopped and reversed prior to it becoming fully open or fully closed.]

2.4.2 ACTIVE NET BARRIERS

****

NOTE: Energy Absorbing crash rated active vehicle barriers are a type of crash rated active vehicle barrier system. Active vehicle barriers under this category normally have shallow mount foundations and secure more than one lane of traffic with a single barrier.

When specifying this type of barrier, be aware that there are only a few barriers that meet this category so in order to ensure competition one may have to allow more than one type of actuator e.g. allow electric and hydraulic.

****

Provide active net barrier systems that meet the design and performance requirements of this SECTION. Provide active net barriers that consist of a [cable/net system][,] [cable/post system][,] [or] [rising gate systems]. Energy absorbing barrier systems are to have a minimum testing frequency of one week and not require any specialized equipment or trained personal to return to the "access allowed" position.

2.4.3 RETRACTABLE BOLLARDS

****

NOTE: Retractable bollard systems consist of steel cylinders which rise out of the ground to deny access and retract to "access allowed" position. Retractable bollards are generally installed in

groups of 3 or more, as needed to protect the traffic lane, and are installed to rise and retract together. Retractable bollards do not provide pedestrian control. Retractable bollards come in hydraulic, pneumatic, electric and manual retractable configurations. There are no shallow or surface mounted bollard systems.

****

A bollard system is to consist of a minimum of 3 bollards spaced no more than 1220 mm 48 inches from centerline to centerline of bollards across a 3.0 m 10 foot roadway. Bollards in the lowered position are to be capable of supporting a 71 kN 16,000 pound wheel load each. Design in accordance with AASHTO GDHS-5 for this load.

2.4.3.1 Number of Bollards

The minimum allowable number of bollards cannot be no less than the number [tested] [described in the [DOS][or] [DOD] Certification Letter].

2.4.3.2 Bollard Operations

****

NOTE: Indicate if bollards are to operate together or independently. Select appropriate requirements below. Most manufacturers have a set of three bollards for a lane that operate in unison.

****

[a. Provide a bollard system where each bollard is operated independently from the other bollards.

][b. Each bollard is to have its own controls.

][c. Bollards must operate in sets. Each set of bollards contains [_____] bollards. A set of bollards will be provided to protect [_____] [a single lane of traffic].

][d. Each set of bollards has its own controls and operate independently from each other set within the system.

]2.4.3.3 Decorative Covers

****

NOTE: Some manufacturers can provide retractable bollards with decorative covers. If required for project, include the following paragraph. The designer should consider possible conflict with marking requirements prior to specifying decorative covers. If cover profiles are not shown in the drawings, designer should provide descriptive information in the paragraph below.

****

Provide decorative covers as shown in the drawings. Provide decorative covers fabricated by the bollard manufacturer, and designed to function with the retractable bollard system without interfering with the operation of the system. Fabricate decorative covers of durable material appropriate for the project's location and environmental conditions. Submit a sample decorative cover for approval.

2.4.3.4 Powered Retractable Bollards

****

NOTE: Based on peak hourly volumes, fill in number of cycles per hour that the barrier will be required to function (maximum 300 complete up/down cycles per hour).

****

Provide a retractable bollard capable of [_____] complete up/down cycles per hour. Provide bollards capable of being raised or lowered within a 3 to 15-second range during normal use and within 2 seconds for emergency operations.

2.4.4 CRASH GATE

****

NOTE: Crash gates either slide across the traffic lane or swing from a hinge point on one or both sides of the traffic lane. The gate is supported by steel buttresses on either side of the opening. Crash gates are available with shallow or surface mounted foundations. Crash gates that are used for pedestrian and vehicle control need to have the taller dimension.

choose a speed that is suitable for the application. Some manufacturers do not have the high rate of speed indicated. Most manufacturers have a standard range that they can meet. Most can meet the two lower speeds indicated.

****

The crash gate consists of steel buttresses anchored into the ground and an above grade assembly consisting of a heavy steel structure or a combination of heavy steel and structural aluminum capable of being opened and closed. The height of the gate must be at least[0.762] [2.1] [_____] m [30][84] [_____] inches from the road surface to the top of the gate frame. The length closes and protects a minimum [3.0] [_____] m [120] [_____] inch clear opening. Provide an operator for the crash gate that opens and closed the gate at an operating speed of [9.1][13.7][18.3][36.6][_____] meters per minute[30][45][60][120][_____] feet per minute.

2.4.4.1 Configuration

Crash gates consist of [track sliding gate systems,] [cantilever sliding gate system,] [single leaf swing gate system].

[Sliding gates slide to the [left] [right] when facing the gate from the attack side.]

[Single leaf gate systems swing [inward in the direction of the secure side] [outward in the direction of the attack side] and swing to the [left] [right] when facing the gate from the attack side.]

2.4.4.2 Fence Fabric

****

NOTE: Crash gates may be installed with fence fabric so they are part of a fence system. If the

crash gate is to be installed with fence fabric, the edit the following paragraphs. If fence fabric is not required, then delete the paragraphs.
****

a. Fence fabric can either be from the same manufacturer as the gate system or the attachments, coordinate dimensions, and fittings between the gate system and fence fabric manufacturer.

b. Fence Fabric consists of [vertical metal pickets] [chain link fence] [ballistic panels] [welded wire mesh] [wire fence] [_____].

c. Fence Fabric and gates must meet the requirements of Section[s] [32 31 13 CHAIN LINK FENCES AND GATES] [32 31 13.53 HIGH-SECURITY FENCES (CHAIN LINK AND ORNAMENTAL) AND GATES] [32 31 26 WIRE FENCES AND GATES].

2.4.4.3 Powered Crash Gate

Control gate movement by [an electro-mechanical gate operator] [or] [a hydraulic gate operator] consisting of an operator unit with required control circuits and operator station. Provide a system that utilizes 24 vac (nominal)or, as an option 24 Vdc control and operating voltages. Provide a remote control master station that is capable of driving the gate at [[_____] m per second fpm] [[_____] degrees per second] for a swing gate. Unless otherwise indicated, motors are to have [drip-proof][totally enclosed] enclosures.

Design the system to prevent opening of the crash gate in the event of electrical or mechanical failure. Provide a disconnect system for the gate drive that allows manual operation of the barrier in the event of a power outage.

2.4.4.4 Manual Crash Gate

Provide a manual crash gate that is capable of being hinged from either side. Provide a hinge point on each buttress that contains a locking pin with padlock acceptance for securing the crash gate in the closed position.

2.4.5 CRASH BEAM
****
NOTE: A crash beam barrier consists of a beam across the traffic lane which is supported on either side of the roadway with concrete or steel buttresses. Generally, a crash beam is a vertical pivot, that operates by raising to allow access and lowering to deny access. The barrier pivots about a hinge point at one of the buttresses and is secured with a locking/pin mechanism on the other buttress. There are, however, several models on the market which allow and deny access with a vertically rising beam which remains parallel with the roadway surface (similar to a lift bridge), or swing horizontally. A crash beam can be hydraulically, electrically or manually actuated and is available in surface mounted configurations.
****

Provide a crash beam that consists of an above-grade assembly that, in the "DOWN" position, presents a visible obstacle to approaching vehicles. Provide a barrier with a minimum height of 750 mm 30 inches as measured from the roadway surface to the centerline of the crash beam. Provide a crash beam that is capable of blocking a minimum road width of [3.0] [_____] m [120][_____] inches. Provide a crash beam end that contains a locking pin with padlock acceptance for securing the crash beam when it is in the "DOWN" position.

2.4.5.1 Vertical Rising/Lifting Crash Beam

****
NOTE: This barrier is able to have an EFO operating mode and slower modes of operation. Typical maximum opening is around 7.3 meters/24 feet. Most of these tend to be hydraulically operated.
****

Provide a vertical rising (lifting) crash beam.

2.4.5.2 Vertical Pivot Crash Beam (Drop Arm)

****
NOTE: They barreir may or may not be suitable for EFO operation. It will depend on the specific model and the length of the beam arm. If the arm is normally in the open position, then take into account prevailing wind speed in the area. Most of these barriers tend to be hydraulic, electric (electro-mechanical), or non-powered.
****

Provide a vertical pivot crash beam.t

2.4.5.3 Horizontal Sliding Crash Beam

****
NOTE: This barrier is not suitable for EFO operation. Most of these barriers tend to be hydraulic or non-powered. This barrier is available, but not as common.
****

Provide a horizontal sliding crash beam.

2.4.5.4 Horizontal Swing Crash Beam (Barrier Arm)

****
NOTE: This barrier is not suitable for EFO operation. The longer the arm, the more time it will take to open and close. Most of these barriers tend to be hydraulic or non-powered.
****

2.4.5.5 Powered Crash Beam

Provide a [hydraulic power system] [or] [electro-mechanical system] for the crash beam that is capable of being raised or lowered within 8 to 15 second time range. Provide the crash beam with a disconnect system that allows manual operation of the barrier in the event of an electrical or

mechanical failure

2.4.5.6 Manual [Non-Powered] Crash Beam

Counterbalance the crash beam so it can be manually raised and lowered with the aid of a counterbalanced end requiring approximately 267 N 60 pounds of force.

2.4.6 PORTABLE CRASH RATED RETRACTABLE BARRIER

****

NOTE: Portable crash rated active vehicle barriers are able to be transported by using equipment (trucks, forklifts, etc) and are able to be erected in a relatively short amount of time. These systems will not be for permanent use and will therefore be surface mounted. They will also not have all of the wiring and control devices required for the permanent crash rated active vehicle barriers. These barriers can be portable retractable barriers, crash beams and crash gates. They can be manually actuated, powered but self contained, or powered via an external power supply.

****

Provide a portable crash rated retractable barrier that is transportable. When in the raised position, the total barrier height is to be no less than [750][_____] mm[30][_____] inches above the roadway surface and must be [_____] mm[_____] inches wide. Equip the barrier with entrance/exit ramps when the barrier extends more than 16 mm 5/8 inch above the roadway surface. Retractable barriers in the lowered position must be capable of supporting a 142 kN 32,000 pound axle load or a 71 kN 16,000 pound wheel load. Design for this load is to be accordance with AASHTO GDHS-5. Portable crash rated retractable barriers are to be anchored in accordance with the manufacturer instructions. This may include stakes or other means.

Portable barriers must be able to be moved via [integral wheels and tow package][or][and] [forklift] [_____].

2.4.6.1 Powered Portable Crash Rated Retractable Barrier

****

NOTE: Based on peak hourly volumes, fill in number of cycles per hour that the barrier will be required to function (maximum 300 complete up/down cycles per hour).

****

Provide a portable crash rated retractable barrier that is capable of [_____] complete up/down cycles per hour. Provide a retractable barrier that is capable of raising the barrier from the lowered position to the raised position within 8 seconds during normal use, and within 2 seconds during an emergency. Also, provide a barrier that is capable of being closed from the raised position to the lowered position in not more than 3 seconds. Equip portable power assisted retractable barriers with on and off ramps for smooth transition between surfaces when the barrier extends more than 16 mm 5/8 inch above the roadway surface. Anchor the barrier in accordance with the manufacturer instructions. Provide a barrier that is [electro-mechanical][or][hydraulic].

Provide a portable barrier that is of the [retractable barrier][or] [crash gate] type.

2.4.6.1.1 Failure Modes of Operation

Design the system to prevent lowering of the barrier in the event of hydraulic, electric, or mechanical failure. Include a manual pump for operation of hydraulic and/or mechanical barriers without power.

2.4.6.1.2 System

Design the system to maintain the barriers in the raised position, without inspection, for periods of time of up to 1 week. If a hydraulic system is used, equip it with a pressure relief valves to prevent overpressure.

2.4.6.1.3 Controls

****

NOTE: Portable system can be connected into larger control systems, but typically these are temporary or remote. Coordinate the choices below with the Control Panel Components and Construction. This paragraph is not required if using more than a control station that is part of the crash barrier.

If an umbilical cord set-up is required, then pick the desired length. Going over 6 meters/20 feet is not standard.

****

[Provide an open/close pushbutton station at the crash barrier location.] [Provide an open/close pushbutton station on a [3][6][_____] meter [10][20][_____] feet flexible cord.][Provide EFO Operation.]

2.4.6.2 Manual Crash Rated Retractable Portable Barriers

Provide a manual barrier capable of being raised and lowered by manual means such as levers or hydraulics requiring a maximum 267 N 60 pounds of force. Provide a manual mechanism that contains a locking pin which accepts a padlock for securing the barrier when it is in the "UP" position and is also capable of being locked in the "DOWN" position. Provide a retractable barrier to withstand a [_____] kg pound vehicle at impact speed of [_____] km/hour mph, with maximum barrier deflection or vehicle penetration of [_____] m feet.

2.4.7 PORTABLE PIVOTING OR SWINGING CRASH BEAM

Provide a portable crash beam with an above-grade assembly that, in the "DOWN" position, presents a visible obstacle to approaching vehicles. Provide a barrier with a minimum height of 750 mm 30 inches as measured from the roadway surface to the centerline of the crash beam. Provide a crash beam that is capable of blocking a minimum road width of [3.0] [_____] m [120][_____] inches. Provide the crash beam end with a locking pin with padlock acceptance for securing the crash beam when it is in the "DOWN" position.

2.4.7.1 Controls

****

NOTE: Portable system can be connected into larger control systems, but typically these are temporary or remote. Coordinate the choices below with the Control Panel Components and Construction. This paragraph is not required if using more than a control station that is part of the crash barrier.

If an umbilical cord set-up is required, then pick the desired length. Going over 6 meters/20 feet is not standard.

EFO operation is not used with this type of barrier.
****

[Provide an open/close pushbutton station at the crash barrier location.]
[Provide an open/close pushbutton station on a [3][6][_____] meter [10][20][_____] feet flexible cord.]

2.4.7.2 Powered Portable Crash Beam

Provide a hydraulic power system for the portable crash beam that is capable of being raised or lowered within 8 to 15 second time range.

Provide a disconnect system for the portable crash beam to allow manual operation of the barrier in the event of an electrical or mechanical failure.

2.4.7.3 Manual Portable Crash Beam

Provide a crash beam that is manually operated by means of a counter balanced system requiring approximately 267 N 60 pounds of force.

2.5 POWER UNIT

2.5.1 HYDRAULIC POWER UNIT ENCLOSURE
****

NOTE: Based on manufacturer's system layout the hydraulic platform unit should be located above ground.The hydraulic oil viscosity must remain within its operating range, even after barrier non-use. If ambient temperature drops below -7 degrees C (20 degrees F) then hydraulic power unit needs to be equipped with proper hydraulic oil, hydraulic oil heater, insulated and heated hydraulic lines, and underground hydraulic oil lines in pipes. If ambient temperature exceeds 38 degrees C (100 degrees F) then the manufacture must supply efficient cooling and proper hydraulic oil for oil viscosity to remain within its operating range, even at constant heaviest use rate. If ambient temperature range requires the oil to be changed, the manufacturer must supply information on type of oil to be used and instructions for changing. Fill in the high and low air temperature of the area where the barrier will be installed.

Hydraulic operated barrier systems will contain synthetic biodegradable hydraulic fluid. Provide fluid that meets International Organization for

Standardization (ISO) Grade 32 for cooler climates or ISO Grade 46 for temperate zones. Barriers for tropical or desert areas require a heavier grade, verify grade requirements with local suppliers. Based on barrier cycling and climate data, decide if a hydraulic fluid heater is required.
****

Provide the hydraulic power unit with synthetic biodegradable hydraulic fluid. Provide fluid ISO Grade that is appropriate for the temperature ranges listed in the Environmental Conditions Section of this specification. Submit recommended Hydraulic Fluid manufacturer's data for approval. Provide a hydraulic thermostatically controlled fluid heater so that the viscosity remains within its operating range if ambient temperatures below minus 7 degrees C 20 degrees F are expected. Buried hydraulic lines for the connection of the hydraulic power unit to the barrier are to consist of flexible or carbon steel pipe, or a combination of flexible and carbon steel pipe. Flexible and rigid hydraulic line working pressures are to exceed the maximum system relief pressure. [Where hydraulic lines are placed underground, provide a casing pipe consisting of PVC pipe and fittings in accordance PVC Type EPC-40 if concrete encased or EPC-80 if not concrete encased in accordance with NEMA TC 2 and UL 651] [Provide a HPU cabinet that is capable of containing leakage and slope hoses containing hydraulic hose pipes to drain to containment.]

a. Provide flexible hydraulic lines that are in accordance with SAE J517.

b. Provide rigid hydraulic lines that are seamless carbon steel pipe in accordance with ASTM A106/A106M.

Place the unit on a reinforced concrete pad or other approved pad material in a prefabricated weatherproof metal enclosure. Provide a containment area; i.e., depressed floor or catch pan, to ensure capture of the total amount of hydraulic fluid within the hydraulic power unit. Access door or doors are provided to meet the maintenance requirements of the unit. The physical location of the unit is on the protected side of the area.

Unless otherwise indicated, provide electric motors with [drip-proof] [totally enclosed] [totally enclosed fan cooled] enclosures. All couplings, motor shafts, gears, and other moving parts are to be fully guarded in accordance with 29 CFR 1910 Subpart O. Provide guards that are removable without disassembling the guarded unit. For multiple barriers operated from a single hydraulic unit it is highly recommended that the electric motor be 3-phase. This paragraph assumes motors are installed above grade.

2.5.2 ELECTRIC POWER UNIT ENCLOSURE

Provide a NEMA Type 3R enclosure as specified in NEMA 250 to enclose the electric power unit. Design the enclosure for easy removal of the power unit and other accessories without complete removal of the enclosure. Provide an access door with hinges and an inside and outside operable/lockable (exterior) door latch. Place and configure equipment within the enclosure so that all periodic maintenance can be performed through the access door without removal of the equipment. Equip the enclosure with weatherproof louver vents appropriately sized and located to dissipate internal heat generation.

2.5.3 PNEUMATIC POWER UNIT ENCLOSURE

Provide a NEMA Type 3R enclosure as specified in NEMA 250 to enclose the power unit. Design the enclosure for easy removal of the compressor and other accessories without complete removal of the enclosure. Provide an access door with hinges and an inside and outside operable/lockable (exterior) door latch. Place and configure equipment within the enclosure so that all periodic maintenance can be performed through the access door without removal of the equipment. Equip the enclosure with weatherproof louver vents appropriately sized and located to dissipate internal heat generation.

2.6 HEATER

Provide a waterproof barrier heater with a thermostat control and NEMA 4 junction box connection point for de-icing and snow melting. Provide a heater that ensures proper barrier operation is maintained down to an ambient temperature of minus 40 degrees C minus 40 degrees F. [Provide a [_____][250]-watt heater for each retractable bollard.]

[Provide heat tape in the drain pipe system that is controlled by the same thermostat for the barrier heater or by a separate thermostat.

]

2.7 FINISH AND MARKINGS

Provide signs and markings that meet retroreflectivity requirements as contained in the MUTCD under Part 2 Signs sections on 'Retroreflectivity', 'Maintaining Minimum Retroreflectivity', and 'Shapes' plus ensure all state and local retroreflectivity requirements are satisfied. Paint surfaces in accordance with requirements of Section 09 90 00 PAINTS AND COATINGS.

Use red and white stripe marking on all crash rated active vehicle barriers [and actuated traffic arms] as required for a stop condition by AASHTO RSDG-4. Provide vertical striping and lights (unless otherwise noted in this SECTION) as per MUTCD Part 8B Signs and Markings, Section on 'Crossbuck Assemblies with YIELD or STOP Signs at Passive Grade Crossings'.

a. Provide bollards with full retroreflective markings . Provide bollards that alternate retroreflective colors red and white with the red starting on the side nearest the curb.

b. Paint wedge, frame, beam, and post type barriers with vertical red/white alternating retroreflective striping that is approximately 400 mm 16 inch wide and covers the entire exposed area of the barrier. Since barriers will vary in width, the striping can be adjusted wider or narrower to have it work so each stripe is the same width.

c. For Crash Gates markings will be provided by the installation of retroreflective markings on the both sides of the gate that are visible to the drivers. It will consist of alternating vertical retroreflective red and white stripes. Markings are to provide the same color scheme, retroreflective performance and durability as required in this SECTION.

Provide markings on both the front and back of the crash rated active vehicle barriers. Provide non-skid, durable markings that are part of the

roadway (i.e. backside of plate barriers or the top of retractable bollards), and ensure retroreflectivity is maintained based on expected traffic flow (see paragraph PROJECT/SITE CONDITIONS of this SECTION) for a minimum of two years.

Markings on surfaces that are not part of the roadway must meet requirements of ASTM D4956, Type III or better and MUTCD.

Provide signing as shown in the drawings. A minimum sign sheeting of MUTCD Part 6F Temporary Traffic Control Device Zone Devices, Section on Channelizing Devices, Type III sign sheeting is to be used for regulatory and warning signs. Provide all sign posts with a breakaway design as set forth in AASHTO RSDG-4 or as required by the local/State Department of Transportation.

Provide a retroreflective white pavement marking envelope consisting of 305 mm 12 inches wide white stripes at 45 degree angle separated by a 610 mm 24 inches clear space at the crash rated active vehicle barriers. Provide an envelope that is full lane width and at least 2.4 meters 8 feet in length.

2.8 SIGNAGE

****

NOTE: Load limit signs based on allowable single axle loads for highways of 80 kN (18,000 pounds) and maximum tandem axle loads of 142 kN (32,000 pounds) are required for subsurface vehicle barriers, except bollards, at entry control points (ECPs). Signage must conform to MUTCD.

****

Provide a sign that conforms to MUTCD sign (R12.2) and reads "Axle Weight Limit 9 Tons 8 metric tons".

2.9 ACTIVE VEHICLE BARRIER CONTROL SYSTEM (AVBCS)

2.9.1 General Requirements

****

NOTE: Delete reference to remote control panel if it is not applicable.

****

The AVBCS provides alarm, status, and control information to the [Master Control Panel], [Remote Control Panel(s),] [Guard Booth Control(s) (panels and buttons),] [Search Area Control Panel(s),] [Search Building Control Panel,][Overwatch Position Control Panel,] [Pedestrian Control Panel,]and the Local Control Panel(s). A full layout showing the location of the controllers is required. A controller that is installed in a facility requires a complete layout of all equipment to be placed in the room/area to ensure all clearances are maintained. This layout is part of the shop drawings submittal. The control system contains all relays, timers, and other devices and an industrial programmable controller programmed as necessary for the barrier operation. The control panel allows direct interface with auxiliary equipment such as card readers, remote switches, loop detectors, infrared sensors, and [sliding][swinging] gate limit switches. Provide logic to coordinate the barricade and the traffic lights.

2.9.2 System Integration

Provide the AVBCS as an integrated system, including all sub systems specified hereafter. AVBCS hardware and software integration is required to function as one integrated system. The Contractor is responsible for all integration and appetencies required for the system to behave as one system. Supply of separate sub systems without integration is not acceptable. The extent and nature of integration must be extensively documented and demonstrated in the Technical Data and Software Package. ***The system is configured with industrial programmable logic controllers.***

2.9.3 AVBCS Processor

The AVBCS processor consists of a combination of controllers located within the ACP/ECF that work with the various hand machine interface operating panels that are either hard control panels (discrete switches, buttons and indicating lights) or touchscreen control panel(s) or a combination of both touchscreen and hard control items.

a. A programmable logic controller (PLC) meeting the requirements listed herein. Provide the PLC or PLCs with the latest software version. This is the main overall controller for the AVBCS.

b. Overspeed controllers are to work in unison with the system to provide the appropriate alarms.

c. Wrong-way controllers are to work in unison with the system to provide the appropriate alarms.

****

NOTE: The EFO is required to be pushbutton or switch with a cover. Touchscreen is not allowed for this operation.

****

d. Human Machine Interface: [Hard-control] [Hard-control panel and touchscreen video-control] [Contractor allowed the option to provide either hard control or touchscreen control or a combination of the two systems; however, EFO is to be hard control] panel operator interface.

e. Vehicle Presence Detection: Controller that operate the vehicle presence detection system(s) are to work in unison with the overall system to provide the appropriate response.

f. Computer control. Controller(s) that are computers (not a PLC or traffic control unit) are not allowed at this time.

****

NOTE: Delete if the red/yellow/green traffic signals associated with the crash rated active vehicle system are NOT located at an intersection.

****

[g. Traffic Control Unit. A traffic control unit is to be used when the crash rated active vehicle barrier traffic signals are co-located at an intersection. The traffic control unit is, as a minimum, control the intersection traffic signals and is to interface with the crash rated active vehicle barrier control system.

