

12/2013

NASATKA SPECIFICATION**VERTICAL LIFT CRASH BEAM****PART 1 GENERAL**

The purpose of this specification is to describe the Nasatka Maximum Security Barrier XII without an operator (NMSB XII) or with either a hydraulic (NMSB XII-H) or an all-electric operator (NMSB XII-E) for the purpose of providing architecture and engineering specification templates.

This section of this specification provides a top level view of document administration and Nasatka requirements; including references, barrier description, manual, warranty, and maintenance.

Equipment names and model numbers included herein are those currently under production or are utilized in the NMSB XII, NMSB XII-E, and NMSB XII-H as of the writing of this specification, and are subject to change without notice.

- A. The Owner/Operator (End User) or facility architect shall assume responsibility for providing traffic and safety engineering, including all necessary safety features to be used at each barrier location, including, but not limited to: sidewalks for pedestrian traffic, sufficient roadway lighting, caution signage, traffic lights, audible warning alerts, visual warning alerts, secondary traffic control devices, guard/control booths.
- B. The NMSB XII system shall consist of one crash beam barrier assembly and a receiver assembly. The crash beam shall utilize manual (by hand) vertical movement.
- C. The NMSB XII-E system shall consist of one crash beam barrier assembly (which contains an all-electric operator) and a receiver assembly. The crash beam shall utilize vertical movement. The crash beam shall be counter-weighted to provide manual operation (completely manual raising or lowering with one person manually operating the beam and one person acting as a safety spotter) in the event of a power or motor failure.
- D. The NMSB XII-H system shall consist of one crash beam barrier assembly (which contains an electric motor driven hydraulic operator) and a receiver assembly. The crash beam shall utilize vertical movement. The crash beam shall be counter-weighted to provide manual operation (completely manual raising or lowering with one person manually operating the beam and one person acting as a safety spotter) in the event of a power, motor, or hydraulic failure.
- E. The design and materials of the K12/L3.0 rated AVB system shall be the same as those used in the crash test of the AVB, IAW SD-STD-02.01 Revision A or as listed in the Department of Defense (DOD) Anti-ram Vehicle Barriers.
- F. Other devices required to prevent vehicles from going around the barrier shall be specified/provided by the facility on either side of the barrier.

All barrier systems should be carefully planned with safety as a paramount concern. The product is designed to control vehicle traffic; however, Nasatka Barrier Inc., DBA Nasatka Security, is not a traffic safety engineering firm and recommends that a system be reviewed before installation. It is recommended that all forms of safety equipment be utilized to the maximum extent possible. Such safety equipment includes, but is not limited to, proper lighting, written warning signs, traffic lights, gate arms and/or audible alarms.

1.1. REFERENCES

Publications cited in the text of this specification are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

- A. AMERICAN WELDING SOCIETY (AWS)
AWS D1.1/D1.1M (2010) Structural Welding Code - Steel
- B. American Society for Testing and Materials (ASTM International) (ASTM)
ASTM F2656 (2007) Standard Test Method for Vehicle Crash Testing of Perimeter Barriers
- C. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
NEMA 250 (2008) Enclosures for Electrical Equipment (1000 Volts Maximum)
- D. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)
AASHTO HB-17 (2002; Errata 2003; Errata 2005, 17th Edition) Standard Specifications for Highway Bridges
- E. U.S. DEPARTMENT OF STATE STANDARD (SD-STD)
SD-STD-02.01 (2003; Rev A) Specification for Vehicle Crash Testing of Perimeter Barriers and Gates
- F. UNIFIED FACILITIES GUIDE SPECIFICATIONS (UFGS)
DIVISION 03 - CONCRETE
DIVISION 28 - ELECTRONIC SAFETY AND SECURITY
DIVISION 31 - EARTHWORK
DIVISION 32 - EXTERIOR IMPROVEMENTS
DIVISION 34 - TRANSPORTATION

1.1.1 RELATED UNIFIED UFGS SECTIONS

- A. Section 03 30 00 Cast-In-Place Concrete
- B. Section 31 00 00 Earthwork
- C. Section 31 60 00 Foundation Preparation
- D. Section 32 12 16 Hot-Mix Asphalt (HMA) for Roads
- E. Section 32 12 18 Resin Modified Pavement Surfacing Material
- F. Section 32 13 43 Pervious Concrete Paving
- G. Section 32 13 43 Pervious Concrete Paving

1.1.2 RELATED AGENCY SPECIFIC UFGS SECTIONS (USACE)

- A. Section 03 30 00.00 10 Cast-In-Place Concrete
- B. Section 28 16 01.00 10 Small Intrusion Detection System
- C. Section 28 20 01.00 10 Electronic Security System

1.1.3 RELATED AGENCY SPECIFIC UFGS SECTIONS (NAVFAC)

- A. Section 28 16 00.00 20 Basic Intrusion Detection Systems (IDS)
- B. Section 28 20 00.00 20 Electronic Security System (ESS), Commercial

1.2. NMSB XII SYSTEMS DESCRIPTION

A. The AVB system shall be one of the following.

1. The NMSB XII – a manually operated vertical lift crash beam system.

The AVB system shall be as indicated on the manufacturers drawings; each AVB shall be complete with housing and frame assembly, arm assembly, receiver, and counter weight system.