]2.9.4 PROGRAMMABLE LOGIC CONTROLLER (PLC)

2.9.4.1 PLC General Requirements

PLCs area digitally operating electronic apparatus that use a programmable memory for internal storage of instructions for implementing specific functions such as logic, sequencing, timing, counting, and arithmetic though digital or analog input/output modules. PLCs are capable of receiving discrete and analog inputs and, through programming, and are able to control discrete and analog output functions, perform data handling operations and communicate with external devices. Provide PLCs that meet the requirements of Class A computing devices, and are labeled as set forth in 47 CFR 15 and are able to withstand conducted susceptibility test as outlined in NEMA ICS 1, NEMA ICS 2, andIEEE C37.90.1. Provide PLCs that function properly at temperatures between 0 and 50 degrees C 32 and 122 degrees F at 5 to 95 percent relative humidity non-condensing and tolerate storage temperatures between minus 40 and plus 60 degrees C 40 and plus 140 degrees F at 5 to 95 percent relative humidity non-condensing. Provide an intelligent process controller that can perform both data acquisition and process control functions that has the ability to function independently; that is, perform its function without the need for commands from a separate computer.

2.9.4.2 Modular PLC

Provide PLCs that are based on a modular, field expandable design allowing the system to be tailored to the process control application. The system is expandable through the use of additional hardware and/or user software. As a minimum, provide the PLC with a mounting backplane, power supply module, central processing unit (CPU) module, communications module, and input/output (I/O) module. Group modules together in a mounting rack or cabinet. Ensure the mounting rack backplane provides the communications mechanism to fully integrate the individual modules located within the rack. Provide modules that plug directly into the backplane. The use of wire connectors between modules is not be allowed. Provide a rack or cabinet sized as needed to hold the equipment necessary while performing the required control functions. The system configuration allows for the removal and/or installation of modules under power.

2.9.4.2.1 Central Processing Unit (CPU) Module

The CPU module is a self contained, microprocessor based unit that provides time of day, scanning, application (ladder rung logic) program execution, storage of application programs, storage of numerical values related to the application process and logic, I/O bus traffic control, peripheral and external device communications and self diagnostics.

a. Provide a processor with battery backed static RAM to hold application programs. Provide a battery that is serviceable without taking the processor module out of service. Provide a monitoring system that monitors the battery for a low voltage condition. Provide a low voltage status bit for use by the PLC program.

b. Provide the processor with illuminated indicators readable from the front of the processor module for diagnostics. Provide diagnostic status bits for use by the PLC program.

2.9.4.2.2 Communications Module

Provide a communications module that allows peer-to-peer communication with other PLCs and allows the PLC to communicate with the workstation. Provide a communication module that utilizes the manufacturer's standard communication architecture and protocol, Ethernet architecture and protocol or a combination of these. The communication module is to allow programming of the PLC to be done locally through the use of a laptop computer.

2.9.4.2.3 Power Supply Module

Provide one or more power supply modules as necessary to power other modules installed in the same cabinet. Provide power supply modules that plug directly into the backplane. Auxiliary power supplies may be used to supply power to remote cabinets or modules.

a. Provide power supply modules that use [AC] [or] [DC] power with a nominal voltage of [120 VAC] [or] [220 VAC] [24 VDC] [_____] plus or minus 5 percent. The power supply module is to monitor the incoming line voltage level and provide over current and over voltage protection. If the voltage level is detected as being out of range the power supply module continues to provide power for an adequate amount of time to allow for a safe and orderly shutdown. Power supply modules are capable of withstanding a power loss for a minimum of 20 milliseconds while still remaining in operation and providing adequate power to all connected modules.

b. Provide each power supply module with an on-off switch integral to the module. If the manufacturer's standard power supply module is not provided with an on-off switch, install a miniature toggle type switch near the PLC and clearly labeled the switch as to its function.

c. Provide power supply modules with an indicating light that is lit when the module is operating properly.

2.9.4.2.4 Input/Output (I/O) Modules

I/O Modules are self contained, microprocessor based units that provide an interface to field devices. Locate the I/O modules in the same mounting rack as the other PLC components. The unit is to plug directly into the backplane of the mounting rack. Each module is to contain visual indication to display the on-off status of individual inputs or outputs. All modules are to be mechanically keyed between the I/O module and the terminal strip to ensure the wiring and modules are correctly matched. Extensive diagnostic indicators are to be available on each module including information on the state of the I/O, along with specific module by module special features such as field wiring faults, blown fuses, and over/under voltage range information.

2.9.4.3 Program Storage/Memory Requirements

The CPU utilizes the manufacturer's standard non-volatile memory for the operating system. Provide the controller with electronically erasable, programmable, read only memory (EPROM) for storage of user programs and battery backed RAM for application memory. The EPROM is loaded through the controller keypad or through the use of a laptop computer. The CPU memory capacity is based on the system's control requirements. The memory capacity is sized such that, when the system is completely programmed and

functional, no more than 50 percent of the memory allocated for these purposes is used.

2.9.4.4 Input/Output Characteristics

Each controller allows for analog input, analog output, discrete input and discrete output. The number and type of inputs and outputs for the system is as shown on the drawings or described herein and is to comply with the sequence of control. Include in the system capacity a minimum of 20 percent spare input and output points (no less than two points) for each point type provided. During normal operation, a malfunction in any input/output channel is to affect the operation of that channel only and must not affect the operation of the CPU or any other channel. Analog input circuits are available in +/-10V, +/-5V, 0-10V, 0-5V, or 4-20 mA. Discrete input circuits are available in 5 volt TTL, 10-30 VDC, 18-26 VDC, or 79-132 VAC. Provide all input circuits with a minimum optical isolation of 1500 VRMS and be filtered to guard against high voltage transients from the externally connected devices. Analog output circuits are to be available in +/-10V or 4-20 mA. Discrete output circuits are to be available in 5 volt TTL, 10-30 VDC, 18-26 VDC, or 79-132 VAC. Provide all output circuits with a minimum optical isolation of 1500 VRMS and filter to guard against high voltage transients from the externally connected devices. Provide a PLC that is able to communicate with a computer or other PLC's via fiber optic cable or copper cable. Provide a PLC processor that is able to process data from Remote Input/Output modules via fiber optic cable or copper cable. Ensure remote Input/Output modules do not require individual programming to function.

2.9.4.5 Wiring Connections

Provide wiring connections that are heavy duty, self lifting, pressure type screw terminals to provide easy wire insertion and secure connections. Provide terminals that accept two #14 AWG wires. Provide a hinged protective cover over the wiring connections. Provide write-on areas for identification of the external circuits on the cover.

2.9.4.6 On-Off Switch

Provide each controller with an integral on-off power switch. If the controller is not provided with a manufacturer's standard on-off switch, then install a miniature toggle type switch in the control panel near the controller and clearly labeled the switch as to its function.

2.9.4.7 Diagnostics

Provide each PLC with diagnostic routines implemented in firmware. The CPU is to continuously perform self-diagnostic routines that will provide information on the configuration and status of the CPU, memory, communications and input/output. The diagnostic routines are to be regularly performed during normal system operation. Provide a portion of the scan time of the controller dedicated to performing these housekeeping functions. In addition, provide a more extensive diagnostic routine that is performed at power up and during normal system shutdown. The CPU is to log input/output and system faults in fault tables which are accessible for display. When a fault affects input/output or communications modules the CPU is to shut down only the hardware affected and continue operation by utilizing the healthy system components. Annunciate all faults at master control panel and at the PLC.

2.9.4.8 Accuracy

Provide controllers with an accuracy of plus or minus 0.25 percent of input span.

2.9.5 PLC SOFTWARE

Furnish all PLC software described in this specification as part of the complete control system.

2.9.5.1 Operating System

Provide each PLC with the manufacturer's standard operating system software package. Maintain a point database in its memory that includes all parameters, constraints and the latest value or status of all points connected to the PLC. Use the data in memory resident files for the execution of the PLC application programs. The operating system must support a full compliment of process control functions. It is possible to define these functions using a mix of function blocks, ladder logic diagrams, sequential function charts and text programming. Base programming methods and interactions on IEC 61131-3. A combination of the programming methods is to be possible within a single controller. The operating system allows loading of software locally. The operating system supports data entry and diagnostics using an operator interface panel attached directly to the PLC. Each PLC is be capable of operating in stand alone mode.

2.9.5.1.1 Startup

Provide the PLC with startup software that causes automatic commencement of operation without human intervention, including startup of all connected I/O functions. A PLC restart program based on detection of power failure at the PLC is to be included in the PLC software. The restart program includes start time delays between successive commands to prevent demand surges or overload trips.

2.9.5.1.2 Failure Mode

Upon failure for any reason, each PLC is to perform an orderly shutdown and force all PLC outputs to a predetermined (failure mode) state, consistent with the failure modes shown and the associated control device.

2.9.5.2 Functions

Provide a controller operating system that is able to scan inputs, control outputs, and read and write to its internal memory in order to perform the required control as indicated in the sequence of control on the drawings. The controller periodically perform self diagnostics to verify that it is functioning properly.

2.9.5.2.1 Analog Monitoring

The system measures and transmits all analog values including calculated analog points.

2.9.5.2.2 Logic (Virtual)

Logic (virtual) points are software points entered in the point database which are not directly associated with a physical I/O function. Logic

(virtual) points can be analog or digital points created by calculation from any combination of digital and analog points, or other data having all the properties of real points, including alarms, without the associated hardware. Logic (virtual) points are defined or calculated and entered into the database. The calculated analog point has point identification in the same format as any other analog point.

2.9.5.2.3 State Variables

If an analog point represents more than two (up to 8) specific states, each state is to be nameable.

2.9.5.2.4 Analog Totalization

Any analog point is to be operator assignable to the totalization program. Up to eight analog values are to be totalized within a selectable time period.

2.9.5.3 Alarm Processing

Provide each PLC with alarm processing software for analog input, digital input, and pulse accumulator alarms for all real and virtual points connected to that PLC.

2.9.6 AVB Control System Processing and Control Software

2.9.6.1 General

Specific functions to be implemented are defined in individual system control sequences and database tables shown on the drawings and herein. Provide software that provides the communication, programming and control capabilities necessary to support all specified points and functions, [plus a minimum expansion of [20][25][50][_____] percent of the current number of points] complete with their point database. Provide a controller that is online at all times and performs all required functions as specified. Provide software that consists of custom-developed code and/or one or more standard software modules. Where multiple modules are used, the modules need to be capable of sharing data and operating together seamlessly. Provide a system that supports multiple user operations with multiple tasks for each user and supports operation and management of all peripheral devices. Provide a system that allows on-line configuration modifications, while the system is operating. Provide a system that allows the possibility of upgrading the software to newer versions using an automatic mechanism provided by the software manufacturer. Provide software with complete user documentation online, including examples of how to operate the various modules within the software. Supply all documentation implemented software, including the custom-developed software codes to [the Contracting Officer][_____] after formal system acceptance. [[The Contracting Officer][_____] has the right of use for the provided software for future enhancements and additions to the installed system.] Ensure the AVB control system does not contain proprietary code or passwords that limit work to be done exclusively by a manufacturer of the product. Provide open source code.

2.9.6.2 Resident Application Software

Provide resident applications programs developed in accordance with paragraph Graphical Object Oriented Programming to achieve the sequences of operation, parameters, constraints, and interlocks necessary to provide

control of the systems connected to the control system. All application programs are resident in the PLC and are to execute in the PLC, and coordinate with each other, to insure that no conflicts or contentions remain unresolved.

2.9.6.3 Display Information

Provide information necessary to support all requirements specified at the AVBCS display, including: guard control commands; alarm notification; status point changes; and report generation

2.9.6.4 Graphical Object Oriented Programming

Provide a system that includes a graphical object oriented programming function which is used to create all control sequences utilized in the control panels. The graphical object oriented programming function provides programming elements to be connected together to create a logic diagram. The diagram must be compliable to produce executable code for the control panel. Provide a graphical object oriented programming function that includes elements necessary to create logic diagrams that represent sequences of operation. Provide program elements that are able to be combined into a custom template which can then be used as a standard function.

2.9.6.5 Command Software

The Provide software for defining and selecting I/O, parameters, and all other functions associated with operation. The operator commands must be usable from keyboards with individual operator passwords as specified. Store the database in non-volatile RAM or other approved means. Static database must downloadable to backup devices.

2.9.6.6 Command Input and Errors

Provide command menus that utilize full words and acronyms selected to allow programmers/technicians to use the AVBCS without extensive training or data processing backgrounds. The AVBCS will issue a prompt to the programmer/technician. Insure the AVBCS supervise programmer/technician inputs to ensure they are correct for proper execution. Insure programmer/technician input assistance is provided whenever a command cannot be executed because of input errors.

2.9.6.7 Special Functions

The AVBCS supports the following special functions by using a mouse or touchscreen, in addition to all other commands specified:

a. The Help display will produce a display of all commands available to the operator. The help command, followed by a specific command, produces a context sensitive listing with a short explanation of the purpose, use, and system reaction to that command.

b. Print Report allows the operator to print reports.

2.9.6.8 Alarms

The software alarms is to notify a programmer/technician of the occurrence of an alarm condition. The AVBCS alarm history are to be stored, to be re callable by the programmer/technician using the report generator. Alarm

messages take precedence over other functions. A minimum of the most recent 1000 alarms must be directly available at the AVBCS. Within the alarm response time digital alarms are subject to immediate reporting, within the alarm response time.

2.9.6.9 Report Generator

Provide software to generate and format standard and custom reports for displaying and storing on disk. Database values and parameters, values calculated using the real time static database or historical data base; with the reports subsequently stored on removable media to generate reports. Do not interrupt dynamic operation of the system to generate a report. Provide the report with the time and date when the report was printed.

2.9.6.10 Periodic Automatic Report

The system allows for specifying, modifying, or inhibiting the report to be generated, the time the initial report is to be generated, the time interval between reports, end of period, and the output peripheral. The system (through the Request Report Mode) allows for the operator to request, at any time, an immediate display of any report.

2.9.6.11 Historical Data Storage and Retrieval

Provide a historical data storage and retrieval function used to collect and store dynamic data. This function is in addition to other data storage requirements. The function must have the capability to collect and store alarm status changes, point values, events and operator commands, and system responses. Provide this function with the capability to retain historical data on non-volatile RAM for pre-specified time periods, up to forty-five days using last day roll over, for short-term analysis, and then output the data to the utility software for long-term retention. Insure the operator is able to selectively recall short-term data stored on non volatile RAM. Using the data retrieval and report generation program retrieval of the contents of any selected historical data file through utility programs is available. The output of the report generation program must be capable of being viewed on the screen, transferred to removable media, or stored.

2.9.6.12 System Access Control

Provide a minimum of 10 passwords that is usable with the control system software. The AVBCS maintains a log of programmers/technicians logged onto the system. Define each password as to the functions that the programmer/technician can perform. The software must support a user based security system. The security system allows for the creation of users with certain rights and/or privileges,When enabled. When user based security is enabled, an audit trail must be generated in the system which tags every programmer/technician logon with user identification (ID). Support the following functions within the security management application:

a. Define users.

b. Define groups which users may belong to.

c. Define user and/or group rights/privileges.

2.9.6.13 Convenience Outlet

****

NOTE: Coordinate with electrical drawings to provide power for control panel convenience outlet and other required accessories.

****

Provide a 120 volt ac, 15 amp, ground fault interruption (GFI) type duplex convenience outlet inside each cabinet that houses a PLC.

2.9.7 CONTROL PANEL(S)

****

NOTE: The first paragraph is to be used if using typical master, guard booth, overwatch style operating panels that are based on Appendix A with layouts shown on the drawings. The second paragraph is for non-standard applications for these control panels. choose the desired paragraph and delete the other.

The guide specification describes control panels here in generic terms of master control panel and types of remote operating panels.

****

[Provide a master control panel to interface between all barrier control circuits, remote EFO control panels,[remote EFO control buttons,][wrong-way][, overspeed], auxiliary equipment, and the crash rated active vehicle barrier power units. Provide remote control panel(s)/buttons [for each [guard booth,][search area,][Overwatch,][_____].] Provide remote local panel(s) at the barrier location to be used for maintenance purposes. Control circuits contain all relays, timers, and other devices or an industrial programmable controller programmed as necessary for the barrier operation. Provide a control panel that allows direct interface with auxiliary equipment such as card readers, remote switches, loop detectors, infrared sensors, and sliding or swinging gate limit switches. Ensure loop controllers do not allow an automatic barrier raise following power loss or restoration. Run all device interconnect lines to terminal strips. Descriptions are primarily for discrete controls making up a given control panel. If allowing or using touchscreen control instead, see paragraph "Touchscreen" for revised requirements. [Provide control panels as shown on the drawings and as described in Appendix A.][Provide control panels as shown on the drawings.][Provide control panels as described in Appendix A.][EFO function is not allowed to be accomplished with a touch screen.]]

[Provide a master control panel to interface between all barrier control circuits, remote EFO control panels,[remote EFO control buttons,] wrong-way[, overspeed], auxiliary equipment, and the crash rated active vehicle barrier power units. Provide remote control panel(s)/buttons [as shown.][for each[guard booth,][search area,][Overwatch,][_____].] Provide remote local panel(s) at the barrier location to be used for maintenance purposes. Control circuits contain all relays, timers, and other devices or an industrial programmable controller programmed as necessary for the barrier operation. Provide a control panel that allows direct interface with auxiliary equipment such as card readers, remote switches, loop detectors, infrared sensors, and sliding or swinging gate limit switches. Ensure loop controllers do not allow an automatic barrier raise following power loss or restoration. Run all device interconnect

lines to terminal strips. Descriptions are primarily for discrete controls making up a given control panel. If allowing or using touchscreen control instead, see paragraph "Touchscreen" for revised requirements. [EFO function is not allowed to be accomplished with a touch screen.]]

[2.9.7.1 Master Control Panel

****
NOTE: If panel layout is shown on the drawings, then keep the first paragraph and delete teh subparagraphs.
****

Provide a master control panel with all necessary displays and controls to allow the operator to view real-time alarms, discrete point status changes, to control crash rated active vehicle barriers and related equipment. Locate the master control panel[as shown on the drawings] in a manner to allow the operator to easily use the controls and monitor the displays while, at the same time, oversee entry and exit operations. Permanently label all control panel indicator lights, push buttons, and switches on the console. [Provide master control panel as shown on the drawings.][The master control panel includes the following:]

[a. Keyed Power On/Off switch with a red indicating light illuminating when power is on.

][b. Mode Selector Switch. Provide a selector switch for each barrier. The switch is to have ["EFO", "Test", "Local"] ["EFO", "Test"] [_____] modes. [Provide a keyed switch.]

][c. A pushbutton for "access allowed" and a pushbutton for "access denied" positions for each barrier and corresponding indicating light for each action. Illuminate a red indicating light for "access denied" and a green indicating light for "access allowed".

][d. A pictograph of the barrier in the "access allowed" position and "access denied" position next to the pushbutton.

][e. An EFO [pushbutton][switch][pushbutton or switch] with a cover that operates the barrier(s) in EFO mode.

][f. EFO Activated. Red indicating light.

][g. EFO Reset. [Lockable][Switch or pushbutton][Keyed switch].

][h. Lamp test button.

][i. An operating mode switch between EFO and manual modes for [each barrier][the inbound lanes and for the outbound lanes][as indicated].

][j. A toggle switch that arms or disarms each [remote panel with an EFO] [guard booth] control panel. Provide indicating light - red for arm and green for disarm.
]
[k. An audible alarm (buzzer) that has adjustable volume control. Volume control can be by another switch or built into the buzzer.
]
[l. Provide a pushbutton that is used to silence the audible alarm.

Silence button when pushed just silences the present alarm. If a new alarm comes into the panel, the audible alarm will activate.
]
][2.9.7.2 Remote EFO Control Panel - Primary
****
NOTE: The first paragraph is intended to be used for an overwatch position that does not have the master control panel. This overwatch is located at ACPs/ECFs. The second main paragraph is for other locations that may have different requirements. choose the appropriate option for the project. If panel layout is one drawings, then delete all the subparagraphs.

Within each paragraph, the choose the appropriate option.
****

[This panel is intended to be installed at each overwatch position. [Provide as shown on the drawings.]
]
[[Provide Remote Control Panel(s) - Primary as shown on the drawings.][The Remote Control Panel(s) - Primary includes the following:]
]
[a. Provide a red indicating light for "access denied" and a green indicating light for "access allowed".

][b. Next to the pushbutton or position indicating lights, provide a pictograph of the barrier in the access allowed position and access denied position.

][c. An EFO [pushbutton][switch][pushbutton or switch] with a cover that operates the barrier(s) in EFO mode.

][d. EFO Activated. Red indicating light. Locate near the EFO.

][e. A lamp test button.]

[f. An audible alarm (buzzer) that has adjustable volume control. Volume control can be by another switch or built into the buzzer.
]
[g. Provide a pushbutton that is used to silence the audible alarm. Silence button when pushed just silences the present alarm. If a new alarm comes into the panel, the audible alarm will activate.
]
[h. Provide a red indicating light that shows when the remote panel is Armed from the master control panel.
]
][2.9.7.3 Remote EFO Control Panel - Secondary
****
NOTE: The first paragraph is to be used for guard booths and search areas that are at ACPs/ECFs. The second main paragraph is for other locations that may have different requirements. choose the appropriate option for the project. If panel layout is one drawings, then delete all the subparagraphs.

Within each paragraph, the choose the appropriate option.

****

[This panel is intended to be installed in each Guard Booth[, at the Pedestrian Booth,] and at each Search Area. [Provide as shown on the drawings.]
]
[[Provide Remote Control Panel(s) - secondary as shown on the drawings.][The Remote Control Panel(s) - secondary includes the following:]
]
[a. An EFO [pushbutton][switch][pushbutton or switch] with a cover that operates the barrier(s) in EFO mode.

][b. Provide a red indicating light that shows when the remote panel is Armed from the master control panel.
]
[c. EFO Activated. Red indicating light. Locate near the EFO.

][d. An audible alarm (buzzer) that has adjustable volume control. Volume control can be by another switch or built into the buzzer.
]
[e. An red visual indicating light for wrong-way.
]
[f. An red visual indicating light for overspeed.
]
][2.9.7.4 Remote EFO Control Button
****

NOTE: Army Only. choose the first paragraph for Army projects.
The second main paragraph is for other locations that may have different requirements. choose the appropriate option for the project. If panel layout is one drawings, then delete all the subparagraphs.

Within each paragraph, choose the appropriate option.

****

[This EFO control button is intended to be installed at each Guard Booth. [Provide as shown on the drawings.]
]
[[Provide EFO control button as shown on the drawings.][The EFO control button includes the following:]
]
a. An EFO [pushbutton][switch][pushbutton or switch] with a cover that operates the barrier(s) in EFO mode.

b. Provide a red indicating light that shows when the remote EFO button is Armed from the master control panel.

c. EFO Activated. Red indicating light. Locate near the EFO.

][2.9.7.5 Remote - Local Control Panel
****

NOTE: Local Control Panel is a remote control panel that is to be located near the crash rated active vehicle barrier by the maintenance personnel. This panel in most applications does not have an EFO. Edit per the project requirements. If panel layout is one drawings, then delete all the subparagraphs.

NOTE: Include first bracketed choice that references Army projects with an Access Control Point and delete all other material.
****

This Remote Control Panel does not haven an EFO. The panel is to be located within a cabinet located near the crash-rated active vehicle barrier that is lockable. [Provide Local Remote Control Panel(s) as shown on the drawings.][The Local Remote Control Panel(s) includes the following:]

[a. A pushbutton for "access allowed" and a pushbutton for "access denied" positions for each barrier and corresponding indicating light for each action. Illuminate a red indicating light for "access denied" and a green indicating light for "access allowed").

][b. Next to the pushbutton, provide a pictograph of the barrier in the "access denied" position and "access allowed" position.

][c. Lamp test button.]

[d. Mode Selector Switch. Provide a selector switch on the panel for each [barrier][direction of travel]. The switch is to have ["EFO or Off", "Local"] modes. [Provide a keyed switch.] Provide with a red indicating light illuminating when in the [Local][On} position.
]
[e. Out of service switch. Provide a two-position switch that can be operated in any operating mode. Provide red indicating light for yes/enabled and a green indicating light for no/disabled.
]]
][2.9.7.6 Keys for Switches

[Provide keyed switches and keys as shown on the drawings and required in Appendix A.][Provide keyed switches and keys as shown on the drawings.][Provide keyed switches and keys as described in Appendix A.][The Control Panel(s) include keyed switches with keys per the following:]

[a. Each master control panel switch operable by a unique key.

][b. Master control panel mode switch key removable in [all modes]["EFO", "Test", "Local"]["EFO", "Test"][_____]mode(s) only.

][c. Local panel mode selector switch with key removable in ([all modes]["Off", "Local"]["Off"][_____].

][d. Master control panel mode selector switch for a [specific barrier][direction of travel] is to match the corresponding Local Control Panel mode selector switch for the same barrier. The master control panel mode selector switch and the local control panel switch are keyed the same.

][e. Key removable only in [off][on][_____] position.]

]2.9.8 VOLTAGE

[The control circuit operates from a [120] [_____] volt [60][50] Hz supply.][Provide control circuits that have a voltage rating of [24] [12] [_____] [ac] [or] [dc] for all external control panels.][Contractor to choose the control voltage desired.]

2.9.9 SEQUENCE OF EVENTS RECORDER

All alarms and events listed in Appendix B must be collected by the AVBCS and stored with the following data: identification of the alarm/event, date and time to the nearest second of occurrence, date and time of acknowledgement (alarm points only), date and time of reset (alarm points only), and an alarm/event message. Events may have multiple messages to describe all possible states, e.g., AVB #1 in EFO mode, AVB #1 in Test mode, or AVB #1 in Local mode, EFO Guard booth 1 activated. Provide means and user-initiated procedure to export the stored alarms and events to a removable storage device for printing in a standard Windows application such as a spreadsheet. Receive and store all alarms and status changes in the AVBCS database with the appropriate time tags in no more than 100 milliseconds after the condition occurs (e.g., alarm/status point contact closure).

2.9.10 ALARM DISPLAY PANELS AT THE ID CHECK AREA AND SEARCH AREA(S)

Mount one or more Alarm Display Panels consisting of back-lit or LED [OVERSPEED and][WRONG WAY] messages outside of but near the guard booths at the ID Check Area. Mount so that the guards can see the message boards while looking toward the on-coming traffic. Include an adjustable audible alarm with the each alarm panel. Provide and locate a sufficient number of alarm panels to ensure any ACP/ECF guard either sitting in a guard booth or standing outside the guard booth can see and hear at least one panel. Provide an adjustable audible alarm that is loud enough to be heard over ambient traffic noise. Overspeed and wrong-way alarms clear automatically 3 seconds (adjustable) after the alarm condition ends with no action required by guard. Record overspeed and wrong-way alarms on the Alarm and Events Recorder.

2.9.11 Control Panel Components and Construction

2.9.11.1 Enclosures

Each control panel enclosure is to conform to the requirements of NEMA 250 for the types specified. Provide the manufacturer's standard finish color, unless otherwise indicated. Repair and refinish damaged using original type finish. Provide Type [1][4][12] enclosures for installation in equipment rooms; those for installation in clean, dry indoor occupied space may be Type 1; other locations are as otherwise specified or shown. [Provide Type 4 or as shown, enclosures for equipment installed outdoors.] [Provide Type 4X enclosures for installation in corrosive environment and construct of [stainless steel] [fiberglass] [polymer plastic]. Painted steel is not be allowed for use in a corrosive environment.] Provide enclosure with a single, continuously hinged exterior door with print pocket, 3-point latching mechanism and key lock and a single, continuously hinged interior door. Provide panels that are mounted on flat horizontal surface with a top that is tilted at 45 degrees or 60 degrees (unless a panel is wall mounted) to ensure easy viewing of the controls. Secure the control panel to the surface it is mounted.

2.9.11.2 Controllers

Provide controllers per paragraph programmable logic controller (PLC).

2.9.11.3 Standard Indicator Light

Provide indicator lights that comply with NEMA ICS 1, NEMA ICS 2, and UL 508. Provide lights that are heavy-duty, round and mount in a 22.5 mm 0.875 inch mounting hole for alarm indicator, crash rated active vehicle barrier position indicator and EFO activation. Provide lights of the same size and type indicated for alarm indicator or provide round and mount in a 12.7 mm 0.5 inch mounting hole for all other indicators. Provide long-life LED type indicator lights that operate at 120 VAC or 24 VDC. Provide indicator light with a legend plate labeled as shown on the drawings. Provide the indicated lens color as shown on the drawings or specified herein. Provide panels with an overall "Push to Test" pushbutton or provide lights that are push to test (lamp) type. It is allowed to provide illuminated pushbuttons instead of a separate visual indicator.

2.9.11.4 Selector Switches

****
NOTE: Indicate on the drawings where key operated switches are required.
****

Selector switches must comply with NEMA ICS 1, NEMA ICS 2 and UL 508. Provide selector switches that are heavy duty, round and mount in a 22.5 mm 0.875 inch mounting hole. Provide the number of positions as indicated on the drawings or specified herein. Provide switches as indicated on the drawings or specified herein. Provide switches that are rated for 600 volts, 10 amperes continuous. Provide selector switches with a legend plate labeled as shown on the drawings or specified herein. Where indicated or required, Provide dual auxiliary contacts for the automatic position where indicated or required, to provide position sensing at the workstation. Auxiliary contacts that are rated for 120 VAC, 1A as a minimum. Provide key operated switches where indicated on the drawings or specified herein. All keys are to be identical unless indicated on the drawings or specified herein to have different keying.

2.9.11.5 Push Buttons

Push buttons must comply with NEMA ICS 1, NEMA ICS 2 and UL 508. Provide push buttons that are heavy duty, round and mount in a 22.5 mm 0.875 inch mounting hole. Provide the number and type of contacts as indicated on the drawings or required by the Sequence of Control. Provide push buttons that are rated for 600 volts, 10 amperes continuous. Provide push buttons with a legend plate labeled as shown on the drawings.

2.9.11.6 Relays

Relays must comply with IEEE C37.90 and derated for altitude above 1,500 meter 4921 feet. Provide relays that are as required by the Sequence of Control. Provide relay coils that are rated[120 VAC] [or] [24 VDC][that coordinates with the controls] and provide with matching mounting socket. Ensure power consumption is not greater than 3 watts.

2.9.11.7 Terminal Blocks

Terminal blocks must comply with NEMA ICS 4 and UL 1059. Provide terminal blocks for conductors exiting control panels that are two-way type with double terminals, one for internal wiring connections and the other for

external wiring connections. Provide terminal blocks made of Bakelite or other suitable insulating material with full deep barriers between each pair of terminals. Provide a terminal identification strip that forms part of the terminal block and each terminal must be identified by a number in accordance with the numbering scheme on the approved wiring diagrams.

[2.9.11.8 Alarm Horns

****

NOTE: If using a SDDCTEA Safety Scheme found in Appendix A, some of the systems require an audible warning at the barrier and some it is just an option. Hybrid Beacon (Signs & Signals), HEPD, and Stop Control require a horn. Full Containment is not required to have a horn.The horn is to sound only for EFO operation. SDDCTEA requires horn to go on for 10 seconds.

****

Provide alarm horns where indicated on the drawings[or where required in Appendix A]. Provide horns that are vibrating type and comply with UL 508. Provide horns with a 100 dB at 3 meters 10 feet rating. Provide horns with a means to adjust the volume level. Exterior horns are to be weather proof by design or be mounted in a weather proof enclosure that does not reduce the effectiveness of the horn. Horn is to be set to go off for [10][4][6][_____] seconds after an EFO is activated.

]2.9.11.9 Alarm Buzzer

Provide warning alarm piezoelectric buzzer at the master control panel and other panels where indicated on the drawings and specified herein.
Provide round buzzer that mounts mount in a 22.5 mm 0.875 inch mounting hole.
Provide buzzers with a Maximum 100 dB at 1000 mm 39 inch. Provide buzzer with a means to adjust the volume level and with selectable alarm tones.

[2.9.11.10 Touchscreen

****

NOTE: The EFO pushbutton/switch function is not allowed to be done by touchscreen.

NOTE: Touchscreens are being used more and more for more complex control systems. If touchscreen are not allowed, then delete paragraph

NOTE: Touchscreens can show the ACP/ECF layout and equipment with the controls or just show the controls. The preferred choice is the layout. choose the option for this project. The symbology indicated can be revised for each project.

****

EFO function is to be done by a discrete pushbutton/switch and is not allowed to be done on the touchscreen. The Contractor[has the option][is] to provide a touchscreen to perform the functions of the master control panel. [The master control panel graphical user interface is to show the layout of the ACP/ECF and have different screens that allow the user to go to specific areas to perform the operation.][The master control

panel graphical user interface is to show pushbuttons and lights in graphical format.] The minimum size for the touchscreen is 15 inches380mm for the master control panel. Screen shots are to be submitted for review and approval as part of the panel layouts. Provide symbology as indicated:

a. Show the crash rated active vehicle barrier graphically.

b. Red circular symbol to "push" for closing. Green circular symbol to "push" to open.

c. Green rectangle with black lettering for changing between operating modes. When going between different operating modes, a different screen is to show. Items that do not function are not shown or can be grayed out on the screen if approved. If going between modes and the system is in the incorrect configuration, an alarm box stating "Incorrect Configuration" is to pop-up.

d. EFO Activation triggers a red square with the wording "Warning Emergency Fast Operate Activated".

e. EFO Reset will be a green square with the wording "Press to Reset EFO". This opens a screen with a keypad to enter the pin to reset the EFO.

f. Control systems that have different operating modes will have the modes on different screens or some means to clearly shown on the screen which mode the panel is currently operating.

g. Local mode, when using discrete components, uses a key to do a lock-out/tag-out type application to ensure the maintenance worker has full control. When using a touch screen, a keyed approach can still be used as well as a password approach. No matter the solution, it is imperative that it require an action done by the guard or maintenance worker at the master control panel and then at the Local control panel to achieve full control. A solution that has only a unique password at the Local control panel is not allowed.

]2.9.11.11 Wiring

Wired, with multiconductor cable secured to underside of panel with straps at 1-inch25-mm maximum intervals and extra straps and cable sheath reinforcing sleeve where conductors break out for connections. Provide solderless, quick-disconnect, plug or sleeve connectors.

2.10 SEQUENCE OF OPERATION

****

NOTE: If Appendix A is used to define the operation or is shown on the drawings, then delete all the listed subparagraphs.

****

[Refer to Appendix A and the drawings for Sequence of Operation requirements.][Refer to Appendix A for Sequence of Operation requirements.][Sequence of Operation is as shown on the drawings.][_____ .]

[The system operates in the following manner:]

[

a. [The master control panel arms or disarms the control functions at the [local][and][remote]control panels and controls the operational mode of all the barriers in the system. The master control panel also

controls and monitors the position of each barrier.]

b. [When enabled by the Master Control Panel, the Local Control Panel[s] control[s] and monitor[s] the position of each barrier under the Local Panels control.]

c. [When enabled by the master control panel, the remote control panel[s] control[s] and monitor[s] the position of each barrier under the remote panel's control.]

d. Power On/Off switch. Provide a green light to indicate the "on" position. With the switch in the "off" position, all indicating lights and switches are off/disabled.

****

NOTE: Edit this for what is interned for this application. The selector switch(es) can be by barrier, by lane, or by direction of travel.

****

e. Selector Switch. Provide a selector switch for each barrier.[Provide a selector switch for each lane.][Provide a selector switch for each direction of travel.]Provide a switch that has ["EFO", "Test", "Local"] ["EFO", "Test"] [_____] modes. "EFO" mode locks out "Test" (manual) and "Local" operation for the barrier via "access allowed" /" and access denied" push buttons. "Test" mode locks out "EFO" and "Local" operation for the barrier. "Local" mode locks out the "Test" manual "access allowed"/ and "access denied" push buttons at the master control panel and the "EFO" mode for that barrier. [_____]

f. EFO. When the EFO button is pushed, barriers that have their selector switch in EFO position deployed after a [4] [_____] second delay. Induction loops must also be clear for the barriers to deploy. [The delay timer allows the yellow light in the traffic signal to illuminate for 3 seconds and then illuminate the red light for [1] [_____] second[s] prior to allowing barrier(s) to deploy. When the EFO button is pushed, a red indicating light on the panel(s) illuminated to indicate EFO activation.][A horn located at the barriers is to sound for [4][6][_____] seconds as soon as the EFO button is pushed.]

g. EFO Reset. Use of a [pushbutton][or][keyed switch] is required to reset the logic after an EFO has occurred.

h. Active Vehicle Barriers with "Access Allowed" and "Access Denied" Pushbuttons. When the barrier is in the "access denied" position a red indicating light on a control panel will illuminate. When the barrier is in the "access allowed" position a green indicating light on the same panel illuminated. The green indicating light must not illuminate until the barrier is in the "access allowed" position.

i. Lamp Test Button. When pushed this button activated all indicating lamps to verify that all bulbs are functional.

j. Induction Loops at the barrier. Provide [one prior to and one after the barrier][as shown on the drawings][_____]. [In "EFO" mode, barrier activation is suppressed until the loops don't sense the presence of vehicles.][In other modes, if the loop is activated (i.e. a vehicle is on the loop) barrier operation is prevented. Once

cleared, the barrier does not deploy.]]

2.11 AVB LIGHTING

Provide all crash rated active vehicle barriers with red warning flashing warning beacons mounted on the crash rated active vehicle barrier itself unless it is not practical as in the case of a net type. Provide LED type luminaires that have a lumen output sufficient to see easily at 61 m 200 feet. These luminaires are located on the face of the barrier that faces toward off-post (nonsecure side). Luminaires are to be on anytime the barrier is not fully open.

Provide the number and spacing of lights to meet the following requirements:

a. Bollard systems must include, as a minimum, one red led light per bollard.

b. Plate, drum or frame barrier systems equal to or greater than 1 m 3 feet in width will include, as a minimum, 3 red lights. One will be mounted within 305 mm 1 foot of each barrier edge and one will be mounted within 305 mm 1 foot of barrier centerline.

c. Plate, drum or frame barrier systems less than 1 m 3 feet in width will include, as a minimum, 1 red light. One light will be mounted within 305 mm 1 foot of the barrier centerline. Frame type barriers are allowed instead of the configuration described can have a light on each post/finger of the barrier If the frame type barrier does not have three or more lights visible, then in-pavement lights are required..

d. Crash beam barrier systems will include, as a minimum, 3 red lights. One will be mounted within 305 mm 1 foot of the each edge of the driving surface. One light will be mounted within 305 mm 1 foot of the roadway centerline.

e. Active Net type barriers are not required to have lighting mounted on the barrier. For Energy Absorbing Barriers, markings will be provided by the installation of retroreflective wrap on the netting/cables/posts which provide the same color scheme, retroreflective performance and durability as required in this SECTION. Provide retroreflective tape wrapped on the cables in alternating red and white pattern that is visible in both directions.

[2.12 IN-PAVEMENT LUMINAIRES

****

NOTE:In pavement lights are required when the barrier does not have lights in the main direction of travel toward the barrier and any path the threat vehicle can take toward the barrier. Also, active net (net/cable type) barriers are unable to have lights mounted on them. The use of the in-pavement lights do add some maintenance since they are installed in the ground/pavement. Normally uni-direction is sufficient, but for net type, it may be beneficial to have bi-directional.

****

[Luminaire technical requirements are as shown on the drawings.

][Luminaire technical requirements are indicated below:]

[a. Provide [unidirectional] [bi-directional] in-pavement luminaires. Utilize red LEDs. Provide the in-pavement luminaire with a light beam spread of 60 degrees. Ensure the housing does not extend more than 6 mm 0.25 inches above the finished pavement. Provide a housing that can withstand a static load of 19958 kg 44,000 lbs without deformation.

][b. Provide a stainless steel luminaire housing when installed in areas with snow. Provide a unit that is rated for snow plow use.

][c. Luminaries are to be steady on and operate [whenever the barrier is not fully open][when the traffic signal for the barrier is red][whenever an emergency fast operate button is activated].

]

]2.13 WARNING BEACONS

The warning beacon or wig-wag must be [mounted within [_____] m[_____] ft of each barrier] [on each barrier] [as shown on the drawings] and is to include two alternately flashing signal sections. Provide each signal section with a standard traffic signal face with a flashing CIRCULAR YELLOW signal indication. Mount signal sections horizontally on the warning beacon. The visible diameter of each signal section is not to be less than 200 mm 8 inch. When illuminated, the beacon must be clearly visible, to all drivers it faces, for a distance of at least 1.6 km 1 mile under normal atmospheric conditions unless otherwise physically obstructed. Provide the yellow lens color to meet the requirements of MUTCD. Provide all flashing contacts with filters for suppression of radio interference. Provide beacons that flash at a rate of not less than 50 nor more than 60 times per minute. The illuminated period of each flash is 1/2 of the total cycle for each signal section. Provide a beacon this is programmable and in order to permit continuous non-flashing operation through a supervisory signal from the Traffic Controller Unit (CU). Provide day-light sensor and an automatic dimming system to reduce the brilliance of the beacon.

2.14 BLANK-OUT SIGNS

****

NOTE: Appendix A safety schemes for HEPD and Stop Control require the use of this type of signs. Hybrid Beacon indicates that this signage is optional.

****

Provide the blank-out sign with LEDs that have a lifetime of 80,000 hours or better. Automatic dimming is to adjust to ambient light levels. Flashing circuits are to be adjustable. Sign is to be NEMA 4 or 4X. Sign housing is to be constructed of extruded aluminum or stainless steel with gasket seals around the doors and lens. At full intensity, the sign is to be highly visible anywhere within a 15 degree cone centered about the optic axis. LED assemblies are removable and replaceable with simple hand tools. Provide a sign that is rated to operate in a temperature range of -37C to 74C -35F to 165F.

2.15 TRAFFIC SIGNALS/HYBRID BEACON TRAFFIC SIGNALS

****

NOTE: Designer must verify that vehicles using a

gate with a barrier will be able to see the barrier position or the traffic lights. Semi-trucks may require a painted stop line or a traffic arm versus a higher mounted traffic light to ensure the lights or barrier can be seen by all vehicles. Manual barriers are not required to have traffic signals.

****

Provide traffic signals with light emitting diode (LED) signal modules. The term "LED signal module" in this text refers to an array of LEDs and lens that are capable of providing a circular signal indication as specified herein and shown on the drawings. All LED signal modules are to conform to the Equipment Standards of the Institute of Transportation Engineers (ITE), chapter 2a. The arrangement and size of signal indications for each LED signal module are as shown on the drawings and are to conform with MUTCD. Provide visors on each signal. Provide [yellow] [or] [black] housing color.

****

NOTE: Red/yellow/green signals are required for HEPD and full containment safety schemes. Delete if not required.

****

[Supply red/yellow/green 305 mm 12 inch traffic lights for each[entrance and exit lanes][as shown on the drawings or required by Appendix A] to alert motorists of the barrier position. Supply all necessary brackets to allow the lights to be properly mounted. Use the green light to indicate that the barrier is fully open.
]

****

NOTE: This signal is used only for hybrid beacon safety scheme.

****

[Hybrid Beacon. A three light hybrid beacon signal head over each inbound and outbound active barrier and on each post or only, only in special cases, post mounted only. Post mounted only requires two posts with each having a traffic signal. Supply red/yellow 305 mm 12 inch traffic lights for each entrance and exit lanes to alert motorists of the barrier position. Signals are placed such that there are two red signals mounted side by side with a yellow signal centered below. Supply all necessary brackets to allow the lights to be properly mounted.
]

****

NOTE: This is required on Stop Control safety scheme.

****

[Supply red 305 mm 12 inch traffic lights for each[entrance and exit lanes][as shown on the drawings or required by Appendix A] to alert motorists of the barrier position. Supply all necessary brackets to allow the lights to be properly mounted.
]

2.16 TRAFFIC SIGNAL SUPPORTS

Submit all traffic signal support design calculations as well as shop drawings to the government for review and acceptance prior to

installation.Ensure compliance with AASHTO LTS and applicable local and state standard specifications for the design and installation of all traffic control supports. Traffic signal supports consist of tubular members, mast arms, pole shaft, base plates, anchor bolts assemblies, foundations as well as associated connections and appurtenances. Evaluate loading to be consistent with local and state guidelines. Determine ice and wind loads based on the geographic location of the installation in accordance with AASHTO guidelines. Evaluate group loading analysis to be consistent with local and state guidelines and section 1.2.6 of AASHTO LTS. Allowable stress must be consistent with local and state guideline and section 1.4 of AASHTO LTS. Provide fatigue calculations that are consistent with local and state guideline and section 1.9.6 of AASHTO LTS. It is the Contractor's responsibility to conduct soil borings for foundation design; otherwise, conservative soils assumptions are to be used in calculating foundation requirements. If local and state guidelines provide foundations designs for design conditions, these guidelines may be used provided all loading and design conditions fall within guideline parameters. Before forming and placing concrete, inspect and evaluate each foundation excavation for the actual soil conditions encountered. Do not proceed with the work until the excavation is inspected and evaluated. If necessary, revise the foundation design based on the soil conditions encountered. Before submitting the revised design for approval, obtain the signature and seal of a Professional Engineer registered in the State.

2.17 VEHICLE PRESENCE, WRONG-WAY, AND OVERSPEED DETECTORS

****

NOTE: Overspeed detection is recommended to be set at 4.5 m/sec 10 mph or more over the posted speed to limit nuisance alarms. In an area with a posted speed below 11.2 m/sec 25 mph use 11.2 m/sec 25 mph as the base. Settings closer to the actual posted speed can lead to nuisance alarms.

****

Provide sensors that are compatible with the barrier controller and that function as part of a complete barrier control system.

Sensors used to detect overspeed are to have an an alarm setpoint of ([____] m/sec [____] mph that covers a distance of ([____] m/sec [____] mph from the ID Check Area or as shows on the drawings.

2.17.1 Photoelectric Type

Provide photoelectric sensors that meet the requirements listed below. Photoelectric sensors are used for vehicle presence detection [and over-height detection] as shown on the drawings.

a. Photoelectric detectors consist of separate transmitter and receiver units. Detector design or arrangement requiring reflector is not acceptable.

b. Light beam: laser or infrared, modulated and synchronized between the transmitter-receiver pair to minimize cross talk with adjacent detectors or other light sources. Where laser is used, provide a light source that is rated laser Class II or lower as per 21 CFR 1040 10.

c. Provide shield cones for beam path to minimize and isolate

interference from other light sources outside the detector aim cone and from other adjacent light sources.

d. Provide a photoelectric detector set, including the mounting post that is of robust design to withstand mechanical abuse such as plowed snow from roadway snow removal operations.

e. Provide surge protective devices (SPD) for the power and sensor wire terminations. Ground the SPD with minimum 10AW insulated ground wire of high strand-count to the closest ground termination point.

f. Provide matching cable connector as required

g. Provide a detector with a minimum range of 1.8 m 6 feet to no less than 19.5 m 65 feet.

h. Provide automatic detector tuning with temperature compensation.

i. Provide a detector with user selectable sensitivity settings.

j. Provide a detector with a response time of 15 milliseconds or less.

k. Provide detector with an output in a dry form C contact set, rated a minimum of 0.25 A at 24 Volts dc.

l. Provide detector enclosure with an enclosure rating NEMA 4X or better.

m. Provide a detector that is capable of operating in a humidity range of 0 to 95 percent and a temperature range of -40 to +77 degrees C -40 to +170 degrees F.

n. Provide a detector that is capable of operating from 120V/60Hz power, or be provided with appropriate power module/assembly and appurtenance, which are suitable for operation with 120V/60Hz.

2.17.2 Induction Loops

Induction loops may be used for vehicle presence detection, wrong-way detection, and point overspeed detection. Induction loops must be capable of detecting passenger vehicles, motorcycles, and high bed trucks. Tests for all three types of vehicles are to be conducted on each installed loop during the Performance Verification Test.[Provide a pair of inductive loops per barrier/lane whose outputs are used to prevent barriers raising[and lowering] when a vehicle has activated the loop. These safety loops are to be in a quadrapole configuration.][Provide loops as required by Appendix A and as shown on the drawings.][Active vehicle barriers that cross multiple lanes are to have loops that are still sized for each lane.] Induction loops used for vehicle detection and not wrong-way or overspeed detection are to be quadrapole. Provide induction loops that meet the following:

a. Tuning: automatic, with temperature compensation.

b. Loop input: to withstand minimum 2000V, both normal and common modes.

c. Loop Sensing frequency: minimum four user selectable frequencies to minimize cross talk with adjacent loops.

d. Sensitivity: user selectable, minimum 8 ranges, 20 to 2500 micro

henries with a Q factor of minimum 5.

e. Diagnostic: provide diagnostics and related indication for short and open loop circuit.

f. Detector output: dry form C contact set, rated a minimum of 0.25 A at 24 Volts dc.

g. Operating humidity: 0 to 95 percent.

h. Operating temperature: -40 to 77 degrees C -40 to 170 degrees F.

i. Vibration: NEMA TS-2 -2.1.9 or better.

j. Shock: NEMA TS-2 -2.1.10 or better.

k. User selectable operation modes: presence, pulse on entrance, pulse on exit - factory set on presence mode.

l. User selectable operation: Fail Safe or Fail Secure - factory set at fail safe.

m. User selectable sensitivity boost feature, which boosts sensitivity after a presence detection and holds the increased sensitivity until the detection drops out, at which time sensor sensitivity returns to the original setting.

n. Power requirement: 120V/60Hz, or be provided with appropriate power module/assembly and appurtenance, which is suitable for operation with 120V/60Hz.

o. Loop Wire.

(1) Provide number of inductive loops as per manufacturer's recommendations based on loop size and distance between loop and loop amplifier.

(2) Ensure that the loop slots in which the loop wire is laid are free from debris, sharp objects, and are completely dry. Clean out slots with compressed air before installing loop wire.

(3) Install loop wire in layers. Install backer rods over top wire at a minimum of 300 mm 1 foot spacing to ensure uniform placement of wire in the slot. Fill the loop slots with sealant per recommendation of the loop wire manufacturer.

(4) Use 16AW stranded cable with cross-linked-polyethylene insulation installed in a PVC sleeve. Loop wire extending from the loop to the loop amplifier is to be twisted with a minimum twist pitch of 18 per m 6 per foot.

(5) Check conductor resistance to ground with "megger" of 500V or higher. Remove and replace the whole installation if ground resistance of less than 10 mega-Ohms is measured.

(6) Provide surge protective device for both loop-wire terminations at or near the loop detector module. Ground the SPD with minimum 10AW insulated ground wire of high strand-count to the closest ground termination point.

(7) Provide loops that are capable of detecting motorcycles, passenger vehicles, and high bed trucks with the same sensitivity setting.

(8) Provide two complete loops for wrong-way detection. Using a single loops to detect wrong-way is not acceptable.

2.17.3 Radar

****

NOTE: Select either Point or Continuous overspeed detection as required

****

Radar detection sensors may be used for vehicle overspeed and wrong-way detection.[Point overspeed Detection. Provide a detector unit that is capable of detecting the speed of one or more vehicles at a point in the ACP/ECF Approach Zone and closing an alarm contact if the vehicle speed is over a preset value.][Continuous overspeed Detection. The detector unit must be capable of continuously detecting the speed of vehicles within preset zones as they approach the ID Check Area of the ACP/ECF. The Sensor is to close an alarm contact when the speed of any vehicle anywhere within the zone is above a preset value. See drawings for required detection zones and detector speed settings. For radar sensors which sense speed at multiple discrete points in the direction of travel instead of continuously, the distance between discrete points is to be 5 m 15 feet or less.] Provide radar detection units that meet the following requirements:

a. Provide a detector unit with an operating temperature range of -40 to +77 degrees C -40 to +170 degrees F and a relative humidity range of 5 to 95 percent, non-condensing. Equip The detector unit with means for automatic temperature compensation as is necessary to overcome adverse effects of temperature and humidity swings in the specified range.

b. The detector unit must be resistant to vibration in accordance with NEMA TS-1, IEC 60068-2-30 (test Fc), or approved equivalent. The detector unit must be resistant to shock in accordance with NEMA TS-1, IEC 60068-2-27 (test Ea), or approved equivalent.

c. Provide a detector unit with a withstand voltage surge of minimum 1kV (rise time = 1.2 microsecond, hold = 50 microsecond) applied in differential mode to all lines, power and output, as defined by IEC 61000-4-5 standard.

d. Provide a detector unit that does not emit a noise at levels exceeding 55 dBa when measured at a distance of 1 meter 3 feet away from its surface.

e. Each detector unit is to transmit on a frequency band of 10.525 GHz +/-25 MHz or another approved spectral band. Provide a detector that complies with the limits for a Class A digital device pursuant to Part 15 of the FCC rules or the appropriate Spectrum Management Authority. Provide a detector unit that does not interfere with any known equipment. Ensure transmitter power does not exceed 10 mili-watts.

f. Provide a detector unit that can detect vehicle speed with 95 percent accuracy or greater independent of the vehicle's direction of travel through the detection zone.

g. Provide a detector unit with a field of view that covers an area

defined by an oval shaped beam with a beam height and width of 15 degrees minimum and a range of3 to 70 m 10 to 200 feet minimum.

h. Provide a NEMA 3R enclosure or better for the detector unit. Do not exceed overall nominal envelop dimensions of 200 by 254 by 150 mm 8 by 10 by 6-inch.

i. Provide a detector unit with a power requirement of 120V/60Hz, or be provided with appropriate power module/assembly and appurtenance, which is suitable for operation with 120V/60Hz.

j. Provide the detector unit output upon detection of a vehicle speed over the adjustable preset value with a dry form C contact set, rated a minimum of 0.25 A at 24 Volts dc.

k. Provide a detector unit that has a blind zone of not more than 3 m 10 feet in front of the unit.

l. The detector unit may be applied in either Side-fired or Forward-looking configuration.

m. Detector units may be mounted on existing ACP/ECF structures or utility poles if suitable for this purpose. When existing structures and utility poles are not suitable, provide mounting trusses or poles for mounting detector units. Provide a support structure that deflect less than 13 mm 0.5 inch at exposure to 160 km/h 100 mph winds with a gust factor of 1.3 when a detector unit or units is mounted on it.

n. Set all detector unit parameters and adjust detectors to provide required zone coverage.

2.17.4 Video Detection

Video detectors may be used for vehicle presence, overspeed, and wrong-way detection. Detection is to be derived from video image signals received from a CCTV video camera. The video vehicle detector set includes the camera, hardware, software, and appurtenances required to perform the detection functions required on the drawings. The Video analytics system produced warning annunciation via alarm contacts when the required detection criteria are met. Refer to Section 28 10 05 ELECTRONIC SECURITY SYSTEMS (ESS) for requirement on the related video camera and video signal transmission system. Provide video detectors that meet the requirements listed below.

a. Provide a detector unit with an operating temperature range of -40 to +77 degrees C -40 to +170 degrees F and a relative humidity range of 5 to 95 percent, non-condensing.

b. Provide a detector that is resistant to vibration in accordance with NEMA TS-1, IEC 60068-2-30 (test Fc), or approved equivalent. Provide a detector unit that is resistant to shock in accordance with NEMA TS-1, IEC 60068-2-27 (test Ea), or approved equivalent.

c. Provide a detector unit when used for continuous speed detection that senses speed at multiple discrete points in the direction of travel. In order to adequately simulate continuous speed detection, the distance between discrete points is limited to no more than 5 m 15 feet.

d. The detector unit when used for speed detection must detect vehicle

speed with a 95 percent accuracy or greater, independent of the vehicle's direction of travel through the detection zone. The detector unit when used for presence or wrong-way detection is to identify the required condition with a 95 percent accuracy or greater.

e. Provide a NEMA 3R enclosure or better for the detector unit.

f. Provide a detector unit with a power requirement of 120V/60Hz, or be provided with appropriate power module/assembly and appurtenance, which is suitable for operation with 120V/60Hz. Provide the detector unit output upon detection of a vehicle speed over the adjustable preset value with a dry form C contact set, rated a minimum of 0.25 A at 24 Volts dc.

g. The detector unit may be applied in either Side-fired or Forward-looking configuration.

h. Detector units may be mounted on existing ACP/ECF structures or utility poles if suitable for this purpose. [When existing structures and utility poles are not suitable, provide mounting trusses or poles for mounting detector units. Provide a support structure that deflect less than 13 mm 0.5 inch at exposure to 160 km/h 100 mph winds with a gust factor of 1.3 when a detector unit or units is mounted on it.]

i. Set all detector unit parameters and adjust detectors to provide required zone overages.

2.18 WRONG-WAY AND OVERSPEED WARNING ANNUNCIATOR

****

NOTE: The marquee panel may not be required if the panel alarms are deemed sufficient.

****

Provide a warning annunciator (audible and visual) as indicated in the following:

(1) Provide a visual and audible annunciator that produces a sound whenever a [wrong way] [or overspeed] is detected by a vehicle entering from the exit. Provide the barrier control panels with an audible and visible indicating device as [indicated in Appendix A][indicated in Appendix A and on the drawings][indicated on the drawings.]

[(2) Provide a visual and audible annunciator that produces a sound whenever a [wrong way] [or overspeed] is detected by a vehicle entering from the exit. Provide a marquee style LED sign that shows "WRONG WAY" or "OVERSPEED" with an audible annunciator. Mount marquee on a column in the ID Check area that is visible to the guards when looking toward approacing traffic. Provide a means to adjust the volume on all the audible alarms. [Provide am audible annunciator that sounds until a silence reset button is pressed.][Provide an audible annunciator that sounds for [3][____] seconds and then clears itself.]

]

2.19 NON-CRASH RATED ACTUATED TRAFFIC ARM ASSEMBLY

****

NOTE: Edit the traffic arm location based on design requirements. Traffic arms may be required for a

SDDCTEA safety scheme or may be located at the ID Check area and at Search Areas.
****

Provide actuated traffic arm capable of 300 duty cycles per hour as a minimum and capable of operating the arm through 90 degrees. Provide gate operators with single phase [[120][208][240][277][_____] volt]motors. Provide slab size and anchorage for gate operator in accordance with manufacturer requirements.

(1) Cover each traffic arm with 406 mm 16 inch wide reflectorized red and white sheeting. Provide the traffic arm with retroreflective markings, in accordance with MARKINGS, [LIGHTING] AND SIGNS paragraph of this SECTION.

(2) Furnish a spare traffic arm for each traffic arm.

(3) Construct gate operator cabinets of galvanized steel, or aluminum and paint per manufacturers approved standard color.

(4) Provide gates with a hand-crank, or other means, which will allow manual operation during power failures.

(5) Construct actuated traffic arms out of wood, steel, fiberglass, or aluminum, as specified by the manufacturer for the given lengths as shown on the drawings.

(6) Provide each gate operator with an obstruction detector that automatically reverses the gate motor when an obstruction is detected. Provide an obstruction detector that is one of the following: An induction loop buried in the road, a photocell electric eye mounted on the gate operator, or a safety strip mounted on the lower edge of the arm. The detector system automatically deactivates when the arm reaches the fully lowered position.

****
NOTE: This option is typically not required.
****

[(7) Provide a break sensor as part of the traffic arm assembly that detects when a vehicle makes contact with the traffic arm and breaks the arm. When the break sensor is activated provide an audible warning through the vehicle barrier control panel. Provide an audible warning that sounds until an audible warning silence reset button is pressed or for [3][_____] seconds.]

2.19.1 Traffic Arm at Other Areas

Provide non-crash rated actuated traffic arm (barrier gate arm) assembly with an opening and closing time of less than or equal to [2][3][5] seconds. Provide each entry lane with a vertical traffic arm gate. Each traffic arm is to be capable of being operated from a remote open-close push button station. The guard booth for that lane is to have the means to open and close. [Provide a means to control each traffic arm from the Command and Control].[Provide actuated traffic arms with three LED flashing lights mounted on the arm.]

2.19.2 Traffic Arm at Active Vehicle Barrier

****

NOTE: HEPD and Full Containment safety schemes in Appendix A require a traffic arm near the active vehicle barrier. Hybrid Beacon safety scheme has the traffic arm optional. Those associated with a safety scheme, choose the 2 second operating time. If the traffic arm is located over the safety loop for the crash rated active vehicle barrier, then that loop can act as the obstruction detector. Edit the last choice accordingly.

It is optional to have flashing lights on the traffic arm. It is recommended when located at the barrier. However, if in-pavement lights are provided, it is not be necessary.

****

Provide non-crash rated actuated traffic arm (barrier gate arm) assembly with an opening and closing time of less than or equal to [2][3][5] seconds. Provide a traffic arm, as a separate piece of equipment, with each non-portable crash rated active vehicle barrier as part of the barrier safety operating system. [This traffic arm automatically deploys (close) when the emergency up button is activated and open when the vehicle barrier is reset.][Provide actuated traffic arms with three (minimum)LED flashing lights mounted on the arm.][Do not equip this traffic arm with a separate automatic obstruction detector. The safety loop for the barrier or the stop line is to function as the obstruction detector.]

2.20 UNINTERRUPTIBLE POWER SUPPLIES (UPS)

****

NOTE: Edit the appropriate choice.

NOTE: Army projects require a minimum of 10 minutes for the batteries.

****

[A panelboard located at the barrier location is powered from main UPS located near or at the Command and Control. This panelboard can be used to power some of the equipment listed below instead of a stand alone units.][When the facility UPS provides power to equipment/systems listed, then separate stand alone UPS are not required.]Provide separate UPS units capable of carrying required loads for a minimum of [10][2][5][15][_____] minutes for those items not powered from a central UPS based on this list below. Submit UPS Calculations for all proposed UPS systems identifying all connected loads plus 25% spare capacity.

[a. Primary communications system.

][b. All sensors and controllers for [over speed,] [wrong-way,] [tamper,] etc.

][c. Active Vehicle Barrier Control system including all controls for crash rated active vehicle barriers, [traffic warning signals], [actuated traffic arms], and [warning signals]. This includes the crash rated active vehicle barrier, traffic signal lights, in-pavement lights, and wig-wags.

]

****

NOTE: For Army Projects the minimum is 1.5 cycles, but not more than 2 cycles.

****

[d. Active Vehicle Barrier activation systems for [1.5][2] complete operation cycle ("access allowed" position to "access denied" position or "access denied" position to "access allowed" position).
]

[e. Lighting. One luminaire for each ID Check Lane located near the ID guard position and one luminaire for each CCTV camera required at the Active Vehicle Barrier.
]

2.21 SURGE PROTECTION

2.21.1 Power Line Surge Protection

Protect equipment connected to alternating current circuits protected from power line surges. Equipment protection must withstand surge test waveforms described in IEEE C62.41.1 and IEEE C62.41.2. Fuses are not to be used for surge protection.

2.21.2 Sensor Device Wiring and Communication Circuit Surge Protection

Protect inputs against surges induced on device wiring. Protect outputs against surges induced on control and device wiring installed outdoors and as shown. Protect communications equipment against surges induced on any communications circuit. Install surge protection circuits at each end on cables and conductors, except fiber optics, which serve as communications circuits between systems. Furnish protection at equipment, and additional triple electrode gas surge protectors rated for the application on each wireline circuit is to be installed within 1 meter 3 feet of the building cable entrance. Fuses are not to be used for surge protection. Test the inputs and outputs in both normal mode and common mode using the following two waveforms:

a. A 10 microsecond rise time by 1000 microsecond pulse width waveform with a peak voltage of 1500 Volts and a peak current of 60 amperes.

b. An 8 microsecond rise time by 20 microsecond pulse width waveform with a peak voltage of 1000 Volts and a peak current of 500 amperes.

2.22 INTRUSION DETECTION SYSTEM

****

NOTE: Edit Section 28 10 05 ELECTRONIC SECURITY SYSTEMS (ESS) to include appropriate project features of the Intrusion Detection System and the duress alarm system.

NOTE: In some cases the IDS/DURESS system equipment is future. Edit the paragraphs accordingly. Edit the appropriate specifications to ensure the conduit system is appropriate for the system.

****

Install and furnish the IDS and duress alarm system per the requirements of 28 10 05 ELECTRONIC SECURITY SYSTEMS (ESS).

[The IDS and duress alarm system for the contract consists of providing power and pathways for the signal wiring. A future contract will install

the wiring and IDS equipment.][The IDS equipment is part of this contract as shown on the drawings.]

2.23 CCTV SYSTEM

Install and furnish the CCTV system per the requirements of 28 10 05 ELECTRONIC SECURITY SYSTEMS (ESS).

2.23.1 CCTV System

[The CCTV system for the contract consists of providing power and pathways for signal wiring. A future contract will install the wiring and CCTV.][The CCTV system equipment is part of this contract.]

2.23.2 AVBCS and ESS Interface

Provide the AVBCS with output contacts for use by the ESS (IDS and CCTV systems) as follows:

a. Pull up all camera views of the crash rated active vehicle barriers during any EFO activation. Provide a dry contact from the AVBCS to be used by the CCTV system.

b. Provide a dry contact from the AVBCS that indicates a tamper switch alarm. This contact is to be used by the IDS system.

c. Provide a spare dry contact from the AVBCS that indicates an EFO activation.

2.24 MATERIALS AND COMPONENTS

2.24.1 Materials and Equipment

Units of equipment that perform identical, specified functions are to be products of a single manufacturer. Provide all material and equipment that is new and currently in production.

2.24.2 Single Manufacturer Active Vehicle Barriers

Provide all parts, components, accessories fittings and fasteners by a single manufacturer as required by manufacturer's written requirements, installation instructions and written warranty, unless otherwise noted in this specification.

2.24.3 Field Enclosures

2.24.3.1 Interior Sensors

Provide sensors used in an interior environment with a housing that provides protection against dust, falling dirt, and dripping non-corrosive liquids.

2.24.3.2 Exterior Sensors

Provide sensors used in an exterior environment with a housing that provides protection against windblown dust, rain and splashing water, and hose directed water. Provide sensors that remain undamaged by the formation of ice on the enclosure.

2.24.3.3 Interior Electronics

Provide systems electronics used in an interior environment with enclosures which meet the requirements of NEMA 250, Type 12.

2.24.3.4 Exterior Electronics

Provide systems electronics used in an exterior environment with enclosures which meet the requirements of NEMA 250, Type 3R, 4, or 4X.

2.24.3.5 Corrosion Resistant

System electronics to be used in a corrosive environment as defined in NEMA 250 are to be housed in non-metallic non-corrosive enclosures which meet the requirements of NEMA 250, Type 4X.

2.24.4 Above Ground Components

All above ground metal components are to be [shop primed and site painted] [or] [hot dipped galvanized] [or] [powder coated] unless otherwise specified.

2.24.5 Below Ground Components

All below ground metal components are to be [shop primed and site painted] [or] [hot dipped galvanized] [or] [powder coated] unless otherwise specified.

2.24.6 Nameplates

2.24.6.1 Components

Provide a nameplate for major components of the system. Nameplates will not be required for devices smaller than 25 by 75 mm1 by 3 inch. Provide corrosion-resistant metal plates that have at least the following data legibly marked:

a. Manufacturer's name.

b. Manufacturer's address.

c. Type, Style or Model number.

d. Serial number.

e. Date of manufacture.

f. Catalog Number.

2.24.6.1.1 AVB Nameplate

Provide nameplate data that is permanently attached to each vehicle barrier. Provide corrosion-resistant metal plates that have at least the following data legibly marked:

a. Manufacturer's name.

b. Model number.

c. Serial number.

d. Date of manufacture.

e. Catalog Number.

2.24.7 Tamper Switches

Provide tamper switches on all equipment enclosures for the AVBCS to include all operating panels and provide on all manhole/handholes that contain spliced control wiring. Provide enclosures with doors larger than 24 inches with two tamper switches or more. Provide corrosion-resistant tamper switches, arranged to initiate an alarm signal when the door or cover is moved. The enclosure and the tamper switch must function together and not allow direct line of sight to any internal components before the switch activates. Tamper switches must be inaccessible until the switch is activated; have mounting hardware concealed so that the location of the switch cannot be observed from the exterior of the enclosure; be connected to circuits which are under electrical supervision at all times, irrespective of the protection mode in which the circuit is operating; must be spring-loaded and held in the closed position by the door or cover; and be wired so that the circuit is broken when the door or cover is disturbed. The crash rated active vehicle barrier control system is to monitor the tamper switches and provide an audible/visual alarm to the Master control panel. The AVBCS is to provide a single dry contact output that indicates a tamper alarm. The alarms are to be zoned at the master control panel in the following manner:

(1) AVBCS operating control panels.

(2) AVBCS cabinets that contain control equipment such as PLCs that are not covered under Zone 1.

(3) Manholes/handholes that contain spliced control wiring associated with the AVBCS. If there are spliced wiring, then provide a visual alarm at the master control panel.

2.24.8 Locks and Key-Lock Switches

****

NOTE: Either round key or conventional key type locks are acceptable for use in the system. Selection should be based on hardware availability at the time of design and the requirements for matching locks currently in use at the site. If the locks do not have to be matched to locks in use, and the designer has no preference, all brackets may be removed.

****

2.24.8.1 Locks

Provide locks on system enclosures for maintenance purposes. Provide UL Listed locks, [round-key type with 3 dual, 1 mushroom, 3 plain pin tumblers][or][conventional key type lock having a combination of 5 cylinder pin and 5-point 3 position side bar]. Stamp keys "U.S. GOVT. DO NOT DUP". Arrange locks so that the key can only be withdrawn when in the locked position. Key locks alike and furnish only 2 keys for all of these locks. Control these keys in accordance with the key control plan

as specified in paragraph Key Control Plan.

2.24.8.2 Key-Lock-Operated Switches

Provide UL listed Key-lock-operated switches as required to be installed on system components , [round-key type, with 3 dual, 1 mushroom, and 3 plain pin tumblers][or][conventional key type lock having a combination of 5 cylinder pin and 5-point 3 position side bar]. Stamp keys "U.S. GOVT. DO NOT DUP". Provide 2 or 3 position key -lock-operated switches , with the key removable in specified positions. Key all key-lock-operated switches differently and furnish only 2 keys for each key-lock-operated-switch. Keys must be removable in the positions described in these specifications or as shown on the drawings. Control keys in accordance with the key control plan as specified in paragraph Key Control Plan.

2.24.8.3 Construction Locks

Use a set of temporary locks during installation and construction. The final set of locks installed and delivered to the Government must not include any of the temporary locks.

2.24.9 System Components

Design system components for continuous operation. Provide electronic components that are solid state type, mounted on printed circuit boards conforming to UL 796. Printed circuit board connectors are to be plug-in, quick-disconnect type. Incorporate safety margins of not less than 25 percent with respect to dissipation ratings, maximum voltages, and current carrying capacity on power dissipating components. Provide control relays and similar switching devices that are solid state type or sealed electro-mechanical.

2.24.9.1 Modularity

Design equipment for increase of system capability by installation of modular components. Design system components to facilitate maintenance through replacement of modular subassemblies and parts.

2.24.9.2 Maintainability

Design components to be maintained using commercially available tools and equipment. Arrange and assemble components they are accessible to maintenance personnel. Insure there is no degradation in tamper protection, structural integrity, EMI/RFI attenuation, or line supervision after maintenance when it is performed in accordance with manufacturer's instructions.

2.24.9.3 Interchangeability

Construct the system with off-the-shelf components which are physically, electrically and functionally interchangeable with equivalent components as complete items. Replacement of equivalent components must not require modification of either the new component or of other components with which the replacement items are used. Do not provide custom designed or one-of-a-kind items without explicit approval from the Contracting Officer. Ensure interchangeable components or modules do not require trial and error matching in order to meet integrated system requirements, system accuracy, or restore complete system functionality.

2.24.9.4 Product Safety

Conform system components to applicable rules and requirements of NFPA 70. Install system components with instruction plates including warnings and cautions describing physical safety and any special or important procedures to be followed in operating and servicing system equipment.

2.25 LINE SUPERVISION

Supervise all signal and Data Transmission System (DTS) lines. Provide a system that supervises the signal lines by monitoring the circuit for changes or disturbances in the signal and for conditions as described in UL 1076 for line security equipment. The system is to initiate an alarm in response to a current change of [5][10] percent or greater. The system also initiates an alarm in response to opening, closing, shorting, or grounding of the signal and DTS lines.

2.26 ELECTRICAL WORK

Submit detail drawings containing complete wiring and schematic diagrams, and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Provide motors, manual or automatic motor control equipment [,except where installed in motor control centers] and protective or signal devices required for the operation specified herein in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Provide all field wiring for induction loop detectors, communication lines, and power circuits with surge protection. Provide any wiring required for the operation specified herein, but not shown on the electrical plans, or specified herein, under this section in accordance with Sections 26 20 00 INTERIOR DISTRIBUTION SYSTEMand 33 71 02 UNDERGROUND ELECTRICAL DISTRIBUTION.

2.27 WIRE AND CABLE

Provide all wire, cable, and conduit connecting all Contractor furnished and, where indicated on the drawings, Government furnished equipment. Provide wiring in accordance with NFPA 70. Provide wiring that is fiber optic or copper cable in accordance with the manufacturers' requirements. Copper signaling line circuits and initiating device circuit field wiring must be No. [20][18][_____] AWG size conductors at a minimum. Ensure wire size is sufficient to prevent voltage drop problems. Circuits operating at 24 VDC must not operate at less than 21.6 volts. Circuits operating at any other voltage are to ensure the voltage drop does not exceed 5 percent of nominal voltage.

2.27.1 Above Ground Sensor Wiring

Provide sensor wiring that is 20 AWG minimum, twisted and shielded, 2, 3, 4, or 6 pairs to match hardware. Provide multi-conductor wire with an outer jacket of PVC.

2.27.2 Cable Construction

Provide all cable components to withstand the environment in which the cable is installed for a minimum of 20 years.

2.28 DATA TRANSMISSION SYSTEM (DTS)
****

NOTE: Include Section 27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEM in the project specification for the appropriate Data Transmission required at the project site
****

Provide DTS as specified in Section 27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEM.

2.29 CONCRETE

Provide concrete that conforms to Section 03 30 00 CAST-IN-PLACE CONCRETE.

2.30 WELDING

Welding is to be in accordance with AWS D1.1/D1.1M.

2.31 ACCESSORIES

Supply all accessories as required for a complete and finished system. Provide, at a minimum, all accessories as required by manufacturer's instructions.

2.32 FABRICATION

Shop assembly the vehicle barrier systems to the greatest extent possible.

2.33 TEST, INSPECTIONS AND VERIFICATIONS

Provide manufacturer written verification that vehicle barrier systems provided under this contract are manufactured in the "as-tested" and/or "as-certified" configurations, based on the crash testing.

Submit a Verification of Performance certificate stating that the construction, materials, and methods used will meet performance standards described in this section for this project

2.34 FACTORY ACCEPTANCE TEST
****
NOTE: Evaluate the need for a factory test. Take into account the size of the system, unusual site conditions, the complexity of the system, the devices that comprise the system, expansion of an existing system as well as other pertinent information. If a factory test is deemed necessary, the factory test requirements below shall be tailored to the control system to be tested. If a factory test is deemed unnecessary, delete it from the following paragraphs.

First paragraph, last choice is for Army projects only.

NOTE: Protective design center and COS-ACP is required on Army projects.
****

2.34.1 General

Provide personnel, equipment, instrumentation, and supplies necessary to perform a factory acceptance test of the complete crash rated active vehicle barrier control system. A factory acceptance test is to demonstrate that the proposed system and related equipment meet the control parameters within the contract documents. The test is to demonstrate how the systems operates if a PLC is damaged or if signals between systems are lost. The system must show that barriers cannot be deployed with anything but a red signal. The test is to demonstrate the required alarm annunciation, CCTV controls, and sequence of events recording. The test set-up must include the PLC(s), the master control panel, alarm panel, control switches, and at least one of each type of remote panel, tamper switches, and limit switches. The duress, overspeed, and wrong-way sensors; the crash rated active vehicle barrier open and close position switches; the VPDs; the traffic signals; and the warning beacons may all be simulated.[A member of the Protective Design Center and [of the Communities of Standardization for Access Control Points][Designer of Record] are to witness the factory acceptance test unless waived by the Government.]

Upon Test Plan approval by the Contracting Officer, assemble the test system and perform the factory acceptance test. The factory acceptance test is to demonstrate that the subsystems comply with the requirement specified herein. Conduct the factory acceptance test during regular daytime working hours on weekdays. The Contracting Officer reserves the right to witness all or a portion of the factory acceptance test.

2.34.2 Factory Acceptance Test Plan

Submit Test Plan for the factory acceptance test plan, a minimum of [45][30] days before the scheduled start of all factory acceptance tests. Factory test plan includes a schedule, test procedures, equipment catalog cuts, one line diagrams showing interconnections of all subsystem components, and diagrams showing control logic for the barriers, traffic signals, warning beacons, and alarm and status points. See paragraph "TEST PLANS" for list of information required to be tested.

2.34.3 Factory Acceptance Test Report

Submit the factory acceptance test report, which documents the results of the test, no more than 1 week after the successful completion of the factory acceptance test. The test report is to include the results of all test procedures showing all commands, stimuli, and responses to demonstrate compliance with the contract requirements in the test report. Include the certification from technical specialists from the crash rated active vehicle barrier, PLC, and the CCTV subsystems that their subsystem meets the contract requirements in the test report. The Contracting Officer will notify the Contractor within ten (10) days of receipt of the test report whether the test report is approved. If disapproved, the Contracting Officer will note the specific procedures that are disapproved; retest those procedures. Do not ship equipment to the field until the test report is approved by the Contracting Officer.

PART 3 EXECUTION

3.1 EXAMINATION

After becoming familiar with all details of the work, verify that site

conditions are in agreement with the contract drawings in accordance with paragraph "Current Site Conditions".

3.2 INSTALLATION

Perform installation in accordance with manufacturers instructions and in the presence of a representative of the manufacturer. Manufacturer's representative must be experienced in the installation, adjustment, and operation of the equipment provided. The representative is to be present during adjustment and testing of the equipment. Show on the drawings proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including foundation and clearances for maintenance and operation.

3.2.1 Oversight

The Contractor designated technical specialist for the crash rated active vehicle barrier control system (AVBCS) must oversee installation.

3.2.1.1 Observation and Inspection

Manufacturer's representative is to [observe and inspect] [inspect] crash rated active vehicle barrier systems installation. Manufacturer's representative must be experienced in the installation, adjustment, and operation of the equipment provided. Manufacturer's representative is to be present during adjustment and testing of the equipment.

3.2.1.2 Installer Training/Certification

Install crash rated active vehicle barriers by the manufacturer's trained or certified installers in accordance with manufacturer's written installation instructions.

3.2.2 Installation Schedule

Before beginning any site work, provide a schedule of all installation and testing activities. Arrange project activities in the proposed schedule in chronological order. Coordinate all installation and testing activities, specifically those requiring ACP/ECF outages, with the Contracting Officer. There must be a Contracting Officer approved schedule before any site work is performed.

3.2.3 Crash Rated Active Vehicle Barrier Installation

Include with the detail installation drawings a copy of the as tested installation drawing. Install crash rated and/or certified crash rated active vehicle barrier in an 'as-tested' condition. Additional site investigation and construction is required in order to accomplish this; except when a site specific crash test was performed where the exact site requirements were utilized in the crash test.

3.2.3.1 Vertical Alignment

Install all vertical elements plumb and in alignment with a tolerance of [6 mm] [1/4 inch][_____] or in accordance with manufacturer's installation instructions, whichever is more restrictive.

3.2.3.2 Horizontal Alignment

Install all horizontal elements in the alignment indicated on the approved shop drawings with a tolerance of [12 mm] [1/2 inch] in [2 m] [6 feet - 6 inches] or in accordance with manufacturer's installation instructions, whichever is more restrictive.

3.2.3.3 Field Welding

Field welding is unacceptable as it will cause significant damage to the galvanizing and powder coat protective finishes.

3.2.3.4 Field Cutting and Drilling

Avoid unnecessary cutting and drilling of pre-finished components. If necessary to cut or drill or otherwise modify product due to field conditions, repair factory finish in accordance with the manufacturer's written instructions.

3.2.4 Hydraulic Lines

Install the hydraulic unit no more than 7.6 m 25 feet from the barriers or no further than the distance provided in the manufacturer's instructions, whichever distance is more restrictive. Place buried hydraulic lines in polyvinyl chloride (PVC) sleeves. Keep sleeves clean of concrete, dirt, or foreign substances during construction. Use proper tools for field cuts requiring tapers. Thoroughly clean sleeves before they are laid. As each run is completed, draw a flexible testing mandrel approximately 305 mm12 inches long with a diameter less than the inside diameter of the sleeve through the sleeve. After which, draw a stiff bristle brush through until the sleeve is clear of particles of earth, sand and gravel; then immediately install plugs. Mark hoses for reference ("up", "down", "barrier #"). Coordinate project specific markings with the Contracting Officer.

3.2.5 Incidental Infrastructure

Provide all incidental construction as indicated. Design construct, and install incidental construction in accordance with local/state DOT requirements, AASHTO GDHS-5, AASHTO RSDG-4, NCHRP 350, and the MUTCD.

3.2.6 Concrete Placement

Provide concrete test reports per Section 03 30 00 CAST-IN-PLACE CONCRETE. After placement of the crash rated active vehicle barrier(s), replace the pavement sections to match the section and depth of the surrounding pavement unless a thicker pavement section is required for the tested condition of the crash rated active vehicle barrier. Warp pavement to match the elevations of existing pavement.

3.2.7 Reinforcing Steel Inspection

Inspect all by contractor's project manageror manufacturer's representative andthe Contracting Officer representative prior to concrete placement. Contractor is required to provide no less than [_____] days notice of concrete placement schedule to required inspection personnel. Coordinate with the requirements found in Section 03 30 00 CAST-IN-PLACE CONCRETE.

3.3 CYBERSECURITY INSTALLATION CERTIFICATION

****

NOTE: Coordinate requirements with UFC 4-010-06 CYBERSECURITY OF FACILITY-RELATED CONTROL SYSTEMS at https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-4-010-06

****

Furnish a certification that control systems are designed and tested in accordance with DOD 8500.01, DOD 8510.01, 25 05 11 CYBERSECURITY OF FACILITY RELATED CONTROL SYSTEMS, and as required by individual Service Implementation Policy.

3.4 DRAINAGE

3.4.1 Pit Drainage

****

NOTE: Edit this paragraph for drainage requirements. If soil characteristic and/or climate dictates another solution, then this should be considered and edited into this paragraph. Provide self-priming sump pump with capacity and power requirements if one is required. Delete this paragraph if pit/vault type construction is not required.

Federal and/or state EPA regulations may require that an oil/water separator be installed in the pit drainage system to ensure capture of any hydraulic fluid that may leak out of the system. If pit/vault type construction is required provisions will be made for drainage and connection to storm drainage system, or if no storm drain exists, a self-priming submersible sump pump of adequate capacity will be specified.

Most the barrier manufacturer's have a 76 mm3 inches opening for drainage. This is the minimum acceptable size drain line. In some applications it is prudent to have larger drain line connect to the smaller opening since several barriers may connect to the same line.

****

Provide a drain connection [and oil/water separator] in each barrier that requires pit/vault type construction.[Provide hookups between the storm drains.] Provide a minimum drainage line of 76 mm3 inches.If there are multiple drain connections that can be made to the crash rated active vehicle barrier ensure the lines drain the low points as a minimum.[Where drain lines connect to a common header drain, provide a minimum header drainage line of [150][_____] mm[6][_____] inches.][If the drainage line(s) are allowed to daylight into the side of a ditch, then provide a cast iron grate over the opening that is embedded into a concrete foundation. Provide coarse rock around the opening for at least [900][_____] mm[36][_____] inches] and extend down the slope to prevent erosion.

[A self-priming submersible sump pump of adequate capacity is to be installed.][Provide the self-priming sump pump with the capacity to remove [_____] gallons liters per minute.] [Submit sump pump data sheets

and calculations showing adequacy of the pump for its proposed use.]

3.4.2 Surface Drainage

****

NOTE: This has been a problem for barriers installed in pits/vaults. Areas that have high incident of rainfall over a short period of time can end up with water in the barrier for a period of time. Consider means to intercept and divert water flow around the crash rated active vehicle barrier.

****

Install crash rated active vehicle barrier per the test conditions for the crash rated active vehicle barrier. Ensure placement of the barrier provides positive drainage away from the barrier.

3.5 ELECTRICAL

Furnish and install all cables and conduits for all wiring interconnecting contractor furnished, and where indicated, Government furnished equipment. Install all wiring per Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM and Section 33 71 02 UNDERGROUND ELECTRICAL DISTRIBUTION.

3.5.1 Wiring

Use ring-style terminals for all control power wiring requiring compression terminals. Conform terminals and compression tools to UL 486A-486B. Use roundhead screws and lockwashers to provide vibration-resistant connections. Use screw connections or other locking means to prevent shock or vibration separation of the card from its chassis for connections between any printed circuit cards and the chassis. Ensure the electrical power supply breaker for the hydraulic power unit is capable of being locked in the power on and power off positions.

3.5.2 Grounding

Provide adequate grounding system for the following: Traffic signal supports, warning signal supports, AVBCS enclosure, crash rated active Vehicle Barrier frames, crash rated active vehicle barrier control enclosure, and supports for overspeed and wrong-way detectors. Test installed ground rods as specified in IEEE 142. Provide a #6 AWG ground wire from crash rated active vehicle barrier frame to the crash rated active vehicle barrier control enclosure.

3.5.3 Enclosure Penetrations

Penetrate enclosures through the bottom unless the system design requires penetrations from other directions. Seal penetrations of interior enclosures involving transitions of conduit from interior to exterior, and penetrations on exterior enclosures with rubber silicone sealant to preclude water entry. Terminate the conduit riser in a hot-dipped galvanized metal cable terminator. Fill the terminator with an approved sealant as recommended by the cable manufacturer and in a manner that does not damage the cable

3.5.4 Exterior Components

Those components installed outside are to be able to function within the

environmental conditions indicated previously for the paragraph on Exterior Conditions.

****

NOTE: choose the appropriate IP rating. Both IP ratings protect from total dust ingress. IP66 protects against low pressure water jets from any direction). IP67 protects against temporary immersion up to 1 meter of water. IP68 protects against complete immersion in water for a long period of time. If barrier is installed in areas with high rate of rain per hour, then choose IP67 or IP68. IP68 is not available by all manufacturers, so ensure the type of barrier being considered has this option.

****

Provide motors, actuators, wiring, luminaires, and other components that are installed below grade that are rated to function in a wet environment. Components within the barrier below grade fall in this category. Manufacturers of the crash rated active vehicle barrier and other below grade components are to assume a water saturated environment for the components. The devices and components must be watertight per NFPA 70. Provide motors and actuators with a minimum rating of[IP66][IP67][IP68]per NEMA MG 1.

3.5.5 Other Requirements

Install the system in accordance with the standards for safety included in NFPA 70 and the appropriate installation instructions from the manufacturers of the equipment. Configure components within the system with appropriate service points to pinpoint system trouble in less than 30 minutes.

3.6 OPERATING AND MAINTENANCE INSTRUCTIONS

Submit written Operations and Maintenance Instructions.
As part of the Operations and Maintenance Instructions, provide:

a. Periodic inspection and testing recommendations for daily, weekly, monthly and yearly intervals.

[b. Electronic copy of the control system programming for each AVB control system. Provide a legend for the acronyms used in the program as well a description of each major logic element.
]

3.7 REPAIR

Repair damage to galvanized, coated, painted finishes in accordance with manufacturers written instructions. Submit Manufacturer Repair of Coatings Instructions. In the case where the manufacturer does not have written instructions, Submit recommended repair instructions (referencing published standards) for approval.

3.8 TEST PLANS

Factory acceptance test plan is to cover items a through o and x through cc or dd as appropriate as a minimum. The contractor verification test plan and performance verification test plan are to include at least all the following:

a. Information on the AVB to include size and rating.

b. Listing of the controllers and description of each controller and the locations of the controllers.

c. PLC restart test (test each one individually) by turning off the PLC for at least 1 minute then back on to verify proper reboot of the system.

d. Battery power test. 10 minutes on battery then do an EFO and lower barrier.

e. Power on/off test.

f. Test (manual) test for each barrier.

g. Local test for each barrier.

h. Test and Local mode loop (VPD) operation. Test each loop at least once with a motorcycle/small cart, SUV, and passenger vehicle.

i. System alarms

j. Panel layout and labeling.

k. Matrix testing of the various combinations of modes that the AVBs can be found in.

l. Tests to verify loss of a PLC ensures safe operation of the system

m. Test traffic signal operation as well as wig-wag and in-ground light operation.

n. Verify loss of signal between controllers triggers a trouble alarm.

o. Other tests deemed necessary to ensure system operates safely.

p. Information on the layout of the barrier to include distance from ID Check.

q. Information on signage to include wording and location

r. Verification of grounding as discussed herein.

s. Information on the cabinet ratings and NEC disconnect locations.

t. Test or verification on any heating system associated with the AVBs

u. Verification that the AVB drains properly (may be a sump pump etc. that needs testing).

v. General appearance of the system to include paint stripe configuration on the barriers, use of reflective tape, etc.

w. Verification of safety equipment necessary for performing maintenance.

****

NOTE: The first bracketed choice are for systems that have an EFO. The second bracketed choice are

for systems that do not use an EFO such as Appendix A - Full Containment (Platooning/Normally Deployed) safety scheme.
****

[x. EFO test for each EFO switch.

y. EFO loop (VPD) operation). Test each loop at least once with a motorcycle/small cart, SUV, and passenger vehicle.

z. EFO loop activation when signal turns yellow

aa. EFO loop deactivation when signal turns yellow

bb. EFO Reset function works properly.

cc. Matrix testing of the various combination of loops for each safety mode: EFO, Test, Local. Note for Test and Local this does include both up (close) and down) open functions.

dd. Arm/Disarm (yes/no) selector switch operation for each remote EFO panel/station.
]
[x. Auto mode test for normally closed

y. Auto loop (VPD) operation). Test each loop at least once with a motorcycle/small cart, SUV, and passenger vehicle.

z. Loop activation when signal turns yellow

aa. Loop deactivation when signal turns yellow

bb. Matrix testing of the various combination of loops for each safety mode: Auto, Test, Local. Note for Test and Local this does include both up (close) and down) open functions.

cc. Arm/Disarm (yes/no) selector switch operation for each remote panel/station.
]

3.9 CONTRACTOR VERIFICATION TEST

Submit test plan for the Contractor Verification Test. Test plans are to include a a test schedule, a minimum of [30][45] days before the scheduled start of the Contractor Field Tests. See paragraph "TEST PLANS" for information required in a test plan. Calibrate and test all equipment, verify communications links between all subsystem components and between subsystems, place the integrated system in service, and test the integrated system using the approved test procedures for the contractor verification test. Submit the contractor verification test report no more than 1 week after the completion of each test. Deliver a report certifying that the installed complete system has been calibrated, tested, and is ready to begin performance verification testing. Include certifications from the Technical Specialists of the crash rated active vehicle barrier, PLC, and CCTV equipment/subsystems that the equipment/subsystems have been installed and tested and that they meet the requirements of the specifications in the report.

3.10 FINAL SYSTEM ACCEPTANCE

3.10.1 General

Final system acceptance consists of successfully completing the Performance Verification Test and completion of the commissioning, the training of Installation security and maintenance personnel, and successfully completing an Endurance Test as described below.

3.10.2 Team Leader

Designate a team leader to be responsible for scheduling all tests, coordinating attendance of all required commissioning team members, conducting the tests, and preparing appropriate test reports and the final commissioning report.

3.10.3 Commissioning Team

****

NOTE: Army. Army projects are required to have the USACE Protective Design Center, Omaha Corps of Engineers present.

****

The commissioning team consists of the commissioning team leader; the technical specialists from the crash rated active vehicle barrier supplier, and the programmer for the AVBCS;[a representative of the design of record;] [a representative of the USACE Protective Design Center;]a contracting officer's representative; and a representative from the Installation.

3.10.4 Training

3.10.4.1 General Requirements

****

NOTE: Coordinate the training requirements with the Installation and designate the number of persons to be trained.

****

Conduct training courses for designated personnel in the operation and maintenance of the AVBCS. Orient the training to the specific system being installed. Deliver training manuals for each trainee with 2 additional copies delivered for archiving at the project site. Include an agenda, defined objectives for each lesson, and a detailed description of the subject matter for each lesson in the manuals. Furnish audio-visual equipment and other training materials and supplies. Where the Contractor presents portions of the course by audio-visual material, copies of the audio-visual material is to be delivered to the Government either as a part of the printed training manuals or on the same media as that used during the training sessions. A training day is defined as 8 hours of classroom instruction, including 60-minutes total of breaks and excluding lunchtime, Monday through Friday, during the daytime shift in effect at the training facility. For guidance in planning the operator training for the guards, assume that guards will have a high school education or equivalent and are familiar with ACPs/ECFs operations. For maintenance training, assume mechanical and electrical maintenance personnel typically employed at military installations. Obtain approval of the planned training schedule from the Government at least 30 days prior to the training. Do no provide training until the performance verification test

has been successfully completed.

3.10.4.2 Guard's Training

Teach the guard training course at the project site for a period of up to eight hours after the performance verification test, but before commencing the endurance portion. Plan on a maximum of [12][_____] personnel attending the course. Include instruction on the specific hardware configuration of the installed system and specific instructions for operating the installed system in the course. Upon completion of this course, each student is to demonstrate the ability to perform the following when operating the AVBCS:

a. Operate the crash rated active vehicle barriers in[Test, Local and EFO/Auto][_____] modes.

b. Understand the differences between the normal and EFO/AUTO operation of the barriers.

c. Understand when to use Test, Local and EFO/AUTO modes for each barrier.

d. Understand all requirements for putting a barrier in either the Test or Local modes including required actions in the roadway ahead of the barrier and actions at the barrier.

e. Understand the crash rated active vehicle barrier safety scheme including operation of all vehicle presence detectors, traffic signals, signs, and warning signals.

f. Understand operation of the traffic signal including all signal indications for various operational modes and barrier positions.

g. Reconfigure barriers after an EFO/Auto activation/operation.

h. Monitor, acknowledge, and reset alarms.

[i. Understand the operation and coverage of all overspeed and wrong-way sensors.
]
[j. Monitor and control CCTV system
]

3.10.4.3 Maintenance Personnel Training

The Maintenance Personnel Training Course is to be taught at the project site for a period of up to eight hours after the Performance Verification testing. Plan on a maximum of [4][_____] personnel attending the course. Include the following in the course:

a. Instruction on each equipment and its configuration in the installed system.

b. Trouble shooting and diagnostic procedures.

c. Component repair and replacement procedures.

d. Emphasis on the importance of periodic testing and preventative maintenance. Provide a list of periodic preventative maintenance tasks for the crash rated active vehicle barriers and other critical equipment.

e. Calibration procedures.

f. Review of system drawings to identify device locations, communications, topology, and flow.

3.10.4.4 System Manager Training

Train System managers for a minimum of 4 hours in addition to the Guard and Maintenance Personnel described above. Provide system manager training training for trainers, such that, system managers will be able to train new guards and maintenance personnel in the future. Plan on a maximum of [4][_____] personnel attending this training. System manager training is to include the following:

a. Enrollment/deactivation process including the assignment of operator passwords.

b. Change database configuration.

c. Modify graphics, if provided.

d. Print reports, e.g., Sequence of Events reports.

e. Any other functions necessary to manage the system.

3.10.5 Performance Verification Test (PVT)

3.10.5.1 Test Plan

Submit a performance verification test plan. The test plan is to match the test plan used for the Contractor Verification Test plus any changes that came up during the testing. The test plan is to include the test procedures/plan, layouts of each of the operating panels and a site layout showing the location of the crash rated active vehicle barriers, traffic signals, warning beacons, actuated traffic arms, panels and all associated signs and signals. Submit to the contracting officer 30 days prior to the proposed start date of the performance verification test.

3.10.5.2 Test Equipment and Personnel

Provide the following for all PVT tests:

a. A minimum of 6 hand held radios/walkie-talkies with additional batteries.

b. Safety vests for all participants.

c. Two Stop watches.

d. Flash lights.

e. Multi-meter.

f. Metal of sufficient size and shape to activate vehicle presence detection (VPD) loops. Provide metal that is easily moveable and provide one piece of metal per loop. Metal roadway signs with a rope tied to one end works well.

g. SUV or High bed truck to test each VPD loop.

h. Sedan type car to test each VPD loop.

i. Motorcycle to test each VPD loop. If testing is during the fall/winter, then a small utility vehicle can be substituted.

j. Three copies of the PVT test plan.

k. Camera that can take video of the crash rated active vehicle barrier and traffic signal operation and then allows a person to go back and count frames to get actual "real time". This is more accurate than the stop watch.

l. Sufficient personnel during the matrix testing equivalent to the number of vehicle presence detection (VPD) loops plus three more. This number of personnel can include government representatives; however, it must be verified that they are willing and able to support the matrix testing. Testing that does not include matrix testing requires five personnel to include government personnel.

m. Contractor is to ensure that someone who can make corrections to the software is present.

3.10.5.3 Commissioning

Perform a performance verification test of the installed AVB Control System per approved test procedures and under the direction of the Contractor's Team Leader. The PVT is to demonstrate that the system complies with the requirements specified herein. Conduct the PVT, where possible, during regular daytime working hours on weekdays. At the completion of the PVT, appropriate Commissioning Team Members are to sign identifying what passed and any deficiencies left unresolved.

3.10.5.4 Test Report

Within ten (10) days of successful completion of the PVT, the Contractor's Team Leader submits a performance verification test report to the Contracting Officer documenting the results of the test. Include in the test report the results of all test procedures showing all commands, stimuli, and responses to demonstrate compliance with the contract requirements. The Contracting Officer will notify the Contractor, within ten (10) days of receipt of the test report, whether the Test Report is approved. If disapproved, the Contracting Officer will note the specific procedures that are disapproved; retest those procedures. Do not start the Endurance Test until the PVT test report is approved by the Contracting Officer.

[3.10.5.5 Opposite Season Test

****

NOTE: If the temperature at the site dips to below freezing for sustained duration in the winter time, specify an opposite season test.

****

Coordinate with the Commissioning Team to conduct an opposite season PVT. If the initial PVT test is performed in the winter, then the opposite season test is to be performed in the summer. If the initial PVT is done in the spring, summer, or fall, then the opposite season test it to be

performed in the winter. All PVT tests and test reports submissions are required for the initial PVT are to be performed for the opposite season PVT.

]3.10.6 Endurance Test

****
NOTE: Army Only. This testing is only required by the Army.
****

3.10.6.1 General

The Contractor's Commissioning Team Leader must submit a test plan including a schedule, test description, list of personnel required to conduct the test, and a list of all data to collect and observances to be made in order to demonstrate system reliability and operability of the completed AVB control system. Conduct the endurance test in phases as specified. The Contractor is to notify the Contracting Officer, in writing, that training as specified has been completed and that the correction of all outstanding deficiencies has been satisfactorily completed prior to performing the endurance test. The Contracting Officer may terminate the testing at any time the system fails to perform as specified. Upon termination of testing by the Contracting Officer or by the Contractor, commence an assessment period as described for Phase II below. Minimum operation times indicated in the O&M manual will indicate the minimum specific intervals the system is to be exercised. Ensure the exercise intervals meet or exceed the O&M requirements. It is important to note that if the endurance testing uncovers a problem that requires a programming change then the PVT is required to be performed again. Intent of the Endurance test:

****
NOTE: choose the safety scheme(s) used on the project and delete the ones not used. If not using one of the safety schemes, then will have to develop what is reasonable for the planned operation of the system.
****

[Hybrid Beacon (Signs & Signals) Safety Scheme. This system typically does not have the crash rated active vehicle barrier moving up/down on a regular basis. The system is to be tested both manually and by an EFO operation at least once every 24 hours or its equivalent as agreed upon by the Contracting Officer. Shift change times are a good time for this operation.
]
[High Efficiency Presence Detection Safety Scheme. Normal system operation can include having the AVB moving up/down on normal basis. A cycle needs to be performed at least twelve times per hour or its equivalent over the normal daylight hours the ACP/ECF operates. Contracting Officer can adjust how this testing is accomplished based on the anticipated operation of this ACP/ECF.
]

[Full Containment Safety Scheme. Normal system operation includes the fill/release of vehicles. A fill/release cycle needs to be performed ate least twelve times per hour or its equivalent over the normal daylight hours the ACP/ECF operates. Contracting Officer can adjust how this testing is accomplished based on the anticipated operation of

the ACP/ECF.

]

[Stop Control Safety Scheme. This system typically does not have the crash rated active vehicle barrier moving up/down on a regular basis. The system is to be tested both manually and by an EFO operation at least once every 12 hours or its equivalent as agreed upon by the Contracting Officer. Shift change times are a good time for this operation.

]

[General Barrier Operation. The system is to be tested manually at least once every[12][_____] hours or its equivalent as agreed upon by the Contracting Officer. Shift change times are a good time for this operation.

]

3.10.6.2 Phase I Testing

Conduct the test 24 hours per day for 7 consecutive calendar days, including holidays, and the system is to operate as specified. Make no repairs during this phase of testing unless authorized by the Contracting Officer in writing.

3.10.6.3 Phase II Assessment

After the conclusion of Phase I, identify all failures, determine causes of all failures, repair all failures, and deliver a written report to the Contracting Officer. Explain in detail the nature of each failure, corrective action taken, results of tests performed, and recommend the point at which testing should be resumed in the report. After delivering the written report, convene a test review meeting at the jobsite to present the results and recommendations to the Contracting Officer. As a part of this test review meeting, demonstrate that all failures have been corrected by performing appropriate portions of the performance verification test. Based on the Contractor's report and the test review meeting, the Contracting Officer will determine the restart date, or may require that Phase I be repeated. If the original Phase I testing was completed without any failures the endurance test is deemed completed.

3.10.7 Final Report

Upon successful completion of the Endurance Test, the Contractor's Team Leader must prepare a Final Report documenting that the Contractor has successfully completed the PVT and Endurance Test and training. Include signatures of the Commissioning Team in the Commissioning Report.

[3.10.8 Post Commissioning PVT

****

NOTE: This is an optional test on the system. It is to be performed approximately 6 months after the system was commissioned. On large, more complex systems, this will add another level of assurance on the system. If an opposite season test is already required, then this option is not required.

****

Perform a performance verification test 6 months after the system was commissioned. All PVT tests and test reports required for the initial PVT are to be performed for the post commissioning PVT.

]

****

NOTE: There are 5 possible Appendix A, of which the Designer must choose the appropriate one or ones for this project. The latest version of the Appendices and drawings for panel layouts are found at _ https://mrsi.erdc.mil/cos/nwo/acp

NOTE: Include a drawing showing the control switches and control logic for this safety scheme. Use drawings from the ACP Standard Design as a base.If the controls are modified from the standard Army COS-ACP drawings, then care must be taken to ensure compliance with the security and safety criteria.

****

3.10.9 APPENDICES

APPENDIX A - SDDCTEA Approved Safety Schemes

****

NOTE: The information provided is based on the SDDCTEA safety scheme layout and operation found in the SDDCTEA Pamphlet 55-15 Traffic and Safety Engineering for Better Entry Control Facilities 2019. There were some significant changes from the 2014 version on the sequence of operation. If needed contact the Army COS-ACPs for information on the operation of the earlier safety schemes.

****

[Appendix A1 - HYBRID BEACON (Conventional Signs and Signals) Active Barrier Safety Scheme

****
NOTE: Delete if not used in project.
****

Hybrid Beacon (Signs and Signals) Safety Scheme Features. Provide the following features for the Conventional (Signs and Signals) Safety Scheme:

****
NOTE: Paragraph 1 can be deleted in its entirety, if the layouts of equipment is shown on the drawings.
****

[1. General Layout Information

1.1 Active Vehicle Barriers in all inbound and outbound lanes. .

1.2 Hybrid Beacon. A three light hybrid beacon signal head over each inbound and outbound active barrier. Special location may require only posts i.e. no masts. Post mounted requires two posts with each having a traffic signal. Provide three head traffic signals with two Red signals adjacent horizontally and a Yellow centered below the two red beacons. Install the hybrid beacon signal at the centerline of the AVB. The beacons are to be Light Emitting Diode (LED) type. Mast arm will have a 'Barrier Signal' sign.

1.3 A 610 mm2 foot wide stop line placed 26.2M86 feet in front of the the active vehicle barrier and the traffic signal is 12.8 meters42 feet from the near edge of the stop line. Provide a 'Stop Here On Red' sign.

1.4 Double solid white lines between inbound lanes approaching the barriers to prohibit lane changes in front of the barriers.

1.5 Diagonal pavement striping. Provide white crosshatching pavement marking that covers the front and back VPDs.

1.6 Vehicle Presence Detectors (VPDs) located immediately before and immediately after each barrier. VPDs can be induction loops, video motion sensors, or other suitable technologies capable of sensing vehicle presence. Induction loops must be diagonal quadrapole loop. A loop crossing multiple lanes is not allowed. The VPD before the AVB starts 610 mm 2 feet from the AVB and is 23.16M76 ft long.

1.7 Warning Sign and Warning Beacons (wig-wags) (2 Beacons with alternating flashing yellow lights) located 44.2 meters145 feet in front of the barriers. Beacon lamps will be LED.

****
NOTE: Army. First option choose for Army projects. All others, choose the second option.
****

1.8 One Master Control Panel, [one Guard Booth Control panel plus one Guard Booth EFO button each Guard Booth][one Guard Booth EFO panel], one Overwatch Position Control Panel, one Search Area Control panel per separate search

area, [Pedestrian panel,]and a Local Control Panel or panels at each barrier along with all control switches and indicating lights as shown on the Drawings. Locate the Master Control Panel in the Command and Control location for use by the ACP/ECF guards. Locate each Local Control Panel at or near its respective barrier power unit.

1.9 Red steady in-pavement lights. When required are to be located between the stop line and approach VPD.

1.10 Horn located at the crash-rated active vehicle barriers. Provide the horn with a means to adjust the volume.

****
NOTE: LED Blankout sign is optional.
****

[1.11 LED blankout sign that indicates 'Do Not Enter' installed at the barrier. Two per direction of travel by placing one on each side of the roadway.]]

****
NOTE: choose the correct option.
****

2 BARRIER OPERATING CONTROL PANELS.

[Operating panel layouts are found in Army Standard Design drawing package.][Operating panel layouts are found in the contract drawings.]

3 TRAFFIC SIGNAL AND BARRIER CONTROLS.

3.1. Hybrid Beacon. EFO MODE OF OPERATION.

3.1.1 EFO Operation. Under normal operations, all barriers' mode selector switches on the Master Control Panel will be in the EFO position with the key removed and with that key being accessible only by the lead ACP/ECF guard. With the barrier's mode selector switch in the EFO position, EFO is enabled for that direction of travel, but the Open and Close switches for that barrier on the Master Control Panel and the Open and Close switches on that barrier's Local Control Panel are disabled.

3.1.2 In the EFO mode of operation with the barrier open, the Traffic Signal is Dark. Upon activation of an EFO command from any armed EFO, delay barrier emergency closure by 2 seconds. Activate the wig-wag (warning beacons) as soon as EFO is pushed. During the 2 seconds, the hybrid beacons signals change from dark (off) to Solid Yellow for 2 seconds and then to Alternating flashing Red (alternate on/off in a wig-wag fashion). Activate the in-pavement lights (steady on) when the traffic signal turns red and stay red as long as the traffic signal light is red. After 2 seconds from EFO activation, energize the barrier's emergency close circuit to close the barrier(s) in emergency fast mode (2 seconds or less) provided that the VPDs immediately in front of and behind the barrier are clear (entry and exit loops). If either or both VPDs detect a vehicle, then the barrier does not close; however, the the emergency close signal is latched only for those barriers that were in EFO mode at the time of activation. Once both VPDs are clear, the barriers (those in EFO mode) deploy (unless EFO Reset had been activated). The warning horn sounds for 10 seconds with the setting adjustable in the program.

3.2 Hybrid Beacon. EFO RESET. After an EFO activation, guards will close all inbound and outbound lanes. Guards will obtain the EFO Reset key and then activate the EFO Reset switch on the Master Control Panel to reset EFO. This turns off the warning beacons (wig-wags) and removes the latch command for the EFO circuit. The person in charge can then place the Master Control Panel mode switches into Test (or go through the sequence to use the Local panel) and use the Open buttons to lower each barrier. Once all the barriers are Open for a given direction of travel and the corresponding mode switches are back in EFO mode, then the traffic signal for that direction of travel turns Dark and the in-pavement lights deactivate. This needs to be done for both directions of travel in order to have Dark traffic signals in all directions.

3.3 Hybrid Beacon. TEST MODE OF OPERATION.

3.3.1 Test Operation. An individual barrier can be test operated by installing the proper lane closure markings and barricades ahead of the active barrier and then placing the mode selector switch for that direction of travel into the Test position. With the mode selector switch in the Test position, the barrier's Open and Close switches on the Master Control Panel for that direction of travel are enabled, but the Open and Close switches on the Local Control Panel for that direction of travel are disabled. In addition all active EFO switches are disabled from operating any barrier for that direction of travel. Where a single barrier spans both inbound and outbound lanes, the test operation switch deactivates all EFO capability.

3.3.2 When a mode switch is placed in Test mode, the traffic signals for that direction of travel cycle to Alternating Flashing RED (the hybrid beacons signals change from dark (off) to Steady Yellow for 2 seconds and then to Alternate flashing Red (alternate on/off in a wig-wag fashion). The barriers for that direction of travel are allowed to operate without any time delay ONCE the signal is alternating flashing Red. The traffic signals for that direction of travel stay Red until all the conditions are met for RETURN TO EFO MODE. The in-pavement lights for that barrier activate when the traffic signal is red and stay red as long as the traffic signals are red. Note the warning beacons do not operate under Test or Local mode, but can be allowed to operate if requested and approved. WARNING: Installation is responsible for proper lane closure procedures (closing off the lane, bagging the traffic signal over the barrier if a long term operation, having guards present, etc) during a Test or Local mode operation.

3.4 Hybrid Beacon. LOCAL MODE OF OPERATION

3.4.1 Local Operation. Local mode is used when maintenance personnel need to perform maintenance on the barrier.

3.4.1.1 Maintenance personnel would obtain the mode selector switch key from the lead ACP/ECF guard and place the key into the Master Control Panel 3-position mode selector switch for the appropriate direction of travel.

3.4.1.2 The person then turns the selector switch to the Local position to enable Local mode and then removes the key.

3.4.1.3 With the mode selector switch on the Master Control Panel in the Local position, Open and Close switches on the Master Control Panel for the barriers for that direction of travel are disabled and all EFO switches are disabled for that direction of travel. If a single barrier spans multiple directions of travel all EFO capability will be deactivated.

3.4.1.4 The maintenance person would then insert the key into the appropriate Off-Local mode selector switch on the barrier's Local Control Panel and turn the key to the "Local" position. This action activates the Open and Close switches at the Local Control Panel for the barriers in that direction of travel.

3.4.1.5 Maintenance personnel would also have to block and mark the lane ahead of the barrier in accordance with standard lane closure procedures/standards and also lock and tag out certain equipment at the barrier per the barrier manufacturer's recommendations for the type of maintenance to be performed.

3.4.2 Hybrid Beacon. LOCAL MODE OF OPERATION (one barrier per direction of travel). When a mode switch is placed in Local mode, the traffic signals for that direction of travel cycle to Alternating Flashing RED (the hybrid beacons signals change from dark (off) to Steady Yellow for 2 seconds and then to Alternate flashing Red (alternate on/off in a wig-wag fashion). The barriers for that direction of travel are allowed to operate without any time delay ONCE the signal is alternating flashing Red and there is full Local control. The traffic signals for that direction of travel stay Red until all the conditions are met for RETURN TO EFO MODE. The in-pavement lights for that barrier activate when the traffic signal is red and stay red as long as the traffic signals are red. Note the warning beacons do not operate under Local, but can be allowed to operate if requested and approved. WARNING: Installation is responsible for proper lane closure procedures (closing off the lane, bagging the traffic signal over the barrier if a long term operation, having guards present, etc) during a Test or Local mode operation.

3.5 If the Master Control panel is in EFO mode and the Local Panel is in Local mode, that is a conflict. Hybrid beacon is dark and EFO DOES NOT function. Local panel does not have any control. The mode indicating lights for Local and EFO are to alternate flashing and an audible alarm is to sound.

3.6 If the Master Control panel is in Test mode and the Local Panel is in Local mode, that is a conflict. Hybrid beacon signal is Red after cycling and all corresponding Test mode functions are INACTIVE. Local panel does not have any control. The mode indicating lights for Test and Local are to alternate flashing and an audible alarm is to sound.

****

NOTE: This is an optional switch function for locations that have only one lane per direction of travel or have one barrier across all the lanes. If there are multiple lanes per direction of travel with each lane having its own AVB and no lane separation, then provide this switch. Keep or delete as required by the project.

****

3.7 Out-of-Service switch. This function is provided for times when a barrier is damaged in a lane and needs to be taken out of service for an extended period of time. The out of service switch is to be located at the AVB location and is allowed to operate in EFO, Test and Local modes. This allows an AVB to be locked out in a lane, but the other lane can operate under EFO. The switch locks out all functions for the AVB when activated. The up and down lights for that AVB will alternate going on and off.

WARNING: Installation is responsible for proper lane closure procedures (closing off the lane, bagging the traffic signal over the barrier, having guards present, etc). The Out-Of-Service switch has two positions: Yes and No [contractor is allowed to use Enable and Disable, but it must be clear].

3.7.1 No Position. All controls operate normally.

3.7.2 Yes Position. The Close/ Open position indicating lights for those barriers will alternate from one to the other approximately every 1 sec. This will happen at the Master Control Panel, Local Control Panel (if on) and at any other panel that has barrier position indicator lights.

3.7.2.1 If Local Panel is in Local Mode, then traffic signal is red and in-pavement lights are on. All controls to operate the barrier(s) are locked out.

3.7.2.2 If system is in Test Mode, then traffic signal is red and in-pavement lights are on. All controls to operate the barrier(s) are locked out.

3.7.2.2 If system is in EFO Mode, then traffic signal is dark. All controls to operate the barrier(s) are locked out.

3.8 Hybrid Beacon. RETURN TO EFO MODE. When the mode switch is placed in the EFO mode and all the barriers for that direction of travel are Open (not deployed), then the barrier's Traffic Signal change from Red to Dark if it was Red. If a mode switch is placed in the EFO mode and any of the barriers for that direction of travel are Closed, then the barrier's Traffic Signal stays Red (if it was red) and an alarm is generated on the ACP/ECF TROUBLE window on the Gatehouse Control Panel. The in-pavement lights turn off when the traffic signal changes to Dark.

3.9 Vehicle Presence Detector consisting of safety loops on either side of a crash rated active vehicle barrier may require additional programming and hardware. If the loops are more than 3 meters10 feet (apart, then add 0.5-1 sec additional time delay on the "back" loop. The alternative is to provide a latching logic between loops. In the latching logic, the master panel needs a release pushbutton for each barrier.

3.10 AUDIBLE ALARMS. Provide an audible alarm at the Master Control Panel, Overwatch Control Panel, [Pedestrian control panel, main Guard Booth Control Panel and Search Area Control panel(s). The volume must be adjustable either through a rheostat or other means. Provide a button that silences the audible alarm at each panel. This silence button does not affect the corresponding visual indicator. Silence button does not prevent an audible alarm if a new condition develops.

3.10.1 When an EFO is pushed an alarm will go off.

3.10.2 Overspeed and Wrong-way will each cause an alarm to go off for 3 seconds and then clear itself.

3.10.3 Duress activation.

3.10.4 AVB Trouble condition.

3.10.5 VPD Trouble condition.

3.10.6 VPD Activation for over the set amount of time period (typically 15 seconds) Light goes on immediately for VPD activation, but audible alarm activates after 15 seconds.

3.10.7 Out of Service activation. AVB indicator lights alternate being on.

3.10.8 Master Panel in EFO mode and Local Panel is in Local Mode. EFO mode and Local mode indicator lights alternate being on.

3.10.9 Master Panel in Test mode and Local Panel is in Local Mode. Test mode and Local mode indicator lights alternate being on.

3.10.10 Return to EFO mode with an AVB or AVBs in the incorrect position (not fully open). EFO mode indicator light and open/down AVB position light(s) flash.

3.10.11 Communication Loss alarm.

3.10.12 Tramper Switch. Any tamper switch activation triggers an alarm.

3.11 LED Blank-Out Sign (when used). The sign is to meet the following:

3.11.1 Symbol conforms to MUTCD or local Host Nation requirements.

3.12 AUDIBLE ALARMS. Provide an audible alarm at the Local Control Panel. The volume must be adjustable either through a rheostat or other means. Provide a button that silences the audible alarm at each panel. This silence button does not affect the corresponding visual indicator. Silence button does not prevent an audible alarm if a new condition develops.

3.12.1. AVB Trouble condition.

3.13 AUXILIARY CONTACTS
Provide auxiliary contacts (dry) to be used by the Intrusion Detection System and the CCTV system as specified herein and indicated on the drawings.
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Appendix A2 - High Efficiency Presence Detection (HEPD) Active Barrier Safety Scheme

HIGH EFFICIENCY PRESENCE DETECTION (HEPD) SAFETY SCHEME FEATURES. Provide the following features for the HEPD Safety Scheme:

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NOTE: Paragraph 1 can be deleted in its entirety, if the layouts of equipment is shown on the drawings.
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[1 General equipment layout information.

1.1 One Active Vehicle Barrier at the end of the Response Zone in each inbound and each outbound lane.

1.2 Vehicle presence detectors can be induction loops, video motion sensors, or other suitable technologies capable of sensing vehicle presence. Induction loops must be diagonal quadrapole loop and sized per lane i.e. a loop crossing multiple lanes is not allowed. Provide a vehicle presence detector (VPD) that starts 1220 mm4 ft ahead of the stop line and goes across the stop line that is 1830 mm6 ft wide by 2.43 meters8 ft long. Provide entry VPD that is between the stop line and AVB and starts 610 mm2 ft from the AVB that is 10.36 meters34 ft long and 1830 mm6 ft wide. This second VPD starts 2 ft from the AVB. There is a third VPD is after the AVB and it is 1830 mm6 ft by 1830 mm6 ft and starts 610 mm2 ft the AVB. All VPDs, if loops, are to be quadrapole.

1.3 A 610 mm2 foot wide stop line placed 13.72 meters45 feet in front of the the active vehicle barrier. Provide a 'Stop Here On Red' sign.

1.4 Traffic Signals and associated signage.

1.4.1 Locations with a single inbound lane and a single outbound lane are to be configured as follows. Provide a post on the driver side and passenger side of the lane. As a minimum the post is to have a three-head Traffic Signal and a LED blank-out sign and a sign that indicates which lane the signal is belongs. Provide a traffic signal that is Red-Yellow-Green top to bottom. The Traffic Signal is to be located at the centerline of the crash rated active vehicle barrier. Bottom of the signal must be 2.49 M8 ft above finished surface. The LED blank-out sign that states "DO NOT ENTER" and is to be mounted below the traffic signal.

1.5 Warning Sign and Warning Beacons (wig-wags) (2 Beacons with alternating flashing yellow lights) located typically between 39.6 meters130 ft and 45.7 meters150 ft in front of the AVB. Beacon lamps will be LED.

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NOTE: Army. First option choose for Army projects. All others, choose the second option.
****

1.6 One Master Control Panel, [one Guard Booth Control panel plus one Guard Booth EFO button each Guard Booth][one Guard Booth EFO panel], one Overwatch Position Control Panel, one Search Area Control panel per separate search area, [Pedestrian panel,]and a Local Control Panel or panels at each

barrier along with all control switches and indicating lights as shown on the Drawings. Locate the Master Control Panel in the Command and Control location for use by the ACP/ECF guards. Locate each Local Control Panel at or near its respective barrier power unit.

1.7 Red steady in-pavement lights. Where required are to be located between the stop line VPD and the approach VPD.

1.8 Horn located at the crash-rated active vehicle barriers. Provide the horn with a means to adjust the volume.

1.9 Diagonal pavement striping. Provide white crosshatching pavement marking that covers the front and back VPDs. Do not stripe the stop line VPD.

1.10 LED blankout sign that indicates 'Do Not Enter' installed at the barrier. Two per direction of travel by placing one on each side of the roadway on the traffic signal post.

1.11 Passive barriers on raised islands between each lane. Passive barriers and islands extend at least the same distance as the stop line VPD on the secure side of the AVB. Passive barriers must be placed to ensure that a vehicle cannot do a reverse slip. A reverse slip is where a vehicle passes over the barrier after a vehicle passes (slips in behind going opposite direction). See Drawings.

1.12 Passive barrier on a raised median island between the inner most inbound and outbound lanes. the median is to extend at least 25 ft ahead of the stop line. Passive barriers as a minimum start at 3.66 meters12 ft from the the stop line and extend to 3.66 meters12 ft past the active vehicle barrier. Island has a passive barrier that is 1830 mm6 ft from the leading edge and 4 ft from the other edge.

1.11 Actuated Traffic Arm 609 mm2 feet beyond the back edge of the Stop Line

1.12 Actuated Traffic Arm for each inbound lane in the ID Check Area. ATAs are installed near the Guard Booths as shown on the Drawings. An ATA Control Panel with Open and Close control switches for the ATA are provided and mounted on the back wall of the Guard Booth below the back window. If the installation plans on getting Automatic Installation Entry, then just provide infrastructure for the future installation of the ATAs.]

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NOTE: Choose the appropriate option.
****

2 BARRIER OPERATING CONTROL PANELS.

[Operating panel layouts are found in Army Standard Design drawing package.][Operating panel layouts are found in the contract drawings.]

3 TRAFFIC SIGNAL AND BARRIER CONTROLS.

3.1 EFO MODE ACTIVATION. The following descriptions assume that the safety VPDs (those located adjacent to the AVB) are clear. A vehicle on the stop line VPD does not impact AVB movement under EFO. . If the VPDs are not clear then the AVB deployment is delayed until all safety VPDs are clear. EFO Operation. Under normal operations, all lane mode selector switches on the Master Control Panel will be in the EFO position with the key removed

and accessible only by the lead ACP/ECF guard. With the barrier's mode selector switch in the EFO position, EFO is enabled for that lane, but the Open and Close switches for that lane on the Master Control Panel and the Open and Close switches on that barrier's Local Control Panel is disabled.

3.1.1 EFO Mode of Operation with Active Vehicle Barrier (AVB) Up (Closed).

3.1.1.1 Initial State
a. AVB is UP (Closed)
b. VPDs do not have to be clear since the AVB is already in the closed position.
c. Traffic Arm is Down (Closed).
d. Traffic Signals for that lane are Red.
e. Warning beacons (wig-wags) and LED 'Do Not Enter' Blank-out signs area off.

3.1.1.2 EFO is Pushed.
a. Warning beacons (wig-wags) and LED Blank-out signs activate immediately.
b. Horn activates for 10 seconds.
c. AVB remains in the deployed position until EFO Reset is accomplished.

3.1.2 EFO Mode of Operation with Active Vehicle Barrier (AVB) Down (Open).

3.1.2.1 Initial State
a. AVB is Down (Open).
b. Traffic Arm is Down (Closed).
c. Traffic Signals for that lane are Red.
d. Warning beacons (wig-wags) and LED Blank-out signs area off.

3.1.2.2 EFO is Pushed.
a. Warning beacons (wig-wags) and LED Blank-out signs activate immediately.
b. Lane horn(s) is activated for 10 seconds.
c. AVB is deployed. AVB is fully Up (Closed) within 2 seconds (t=2). EFO is not to be interrupted by any position limit switch for the Actuated Traffic Arm.
d. AVB remains in the deployed position until EFO reset is accomplished.

3.1.3 EFO Mode of Operation while Active Vehicle Barrier (AVB) is Down (Open) While Processing Traffic.

3.1.3.1 Initial State
a. AVB is Down (Open).
b. Traffic Arm is Up (Open).
c. Traffic Signals for that lane are green i.e. in Normal Operation.
d. Warning beacons (wig-wags) and LED Blank-out signs area off.

3.1.3.2 EFO is Pushed.
a. Warning beacons (wig-wags) and LED Blank-out signs activate immediately.
b. Lane horn(s) is activated for 10 seconds.
c. Traffic Signal if Green will go to Yellow for 2 seconds (t=2).
d. Traffic Signal will go to Red (t=2).
e. Traffic Arm begins to go Down (Close) as soon as VPD 1a and 1b are clear. Traffic Arm is fully Down (Closed) after 2 seconds. EFO is not to be interrupted by any position limit switch for the Actuated Traffic Arm.
f. Once Traffic Arm is fully Down (Closed), then AVB is deployed. AVB is to be fully Up (Closed) within 2 seconds.
g. AVB remains in the deployed position until EFO reset is accomplished.

3.2 Normal Operations - EFO Mode

3.2.1.1 Initial State
a. AVB is Up (Closed).
b. Traffic Arm is Down (Closed).
c. Traffic Signals for that lane are Red.
d. Warning beacons (wig-wags) and LED Blank-out signs area Off.

3.2.1.2 Vehicle Stops is detected by stop line VPD.
a. Once vehicle detected, AVB is to start Down (Open) after a 1 second delay (t=1).
b. AVB is fully Down (Open) after 2 more seconds (t=3).
c. Once AVB is Down (Open), Traffic Arm is to start Up (Open).
b. Traffic Arm is fully Up (Open) after 2 more seconds (t=5).
c. Traffic signal changes to Green (t=5).
d. A timer is started once stop line VPD is cleared. The timer is set for 3 seconds.
(1). If stop line VPD is clear for the 3 seconds then the Traffic Signal is to change to Yellow (t=8).
(a). Traffic Signal is Yellow for 3 seconds (t=11). Once signal changes to Yellow, the system is to complete the following steps prior to processing other vehicles, even if a vehicle is detected by the stop line VPD.
(b). Traffic Signal changes to Red.
(c) Traffic Arm begins Down (Close).
(d) Traffic Arm is fully Down (Closed) after 2 seconds (t=13).
(e) Once Traffic Arm is fully Down (Closed), AVB is to start Up (Close).
(f) AVB is to be fully Up (Closed) within 2 seconds (t-15).
(2). If the stop line VPD detects a vehicle before 3 seconds elapse, then the Traffic Signal is to stay Green and the Traffic Arm stay Up (Open). The three second timer resets to each time the loop is cleared.

3.3 EFO RESET. After an EFO activation, guards will close all inbound and outbound lanes. Guards will then activate the EFO Reset switch on the Master Control Panel to reset EFO, place each lane's mode switch to the Test or Local position. When in Test position, it will allow the guard to operate the traffic arm and crash rated active vehicle barrier for that lane. Local mode would be used by maintenance personnel.

3.4 TEST MODE OF OPERATION.

3.4.1 When a barrier's mode switch is placed in Test mode the following is to happen. An individual barrier and traffic arm can be test operated by installing the proper lane closure markings and barricades ahead of the active barrier and then placing the mode selector switch for that direction AVB into the Test position. With the mode selector switch in the Test position, the barrier's and traffic arm's Open and Close switches on the Master Control Panel for that AVB is enabled, but the Open and Close switches on the Local Control Panel for that AVB are disabled. In addition all active EFO activations disabled from operating that barrier.

3.4.2 Test Mode Sequence of Operation

3.5.2.1 Initial State
a. Traffic Arm is Down (Closed).
b. Traffic Signals for that lane are Red. Note signals do not cycle through yellow before changing to red.
c. warning beacons (wig-wags) and LED Blank-out signs area off.

d. AVB can either be Up (Closed) or Down (Open).

3.4.2.2 Switch is placed in Test
a. The operator must ensure that the lane that the barrier is in is properly blocked and marked prior to placing the switch into Test or Local mode. This is to comply with MUTCD or Host Nation Criteria.
b. Switch must be in either Test or Local mode for 1 second.
c. Blocks EFO operation for that lane.
d. Horn sounds for 4 seconds or not at all .
e. LED blankout signs activate.
f. Warning beacons do not activate.

3.4.2.3 Initial State
a. AVB is Down (Open).
b. Traffic Arm is Up (Open).
c. Traffic Signals for that lane is Green.
d. warning beacons (wig-wags) and LED Blank-out signs area off.

3.4.2.4 Switch is placed in Test or Local Mode.
a. The operator must ensure that the lane that the barrier is in is properly blocked and marked prior to placing the switch into Test or Local Mode. This is to comply with MUTCD or Host Nation Criteria.
b. Blocks EFO operation for that lane.
c. Traffic Signal changes from green to yellow for 2 seconds then red.
d. Horn sounds for 4 seconds or not at all.
e. LED blankout signs activate.
f. Warning beacons do not activate.

3.5 LOCAL MODE OF OPERATION.

3.5.1 Local Operation. Local mode is used when maintenance personnel need to perform maintenance on the barrier.

3.5.1.1 Maintenance personnel would obtain the mode selector switch key from the lead ACP/ECF guard and place the key into the Master Control Panel 3-position mode selector switch for the appropriate AVB.

3.5.1.2 The person then turns the selector switch to the Local position and remove the key.

3.5.1.3 With the mode selector switch on the Master Control Panel in the Local position, Open and Close switches on the Master Control Panel for that barrier and actuated traffic arm is disabled and all EFO activations disabled for that AVB. Local mode operation is enabled.

3.5.1.4 The maintenance person would then insert the key into the appropriate Off-Local mode selector switch on the barrier's Local Control Panel and turn the key to the "Local" position. This action activates the Open and Close switches at the Local Control Panel for that barrier and actuated traffic arm.

3.5.1.5 Maintenance personnel would also have to block and mark the lane ahead of the barrier in accordance with standard lane closure procedures/standards and also lock and tag out certain equipment at the barrier per the barrier manufacturer's recommendations for the type of maintenance to be performed.

3.5.2 Local Mode Sequence of Operation.

3.5.2.1 Initial State
a. Traffic Arm is Down (Closed).
b. Traffic Signals for that lane are Red. Note signals do not cycle through yellow before changing to red.
c. warning beacons (wig-wags) and LED Blank-out signs area off.
d. AVB can either be Up (Closed) or Down (Open).

3.5.2.2 Switch is placed in Local Mode
a. The operator must ensure that the lane that the barrier is in is properly blocked and marked prior to placing the switch into Test or Local mode. This is to comply with MUTCD or Host Nation Criteria.
b. Switch must be in either Test or Local mode for 1 second.
c. Blocks EFO operation for that lane.
d. Horn does not sound.
e. LED blankout signs activate.
f. Warning beacons do not activate.

3.5.2.3 Initial State
a. AVB is Down (Open).
b. Traffic Arm is Up (Open).
c. Traffic Signals for that lane is Green.
d. warning beacons (wig-wags) and LED Blank-out signs area off.

3.5.2.4 Switch is placed in Local Mode.
a. The operator must ensure that the lane that the barrier is in is properly blocked and marked prior to placing the switch into Test or Local Mode. This is to comply with MUTCD or Host Nation Criteria.
b. Blocks EFO operation for that lane.
c. Traffic Signal changes from green to yellow for 2 seconds then red.
d. Horn does not sound.
e. LED blankout signs activate.
f. Warning beacons do not activate.
[
****
NOTE: This switch is optional. Verify with customer if desired.
****

3.6 Out-of-Service switch. Provide one per direction of travel. This function is provided for times when a barrier is damaged in a lane and needs to be taken out of service for an extended period of time. WARNING: Installation is responsible for proper lane closure procedures (closing off the lane, bagging the traffic signal over the barrier, having guards present, etc). The switch is located at the Local panel but can function at anytime. The Out-Of-Service switch has two positions: Yes and No or the wording Enable and Disable is allowed..

3.6.1 No Position. All controls operate normally.

3.6.2 Yes Position. The Close/ Open position indicating lights for those barriers will alternate from one to the other approximately every 1 sec. This will happen at the Master Control Panel, Local Control Panel (if on) and at any other panel that has barrier position indicator lights.

3.6.2.1 If Local Panel is in Local Mode, then traffic signal is red and in-pavement lights are on. All controls to operate the barrier(s) are locked out.
3.6.2.2 If system is in Test Mode, then traffic signal is red and in-pavement lights are on. All controls to operate the barrier(s) are

locked out.
3.4.2.2 If system is in EFO Mode, then traffic signal is green. All controls to operate the barrier(s) are locked out.]

3.7 RETURN TO AN EFO MODE. The traffic arm is to be down, AVB is up, and the traffic signal is to be red. When the operator places the mode switch into EFO mode, the system is to wait 1 second and then check the position of the traffic arm and the AVB. If either the traffic arm or the AVB are not in the correct position or both are not in the correct position, then the EFO Mode indicating light is to flash and an audible alarm activates. The audible alarm is on for 1 second and then off for 2 seconds. The audible alarm continues in this manner until the equipment is either put in the correct position or the alarm silence is pushed.

3.8 VPDs.

3.8.1 Stop Line VPD. This vehicle presence detection device is used to notify the system when a vehicle is in position to be processed through the lane.

3.8.2. Safety VPDs. These vehicle presence detection devices are used to notify the system when a vehicle is traversing the AVB and it will suppress the AVB from going Up (Close) or Down (Open).
These VPDs must be clear before the AVB is allowed to deploy.

3.8.3. When a VPD is activated for 15 seconds or more, an audible/visual alarm indicating light activates for that lane.

3.8.4. Vehicle Presence Detector consisting of safety loops on either side of a crash rated active vehicle barrier may require additional programming and hardware. If the loops are more than 10 ft (3 meters) apart, then add 0.5-1 sec additional time delay on the "back" loop. The alternative is to provide a latching logic between loops. In the latching logic, the master panel needs a release pushbutton for each barrier.

3.9 Lane Horn. The horn activates under EFO. An adjustable timer is to be set at 10 seconds.

3.10 Actuated Traffic Arm. The Traffic Arm is to have an edge sensor or a torque motor sensor to stop it from continuing to close on a vehicle. When the sensor impacts an object it stops motion and reverses to the Up (Open) position. Loops or break beams are not allowed for this operation. The stop line VPD is to prevent the traffic arm from closing until the VPD is cleared.

3.11 AUDIBLE ALARMS. Provide an audible alarm at the Master Control Panel, Overwatch Control Panel, main Guard Booth Control Panel, Pedestrian Booth, and Search Area Control panel(s). The volume must be adjustable either through a rheostat or other means. Provide a button that silences the audible alarm at each panel. This silence button does not affect the corresponding visual indicator. Silence button does not prevent an audible alarm if a new condition develops.

3.11.1. When an EFO is pushed an alarm will go off for 10 seconds unless silenced earlier.

3.11.2. Overspeed and Wrong-way will cause an alarm to go off for 3 seconds and then clear itself.

3.11.3. Duress activation.

3.11.4. AVB Trouble condition.

3.11.5. Loop Trouble condition.

3.11.6. VPD Activation for over the set amount of time period (typically 15 seconds) Light goes on immediately for VPD activation, but audible alarm activates after 15 seconds.

3.11.7. Out of Service activation. AVB indicator lights alternate being on.

3.11.8. Master Panel in EFO mode and Local Panel is in Local Mode. EFO mode and Local mode indicator lights alternate being on.

3.11.9. Master Panel in Test mode and Local Panel is in Local Mode. Test mode and Local mode indicator lights alternate being on.

3.11.10. Return to EFO mode with an AVB or AVBs in the incorrect position (not fully open). EFO mode indicator light and open/down AVB position light(s) flash.

3.11.11 Traffic arm is neither in fully up or fully down for more than 10 seconds. Position indicator lights for that traffic arm alternate flashing.

3.11.12 Communication Loss alarm.

3.11.13 Tramper Switch. Any tamper switch activation triggers an alarm.

3.12 LED Blank-Out Sign. The sign is to meet the following:

3.12.1 Symbol conforms to MUTCD or local Host Nation requirements.

3.13 AUDIBLE ALARMS. Provide an audible alarm at the Local Control Panel. The volume must be adjustable either through a rheostat or other means. Provide a button that silences the audible alarm at each panel. This silence button does not affect the corresponding visual indicator. Silence button does not prevent an audible alarm if a new condition develops.

3.13.1. AVB Trouble condition.

3.14 AUXILIARY CONTACTS
Provide auxiliary contacts (dry) to be used by the Intrusion Detection System and the CCTV system as specified herein and indicated on the drawings.

Appendix A4 - FULL CONTAINMENT ((Sally Port or Platooning) Active Barrier Safety Scheme

FULL CONTAINMENT (Sally Port or Platooning)SAFETY SCHEME FEATURES. Provide the following features for the full containment Safety Scheme:

****

NOTE: Paragraph 1 can be deleted in its entirety, if the layouts of equipment is shown on the drawings.

****

[1 General equipment layout information.

1.1 One or more sets of Active Vehicle Barriers in the inbound and outbound lane or lanes. Each set of barriers consists of an initial and final barrier(s) separated by a selected distance to form an entrapment area, in which either the initial barrier(s) or final barrier(s) is always closed.

1.2 Passive barrier on a raised island separating the inbound entrapment area from the outbound entrapment area to prevent vehicle crossover.

1.3 Passive barriers along the ACP/ECF corridor to contain vehicles within the corridor.

1.4 One three-light Traffic Signal located on each side of each crash rated active vehicle barrier (or roadway if there is more than one barrier across the roadway) as shown on the Drawings. Provide three lights in each Traffic Signal with a light configuration of Red-Yellow-Green top to bottom.

1.5 A 610 mm2 foot wide stop line placed 4.9 meters16 feet in front of each barrier(s) as a driver normally approaches the barrier(s). Provide a 'Stop Here On Red' sign at the stop line on each side of the roadway.

1.6 Vehicle presence detectors located immediately before and immediately after each barrier. Presence detectors can be induction loops, video motion sensors, or other suitable technologies capable of sensing vehicle presence. Induction loops must be diagonal quadrapole loop and sized per lane i.e. a loop crossing multiple lanes is not allowed.

1.7 Vehicle presence detector located at the stop line starts 1200 mm4 ft before the stop line then crosses the stop line and extends another 610 mm2 ft past the stop line. Presence detectors can be induction loops, video motion sensors, or other suitable technologies capable of sensing vehicle presence.

1.7 One Master Control Panel, one Guard Booth Control panel for each Guard Booth, and one Overwatch Panel along with all control switches and indicating lights as shown on the Drawings. The Master Control Panel is normally located in the Command and Control for use by the lead ACP/ECF guard.

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NOTE: Army. First option choose for Army projects. All others, choose the second option.

****

1.8 One Master Control Panel, [one Guard Booth Control panel plus one Guard Booth EFO button each Guard Booth][one Guard Booth EFO panel], one Overwatch Position Control Panel, one Search Area Control panel per separate search area, [Pedestrian panel,]and a Local Control Panel or panels at each barrier along with all control switches and indicating lights as shown on the Drawings. Locate the Master Control Panel in the Command and Control location for use by the ACP/ECF guards. Locate each Local Control Panel at or near its respective barrier power unit.

1.9 Diagonal pavement striping. Provide white cross hatching pavement marking that covers the front and back VPDs. Do not stripe the stop line VPD.

****
NOTE: Stop line traffic arm is optional. It is recommended to provide since it help provide another visual indicator.
****

[1.10 Provide an Actuated Traffic Arm for each lane. Install ATAs 610 mm2 ft from the backside of the stop line.
]
1.11 Provide an Actuated Traffic Arm (ATA) for each inbound lane in the ID Check Area. ATAs are to be installed near the Guard Booths as shown on the Drawings. Provide an ATA Control Panel with Open and Close control switches for the ATA and mount in the Guard Booth.
]
****
NOTE: Choose the appropriate option.
****

2 BARRIER OPERATING CONTROL PANELS.

[Operating panel layouts are found in Army Standard Design drawing package.][Operating panel layouts are found in the contract drawings.]

3 TRAFFIC SIGNAL AND BARRIER CONTROLS.

3.1 BARRIER LAYOUT AND DESIGNATIONS. Arrange each inbound and outbound lane to have two barriers per lane arranged in to entrap a vehicle or vehicles between them. Design the space between barriers to be long enough for the longest vehicle anticipated for the ACP/ECF. The space may be made longer to accommodate multiple vehicles in a platooning type arrangement. The initial barrier from the perspective of innocent motorists is designated 1, and the final barrier is designated 2 for inbound lanes. The initial barrier, again from the perspective of the innocent motorists leaving the installation, is designated 1, and the final barrier is designated 2 for outbound lanes.

3.2 AUTO MODE OF OPERATION.

3.2.1 Auto Operation. In the Auto mode of the Inbound Barriers' mode selector switch, the Close and Open switches on the Control Panel are deactivated for the inbound barriers and the Fill and Release switches on the Master Control panel are activated for the inbound barriers. Guard Booth Panels and Overwatch Panel are activated for the inbound barriers, but only if the arm/disarm switch for the given panel is in the armed position. The above requirements also apply to the control switches and control logic

for the outbound barriers.

3.2.2 Initially with no vehicles present in the inbound lanes and the Inbound Barriers' Manual - Auto - Local mode selector switch in the Auto mode, Barrier 1 is open and Barrier 2 is closed. Incoming vehicles are checked at the ID Check point and if cleared are allowed to pass over Barrier 1 and proceed to the Stop Line for Barrier 2. The guard at either the Gatehouse or the Guard Booth then activates the Inbound Release switch. Upon activation of the Inbound Release switch, the Traffic Signal for Barrier 1 goes from Green to Yellow for three seconds and then to Red. After an additional second of Red, Barrier 1's close circuit is energized to close the barrier and traffic arm if present. After Barrier 1 is fully closed, Barrier 2's open circuit is energized to open Barrier 2. When Barrier 2 is fully open, its Traffic Signal changes from Red to Green to allow the vehicle or vehicles to proceed onto the Installation. If traffic arms are provided at the Stop Line, then the traffic arm associated with Barrier 1 will close first followed by closing Barrier 1. The traffic arm associated with Barrier 2 will have the barrier open first and then the traffic arm will open. In both cases, the traffic signal does not change to Green unless both the traffic arm and crash rated active vehicle barrier are fully open.

3.2.3 When the vehicle or vehicles between Barriers 1 and 2 have passed over Barrier 2, the guard activates the Inbound Fill switch. Upon activation of the Inbound Fill switch, the Traffic Signal for Barrier 2 changes from Green to Yellow for 3 seconds and then to Red. After an additional 1 second at Red, Barrier 2's close circuit is energized to close Barrier 2. After Barrier 2 is fully closed, the open circuit for Barrier 1 is energized to open Barrier 1. After Barrier 1 is fully open, its Traffic Signal changes from Red to Green. If there is a traffic arm associated with Barrier 2, the traffic arm closes once the signal is Red, then once fully closed, then Barrier 2 closes. If there is a traffic arm associated with Barrier 1, then Barrier 1 will open first, followed by the traffic arm. Once both are open then the signal changes to Green.

3.2.4 The same controls apply to Barriers 1 and 2 in the outbound lanes and control switches Outbound Release and Outbound Fill.

3.2.5 Supervise the close circuit for all barriers by the Vehicle Presence Detectors (VPD's) in front of and behind the barrier, such that if either VPD detects a vehicle, the barrier close circuit is suppressed. The open circuit is not impacted by a VPD being activated.

3.2.6 A green indicating light adjacent to each Fill switch illuminates when the lane barriers are moving to the Fill position from the barriers being in the Release position. The indicating light is only on while the barriers (and actuated traffic arms) are moving to the proper position. Once in the Fill position the indicating light goes off. Similarly, there is a green indicating light adjacent to each Release switch that lights when the lane barriers are moving to the Release position from the barriers being in the Fill position. The indicating light is only on while the barriers (and actuated traffic arms) are moving to the proper position. Once in the Release position the indicating light goes off.

3.2.7 Red indicating lights are provided to indicate when the barriers (and actuated traffic arms) are in the Fill or Release positions.

3.3 MANUAL MODE OF OPERATION.

3.3.1 In the Manual mode of the Inbound Barriers' mode selector switch, the Close and Open switches on the Master Control Panel are activated for the inbound barriers, but the Fill and Release switches on the Master, Guard Booth Control Panels, and Overwatch Panel are deactivated for inbound barriers. The above requirements also apply to the control switches and control logic for the outbound barriers. The AVB and traffic arm in manual mode can be operated independently. Warning: In this mode it is possible to have the traffic arms and AVBs all in the option position.

3.3.1 When the Inbound Barriers Manual - Auto - Local mode switch is placed in the Manual mode, the inbound barriers can now be controlled by the individual barrier Open and Close switches on the Master Control Panel. Initiation of a Close command to an open barrier causes that barrier's Traffic Signal to change from Green to Yellow for 3 seconds and then to Red. After an additional one second of Red, the barrier's close circuit is energized through the VPD's immediately in front of and behind the barrier. If the VPD's are clear, the barrier closes. Initiation of an Open command to a closed barrier energizes the open circuit for the barrier and open the barrier. After the barrier is fully open and the mode switch is placed in Auto mode, then the Traffic Signal changes from Red to Green. In the Manual mode, both initial and final barriers in a given entrapment area can be opened. Situations requiring this configuration include passing a vehicle that is longer than the entrapment area. In such situations, guards must provide compensatory security measures to defeat a threat while both barriers are open. If there is a traffic arm associated with a barrier, the traffic arm is to close first and open last when compared to the barrier movement. Manual mode does not allow manual operation of the barrier and the traffic arm separately from each other.

3.3.2 The close circuit for all barriers is supervised by the Vehicle Presence Detectors (VPD's) in front of and behind the barrier, such that if either VPD detects a vehicle, the barrier close circuit is suppressed. The open circuit is not impacted by a VPD being activated.

3.4 LOCAL MODE OF OPERATION.

3.4.1 Local Operation. Local mode is used when maintenance personnel need to perform maintenance on the barrier.

3.4.1.1 Maintenance personnel would obtain the mode selector switch key from the lead ACP/ECF guard and place the key into the Master Control Panel 3-position mode selector switch for the appropriate direction of travel.

3.4.1.2 The person then turns the selector switch to the Local position and remove the key.

3.4.1.3 With the mode selector switch on the Master Control Panel in the Local position, Open and Close switches on the Master Control Panel for the barriers for that direction of travel are disabled and Auto mode is disabled disabled for that barrier set.

3.4.1.4 The maintenance person would then insert the key into the appropriate Off-Local mode selector switch on the barrier's Local Control Panel and turn the key to the "Local" position. This action enables the Open and Close switches at the Local Control Panel for the barriers in that direction of travel.

3.4.1.5 Maintenance personnel would also have to block and mark the lane ahead of the barrier in accordance with standard lane closure

procedures/standards and also lock and tag out certain equipment at the barrier per the barrier manufacturer's recommendations for the type of maintenance to be performed.

3.5.2 When the Inbound Barriers Manual - Auto - Local mode switch is placed in the Local mode no change takes place with the traffic signals. This action just locks out the Auto and Manual mode functions. The key is then taken to the Local panel where the Local panel is placed into Local mode. The inbound barriers can now be controlled by the individual barrier Open and Close switches on the Local Control Panel. Initiation of a Close command to an open barrier causes that barrier's Traffic Signal to change from Green to Yellow for 3 seconds and then to Red. After an additional one second of Red, the barrier's close circuit is energized through the VPD's immediately in front of and behind the barrier. If the VPD's are clear, the barrier closes. Initiation of an Open command to a closed barrier energizes the open circuit for the barrier and open the barrier. After the barrier is fully open and the mode switch is placed in Auto mode, then the Traffic Signal changes from Red to Green. In the Local mode, both initial and final barriers in a given entrapment area can be opened. In such situations, guards must provide compensatory security measures to defeat a threat while both barriers are open. The traffic arm associated with a barrier is operated independent from the crash rated active vehicle barrier. Upon completion of maintenance, the traffic arm and corresponding barrier need to be in the same position e.g. either both open or both closed.

3.5.3 The close circuit for all barriers is supervised by the Vehicle Presence Detectors (VPD's) in front of and behind the barrier, such that if either VPD detects a vehicle, the barrier close circuit is suppressed. The open circuit is not impacted by a VPD being activated.

3.6 FINAL BARRIER: A VPD located at the barrier's STOP line detects a vehicle's presence in the entrapment area. If the final barrier is closed, then a signal is sent to the guard in the Gatehouse notifying him/her of the vehicle's presence. The signal causes a short audible noise to alert the guard and turns on a Red indicating light until the final barrier is open. If the barrier is open, then just the indicating light for the loop illuminates.

3.7 FILL OR RELEASE COMMAND WITH VPD.

3.7.1 Vehicle Presence Detector consisting of safety loops on either side of a crash rated active vehicle barrier may require additional programming and hardware. If the loops are more than 3 meters10 ft apart, then add 0.5-1 sec additional time delay on the "back" loop. The alternative is to provide a latching logic between loops. In the latching logic, the master panel needs a release pushbutton for each barrier.

3.7.2 When in Auto mode and a Fill or Release command is requested, then the system is to function as indicated.

3.7.2.1 When a VPD is activated on a barrier that is to close, then the action (Fill or Release) is suppressed. An audible alarm is to sound and the Fill or Release indicating light is to Flash. The original command is unlatched. Once the VPD(s) is cleared, then the guard must hit the reset button to clear the system and alarm. The Fill or Release command is to be reinitiated then. Once the traffic arm or barrier starts to close, a VPD activation is not to stop the cycle. The VPD must be activated prior to the command to stop the command.

3.7.2.2 A VPD activation on a barrier that is to open does not stop the action of opening (Fill or Release).

3.8 MANUAL OPEN OR CLOSE COMMAND WITH VPD.

3.8.1 Manual operation to Open a barrier or traffic arm is not impacted by a VPD activation associated with that barrier/traffic arm.

3.8.2 Manual operation to Close a barrier or traffic arm is suppressed by a VPD activation associated with that barrier/traffic arm. The VPD activation must take place prior to the Close command to suppress the action. The command is unlatched and must be reinitiated once the VPD(s) is cleared.

3.9 RETURN TO AUTO MODE.

3.9.1 When the mode switch is placed in the Auto mode and all the barriers for that direction of travel are in the appropriate configuration - one is Open (not deployed) and one is Closed (deployed), then the Auto mode indicating light illuminates and the corresponding Fill or Release light is to be illuminated.

3.9.2 If a mode switch is placed in the Auto mode and if both barriers for that direction of travel are either Open or Closed or if the traffic arm and barrier are in an incorrect position, then an alarm is to sound. The visual indicator is to be an alternating flashing of the Fill and Release indicator lights and the Auto indicating light is to turn off. The guard needs to go to manual mode and place the equipment in the correct configuration. Moving the mode switch from Auto to Manual (or local) mode turns off the alarm.

3.10 RESET. Reset button is only located at the Master Control Panel.

3.10.1 The reset button is used to reset after an Auto mode Fill or Release action is stopped by a VPD during a closing action. See RETURN to Auto Mode.

3.10.2 The reset button is also used to correct the unlikely situation that a barrier and traffic arm are prevented from completing a coordinated action. One possible is traffic arm closing on an object and then reversing back to the open position.

****

NOTE: This is an optional switch function for locations that have only one lane per direction of travel or have one barrier across all the lanes. If there are multiple lanes per direction of travel with each lane having its own AVB and no lane separation, then provide this switch. Keep or delete as required by the project.

****

3.11 Out-of-Service switch. This function is provided for times when a barrier is damaged in a lane and needs to be taken out of service for an extended period of time. The out of service switch is to be located at the AVB location and is allowed to operate in EFO, Test and Local modes. This allows an AVB to be locked out in a lane, but the other lane can operate under EFO. The switch locks out all functions for the AVB when activated. The up and down lights for that AVB will alternate going on and off. WARNING: Installation is responsible for proper lane closure procedures (closing off the lane, bagging the traffic signal over the barrier, having

guards present, etc). The Out-Of-Service switch has two positions: Yes and No or Enable and Disable is allowed for the wording..

3.12 AUDIBLE ALARMS. Provide an audible alarm at the Master Control Panel, Overwatch Control Panel, [Pedestrian control panel,] main Guard Booth Control Panel and Search Area Control panel(s). The volume must be adjustable either through a rheostat or other means. Provide a button that silences the audible alarm at each panel. This silence button does not affect the corresponding visual indicator. Silence button does not prevent an audible alarm if a new condition develops.

3.12.1 Stop line VPD. When the stop line VPD is activated it activates a visual indicator and audible indicator when the barrier is in the Closed position. If the AVB is in the open position, only a visual indicator.

3.12.2. Overspeed and Wrong-way will cause an alarm to go off for 3 seconds and then clear itself.

3.12.3. Duress activation.

3.12.4. AVB Trouble condition.

3.12.5. Loop Trouble condition.

3.6.6. Each Loop Activated.

3.12.7 If an actuated traffic arm is provided at the crash rated active vehicle barriers are equipped with a break arm alarm. Upon breakage of the traffic arm, an audible/visual alarm is to happen at the master control panel. The visual indicator consists of a the traffic arm position indicator light flashing.

3.12.8. Master Panel in Auto mode and Local Panel is in Local Mode. Auto mode and Local mode indicator lights alternate being on.

3.12.9. Master Panel in Manual/Test mode and Local Panel is in Local Mode. Manual/Test mode and Local mode indicator lights alternate being on.

3.12.10. Return to Auto mode with an AVB or AVBs are in the incorrect position (not fully open). Auto mode indicator light and open/down AVB position light(s) flash.

3.12.11 Communication Loss alarm.

3.12.11 Tramper Switch. Any tamper switch activation triggers an alarm.

3.13 AUDIBLE ALARMS. Provide an audible alarm at the Local Control Panel. The volume must be adjustable either through a rheostat or other means. Provide a button that silences the audible alarm at each panel. This silence button does not affect the corresponding visual indicator. Silence button does not prevent an audible alarm if a new condition develops.

3.13.1. AVB Trouble condition.

3.14 AUXILIARY CONTACTS. Provide auxiliary contacts (dry) to be used by the Intrusion Detection System and the CCTV system as specified herein and indicated on the drawings.

Appendix A4 - Stop Control Safety Scheme

STOP CONTROL Provide the following features for the full containment Safety Scheme:

****
NOTE: Paragraph 1 can be deleted in its entirety, if the layouts of equipment is shown on the drawings.
****

[1 General equipment layout information.

1.1 Active Vehicle Barriers in all inbound and outbound lanes.

1.2. Do Not Enter LED blankout signs are located at the midpoint of the AVB on each side of the lane.

1.3 A 610 mm2 foot wide stop line placed 4.3 meters14 feet in front of the the active vehicle barrier. A Stop sign is located at the front of the stop line.

1.4 Double solid white lines between inbound lanes approaching the barriers to prohibit lane changes in front of the barriers.

1.5 Double solid yellow lines between adjacent inbound and outbound lanes.

1.6 Vehicle Presence Detectors (VPDs) located immediately before and immediately after each barrier. VPDs can be induction loops, video motion sensors, or other suitable technologies capable of sensing vehicle presence. Induction loops must be diagonal quadrapole loop and sized per lane i.e. a loop crossing multiple lanes is not allowed. The VPD before the AVB starts 610 mm2 ft from the AVB and is 1829 mm6 ft long.

1.7 Warning Sign and Warning Beacons (wig-wags) (2 Beacons with alternating flashing yellow lights) located approximately 33.5 meters110 feet in front of the barriers. Beacon lamps will be LED.

****
NOTE: Army. First option choose for Army projects. All others, choose the second option.
****

1.8 One Master Control Panel, [one Guard Booth Control panel plus one smaller panel for each Guard Booth][one Guard Booth EFO Control Button], one Overwatch Position Control Panel, one Search Area Control panel per separate search area, Pedestrian booth, and a Local Control Panel or panels at each barrier along with all control switches and indicating lights as shown on the Drawings. Locate the Master Control Panel in the Command and Control location for use by the ACP/ECF guards. Locate each Local Control Panel at or near its respective barrier power unit.

1.9 Diagonal pavement striping. Provide white crosshatching pavement marking that covers the front and back VPDs. Do not stripe the stop line VPD.
[

****

NOTE: In-pavement lights are optional. Edit per project requirements.

****

[1.9 Red steady in-pavement lights on both sides of the barrier in each lane where there are inbound and outbound lanes adjacent to each other. If multiple lanes per direction of travel then the lights are only required where the AVB does not have lights facing normal traffic flow. Provide three lights per barrier on each side of the barrier. Locate approximately 610 mm2 ft in front of the stop line.]]

1.10 Horn located at the crash-rated active vehicle barriers. Provide the horn with a means to adjust the volume.

1.11 Actuated Traffic Arm for each inbound lane in the ID Check Area. Install ATAs near the Guard Booths as shown on the Drawings. Provide an ATA Control Panel with Open and Close control switches for the ATA in the guard booth or as directed.]

****

NOTE: choose the appropriate option.

****

2 BARRIER OPERATING CONTROL PANELS.

[Operating panel layouts are found in Army Standard Design drawing package.][Operating panel layouts are found in the contract drawings.]

3 TRAFFIC SIGNAL AND BARRIER CONTROLS.

3.1 EFO MODE. Under normal operations, all barriers' mode selector switches on the Master Control Panel will be in the EFO position with the key removed and with that key being accessible only by the lead ACP/ECF guard. With the barrier's mode selector switch in the EFO position, EFO is enabled for that direction of travel, but the Open and Close switches for that barrier on the Master Control Panel and the Open and Close switches on that barrier's Local Control Panel are disabled.

3.2 EFO OPERATION. In the EFO mode of operation with the barrier open, the LED Do Not Enter signs are off. Activation of an EFO command from any armed EFO deploys the AVB, activates the warning beacons, turns on the in-pavement lights (if present), red signal, and LED Do Not Enter signs as soon as EFO is pushed. The barrier(s) in emergency fast mode is to be fully deployed within 2 seconds provided that the VPDs immediately in front of and behind the barrier are clear. If either or both VPDs detect a vehicle, then the barrier does not close; however, the emergency close signal is latched only for those barriers that were in EFO mode at the time of activation. Once both VPDs are clear, the barriers (those in EFO mode) deploy (unless EFO Reset had been activated). Horn is to sound for 10 seconds.

3.3 EFO RESET. After an EFO activation, guards will close all inbound and outbound lanes. Guards will obtain the EFO Reset key and then activate the EFO Reset switch on the Master Control Panel to reset EFO. This removes the latch command for the EFO circuit. The person in charge can then place the Master Control Panel mode switches into Test (or go through the sequence to use the Local panel) and use the Open buttons to lower each barrier. Once all the barriers are Open for a given direction of travel and the corresponding mode switches are back in EFO mode, then the warning beacons, red signal, and Do Not Enter signs for that direction of travel, and the

in-pavement lights deactivate. This needs to be done for both directions of travel in order to have all signals off.

3.3 Test Operation.

3.3.1 An individual barrier can be test operated by installing the proper lane closure markings and barricades ahead of the active barrier and then placing the mode selector switch for that direction of travel into the Test position. With the mode selector switch in the Test position, the barrier's Open and Close switches on the Master Control Panel for that direction of travel are enabled, but the Open and Close switches on the Local Control Panel for that direction of travel are disabled. In addition all active EFO switches are disabled from operating any barrier for that direction of travel. Where a single barrier spans both inbound and outbound lanes, the test operation switch deactivates all EFO capability.

3.3.2 When a mode switch is placed in Test mode, the warning beacons, red signal, Do Not Enter signs, and in-pavement lights for that direction of travel activate. The barriers for that direction of travel are allowed to operate without any time delay. The traffic signals for that direction of travel stay on until all the conditions are met for RETURN TO EFO MODE. The AVB must be down and back in EFO mode to deactivate the signals. The warning beacons, in pavement lights, Do Not Enter signs, and red signal all deactivate. WARNING: Installation is responsible for proper lane closure procedures (closing off the lane, bagging the traffic signal over the barrier if a long term operation, having guards present, etc) during a Test or Local mode operation.

3.4 LOCAL MODE OF OPERATION

3.4.1 Local Operation. Local mode is used when maintenance personnel need to perform maintenance on the barrier.

3.4.1.1 Maintenance personnel would obtain the mode selector switch key from the lead ACP/ECF guard and place the key into the Master Control Panel 3-position mode selector switch for the appropriate direction of travel.

3.4.1.2 The person then turns the selector switch to the Local position to enable Local mode and then removes the key.

3.4.1.3 With the mode selector switch on the Master Control Panel in the Local position, Open and Close switches on the Master Control Panel for the barriers for that direction of travel are disabled and all EFO switches are disabled for that direction of travel. If a single barrier spans multiple directions of travel all EFO capability will be deactivated.

3.4.1.4 The maintenance person would then insert the key into the appropriate Off-Local mode selector switch on the barrier's Local Control Panel and turn the key to the "Local" position. This action activates the Open and Close switches at the Local Control Panel for the barriers in that direction of travel.

3.4.1.5 Maintenance personnel would also have to block and mark the lane ahead of the barrier in accordance with standard lane closure procedures/standards and also lock and tag out certain equipment at the barrier per the barrier manufacturer's recommendations for the type of maintenance to be performed.

3.4.2 LOCAL MODE OF OPERATION (one barrier per direction of travel). When a

mode switch is placed in Local mode, the traffic signals, in-pavement lights and LED blankout signs for that direction of travel activate. The barriers for that direction of travel are allowed to operate without any time delay. Everything stays activated for that direction of travel until all the conditions are met for RETURN TO EFO MODE. The in-pavement lights for that barrier activate when the traffic signal is red and stay red as long as the traffic signals are red. Note the warning beacons do not operate under Local, but can be allowed to operate if requested and approved. WARNING: Installation is responsible for proper lane closure procedures (closing off the lane, bagging the traffic signal over the barrier if a long term operation, having guards present, etc) during a Test or Local mode operation.

3.5 Vehicle Presence Detector consisting of safety loops on either side of a crash rated active vehicle barrier may require additional programming and hardware. If the loops are more than 3 meters10 ft apart, then add 0.5-1 sec additional time delay on the "back" loop. The alternative is to provide a latching logic between loops. In the latching logic, the master panel needs a release pushbutton for each barrier.

****

NOTE: This is an optional switch function for locations that have only one lane per direction of travel or have one barrier across all the lanes. If there are multiple lanes per direction of travel with each lane having its own AVB and the lanes are not separated by an island, then provide this switch. Keep or delete as required by the project.

****

3.6 Out-of-Service switch. This function is provided for times when a barrier is damaged in a lane and needs to be taken out of service for an extended period of time. The out of service switch is to be located at the AVB location and is allowed to operate in EFO, Test and Local modes. This allows an AVB to be locked out in a lane, but the other lane can operate under EFO. The switch locks out all functions for the AVB when activated. The up and down lights for that AVB will alternate going on and off. WARNING: Installation is responsible for proper lane closure procedures (closing off the lane, bagging the traffic signal over the barrier, having guards present, etc). The Out-Of-Service switch has two positions: Yes and No or use Enable and Disable.

3.6.1 No Position. All controls operate normally.

3.6.2 Yes Position. The Close/ Open position indicating lights for those barriers will alternate from one to the other approximately every 1 sec. This will happen at the Master Control Panel, Local Control Panel (if on) and at any other panel that has barrier position indicator lights. Controls for that AVB are all locked out.

3.7 RETURN TO EFO MODE. When the mode switch is placed in the EFO mode and all the barriers for that direction of travel are Open (not deployed), then the barrier's signs and warning beacons (wig-wags) deactivate. If a mode switch is placed in the EFO mode and any of the barriers for that direction of travel are Closed, then the barrier's signs stay on and an alarm is generated on the ACP/ECF TROUBLE window on the Gatehouse Control Panel.

3.8 AUDIBLE ALARMS. Provide an audible alarm at the Master Control Panel, Overwatch Control Panel, main Guard Booth Control Panel and Search Area Control panel(s). The volume must be adjustable either through a rheostat

or other means. Provide a button that silences the audible alarm at each panel. This silence button does not affect the corresponding visual indicator. Silence button does not prevent an audible alarm if a new condition develops.

3.8.1. When an EFO is pushed an alarm will go off for 3 seconds unless silenced earlier.

3.8.2. Overspeed and Wrong-way will cause an alarm to go off for 3 seconds and then clear itself.

3.8.3. Duress activation.

3.8.4. AVB Trouble condition.

3.8.5. VPD Trouble condition.

3.8.6 VPD Activation for over the set amount of time period (typically 15 seconds) Light goes on immediately for VPD activation, but audible alarm activates after 15 seconds.

3.8.5. Out of Service activation. AVB indicator lights alternate being on.

3.8.6. Master Panel in EFO mode and Local Panel is in Local Mode. EFO mode and Local mode indicator lights alternate being on.

3.8.7. Master Panel in Test mode and Local Panel is in Local Mode. Test mode and Local mode indicator lights alternate being on.

3.8.8. Return to EFO mode with an AVB or AVBs in the incorrect position (not fully open). EFO mode indicator light and open/down AVB position light(s) flash.

3.8.9 Communication Loss alarm.

3.8.10 Tramper Switch. Any tamper switch activation triggers an alarm.

3.9 AUDIBLE ALARMS. Provide an audible alarm at the Local Control Panel. The volume must be adjustable either through a rheostat or other means. Provide a button that silences the audible alarm at each panel. This silence button does not affect the corresponding visual indicator. Silence button does not prevent an audible alarm if a new condition develops.

3.9.1. AVB Trouble condition.

3.9 AUXILIARY CONTACTS Provide auxiliary contacts (dry) to be used by the Intrusion Detection System and the CCTV system as specified herein and indicated on the drawings.

APPENDIX B			
Events and Alarms at ACP/ECF, CSMS, & Recorded			
Event/Alarm Point	Alarm at Command & Control	Alarm at CSMS	Record on SER
On Generator Power (Note 8)	Yes	No	No
Generator Low Fuel (Note 8)	Yes	No	No
UPS Trouble Alarm (Note 9)	Yes	No	No
Hydrogen Gas Alarm (Note 10)	Yes	No	No
Barrier #N Inbound - EFO Mode (Note 4)	No	No	Yes
Barrier #N Inbound - TEST Mode	No	No	Yes
Barrier #N Inbound -LOCAL Mode	No	No	Yes
Barrier #N Inbound - AUTO Mode (Note 12)	No	No	Yes
Barrier #N Outbound - EFO Mode (Note 4)	No	No	Yes
Barrier #X Outbound - TEST Mode	No	No	Yes
Barrier #X Outbound - LOCAL Mode	No	No	Yes
Barrier #X Outbound - AUTO Mode (Note 12)	No	No	Yes
Barrier #N Inbound AVB - Manual Close Command	No	No	Yes
Barrier #N Inbound AVB - Manual Open Command	No	No	Yes
Barrier #N Inbound Traffic Arm - Manual Close Command (Note 3)	No	No	Yes
Barrier #N Inbound Traffic Arm - Manual Open Command (Note 3)	No	No	Yes
Barrier #X Outbound AVB - Manual Close Command	No	No	Yes
Barrier #X Outbound AVB - Manual Open Command	No	No	Yes
Barrier #X Outbound Traffic Arm - Manual Close Command (Note 3)	No	No	Yes
Barrier #X Outbound Traffic Arm - Manual Open Command (Note 3)	No	No	Yes
EFO Activation - Master Panel	Yes	No	Yes
EFO Activation - Pedestrian Booth	Yes	No	Yes
EFO Activation - Guard Booth #Y	Yes	No	Yes
EFO Activation - Search Area	Yes	No	Yes
EFO Activation - Overwatch	Yes	No	Yes
EFO Activation - Any Location (Note 11)	No	Yes	No

APPENDIX B			
Events and Alarms at ACP/ECF, CSMS, & Recorded			
Event/Alarm Point	Alarm at Command & Control	Alarm at CSMS	Record on SER
Barrier #N Inbound AVB Close Circuit Energized Barrier #X Outbound AVB Close Circuit Energized Barrier #N Inbound AVB - Trouble Alarm Barrier #X Outbound AVB - Trouble Alarm Barrier #N Inbound AVB - Safety Loop Trouble Barrier #X Outbound AVB - Safety Loop Trouble	No No Yes Yes Yes Yes	No No No No No No	Yes Yes Yes Yes No No
Barrier #N Inbound AVB - Loop 1 (stop line) Malfunction (Note 13) Barrier #N Inbound AVB - Safety Loop 2 (threat side) Malfunction Barrier #N Inbound AVB - Safety Loop 3 (secure side) Malfunction	No No No	No No No	Yes Yes Yes
Barrier #X Outbound AVB - Loop 1 (stop line) Malfunction (Note 13) Barrier #X Outbound AVB - Safety Loop 2 (threat side) Malfunction Barrier #X Outbound AVB - Safety Loop 3 (secure side) Malfunction	No No No	No No No	Yes Yes Yes
EFO Reset Barrier #N Inbound AVB - Loop 1 (stop line) Activation (Note 13) Barrier #N Inbound AVB - Safety Loop 2 (threat side) Activation Barrier #N Inbound AVB - Safety Loop 3 (secure side) Activation	No No No No	No No No No	Yes Yes Yes Yes
Barrier #X Outbound AVB - Loop 1 (stop line) Activation (Note 3) Barrier #X Outbound AVB - Safety Loop 2 (threat side) Activation Barrier #X Outbound AVB - Safety Loop 3 (secure side) Activation	No No No No No	No No No No No	Yes Yes Yes Yes Yes

APPENDIX B			
Events and Alarms at ACP/ECF, CSMS, & Recorded			
Event/Alarm Point	Alarm at Command & Control	Alarm at CSMS	Record on SER
Barrier #N Inbound AVB - Loop 1 (stop line) Deactivation (Note 13)	No	No	Yes
Barrier #N Inbound AVB - Safety Loop 2 (threat side) Deactivation	No	No	Yes
Barrier #N Inbound AVB - Safety Loop 3 (secure side) Deactivation	No	No	Yes
		No	Yes
		No	Yes
Barrier #X Outbound AVB - Loop 1 (stop line) Deactivation (Note 3)	No	No	Yes
Barrier #X Outbound AVB - Safety Loop 2 (threat side) Deactivation	No	No	Yes
Barrier #X Outbound AVB - Safety Loop 3 (secure side) Deactivation	No	No	Yes
Barrier #N Inbound AVB Close Limit Switch Activated	No	No	Yes
Barrier #X Outbound AVB Close Limit Switch Activated	No	No	Yes
Barrier #N Inbound AVB Open Limit Switch Activated	No	No	Yes
Barrier #X Outbound AVB Open Limit Switch Activated	No	No	Yes
Master Panel Power Off	No	No	Yes
Local Panel Power Off	No	No	Yes
EFO Not Armed - Guard Booth #Y	No	No	Yes
EFO Not Armed - Overwatch	No	No	Yes
EFO Not Armed - Search Area	No	No	Yes
Overspeed Activated (Alarm)	Yes	No	Yes
Wrong-way Activated (Alarm)	Yes	No	Yes
Inbound Traffic Signal Red On	No	No	Yes
Inbound Traffic Signal Yellow On (Note 14)	No	No	Yes
Inbound Traffic Signal Green On (Note 15)	No	No	Yes
Outbound Traffic Signal Red On	No	No	Yes
Outbound Traffic Signal Yellow On (Note 14)	No	No	Yes
Outbound Traffic Signal Green On (Note 15)	No	No	Yes
Duress Activation - Any Location (Note 11)	Yes	No	No
Duress Activation - Guard Booth #Y (Note 11)	No	No	Yes

APPENDIX B			
Events and Alarms at ACP/ECF, CSMS, & Recorded			
Event/Alarm Point	Alarm at Command & Control	Alarm at CSMS	Record on SER
Duress Activation - Overwatch (Note 11) Duress Activation - Command & Control (Note 11) Duress Activation - Search Area (Note 11) Duress Activation - Visitor Control Center (Note 11) Intrusion Detection Activation - Guard Booth #Y (Note 11)	No No No No No	Yes Yes Yes Yes Yes	No No No No No
Intrusion Detection Activation - Overwatch (Note 11) Intrusion Detection Activation - Command & Control (Note 11) Intrusion Detection Activation - Search Area (Note 11) Intrusion Detection Activation - Visitor Control Center (Note 11)	No No No No	Yes Yes Yes Yes	No No No No
Intrusion Detection Activation - Any Location (Note 11)	Yes	No	No

NOTES:
1. CSMS - Central Security Monitoring Station
2. SER - Sequence of Events Recorder
3. Monitor on Hybrid Beacon, if used, HEPD, and Stop Control Safety Schemes
4. This command is for any safety scheme that has an EFO.
5. N = number of inbound crash rated active vehicle barriers.
6. X = number of outbound crash rated active vehicle barriers
7. Y = number of guard booths
8. Alarm can be by a Remote Generator Alarm/Status Panel.
9. Alarm can be by a Remote UPS Alarm/Status Panel.
10. Alarm can be separate from Master Control Panel.
11. Alarm is to be monitored by the Intrusion Detection System Panel. Alarm signal is sent by the IDS panel.
12. Only used on Full Containment (Platooning/Sally Port) Safety Scheme. Number is number of lanes.
13. HEPD and Full Containment.
14. Hybrid Beacon, HEPD and Full Containment.
15. HEPD and Full Containment.

-- End of Section --