Customer selectable features, equipment, and accessories shall be available.

No electric or hydraulic operator systems shall be required for operation.

2. The NMSB XII-E – an electrically operated vertical lift crash beam system.

The AVB system shall be as indicated on the manufacturers drawings; each AVB shall be complete with housing and frame assembly, counter weight system, arm assembly, receiver, and all-electric operator components.

Customer selectable features, equipment, and accessories shall be available.

No hydraulic systems shall be required or used.

3. The NMSB XII-H – a hydraulically operated vertical lift crash beam system.

The AVB system shall be as indicated on the manufacturers drawings; each AVB shall be complete with housing and frame assembly, counter weight system, arm assembly, receiver, and hydraulic operator components.

Customer selectable features, equipment, and accessories shall be available.

B. The AVB system shall be available in a Left- or Right-hand configuration. The Customer shall specify the AVB system configuration required at each AVB location. Left- or Right-hand configuration shall be determined by the housing location (pivot end of the beam) when the beam is viewed from the secure (safe) side.

C. The AVB system shall comply with Customer specified requirements.

D. The barrier shall utilize two separate foundations.

E. The barrier weight restrictions (for vehicles traveling through this barrier) shall be limited only by the roadway.

F. Beam height shall be 30 +/- 1 in (762 mm +/- 25 mm) as measured from grade to top of the beam, at center of span, with beam in the fully secure position.

G. The manufacturer shall provide LED wig wags for the barrier as an option.

H. The manufacturer shall provide traffic safety lights as an option.

I. The manufacturer shall provide a concrete heating system as an option.

J. The manufacturer shall provide the following UPS (uninterruptable power supply) as options:

1. 110 VAC or 208VAC-230VAC, single phase, 50hz or 60hz (battery charger HPU only)
2. 208 to 240 VAC, single phase, 60 Hz
3. 208 to 240 VAC, three phase, 60 Hz
4. Customer shall specify if 50 Hz.

1.2.1 NMSB XII Rating Description

A. The barrier shall meet or exceed a crash rating of K12/L3 and be certified, as defined by DOS SD-STD-02.01 Revision A.

B. The barrier performance shall be based on the DOS publication SD-STD-02.01, Revision A, dated March 2003 for Vehicle Crash Testing of Perimeter Barriers and Gates, in which the impact conditions and performance levels are:

Crash Rating	Vehicle Weight	Impact Speed	Impact Energy
K12	15,000 pounds (6804 kg)	50 mph (80 km/h)	1,253 ft-kips (1,699 kJ)

Performance Level	Penetration Definition	Permitted Penetration
L 3.0	Vehicle and cargo stopped <u>1/</u>	≤ 1 m (3.3 ft)

1/ Vehicle partial penetration and/or barrier deflection of up to the listed Permitted Penetration is allowed for the listed Performance Level.

C. The AVB performance shall meet or exceed L 3.0 - Vehicle and cargo are to be stopped although vehicle partial penetration and/or barrier deflection of up to 1 m (3.3 feet) shall be permitted.

D. The barrier shall protect the following clear openings as specified below.

1. DOS K12/L3.0 protection shall be provided for a clear opening of 12 ft (3.65 m), 14 ft (4.26 m), 16 ft (4.87 m), or 18 ft (5.48 m). Protection for a clear opening of 12 ft (3.65 m) shall be designated as the standard NMSB XII system.
2. In addition, the barrier shall provide 20 ft (6 m), 22 ft (6.7 m), and 24 ft (7.31 m) clear openings with engineer rated K12 protection when specified by the Customer.

NOTE

The NMSB XII-E (only the electric operator) is NOT recommended for clear openings of greater than 22 (6.7 m) for traffic volume in excess of 30 cycles per hour. The NMSB XII-E supporting clear openings of 22 (6.7 m) and 24 ft (7.31 m) do NOT use a motor with an integrated brake and require the use of electromagnetic locks.

1.2.2 Performance Requirements

- A. Each system will be 100% factory tested and adjusted for normal installed operating conditions. The barrier, electric or hydraulic operator components, and the standard (or specific option if selected) electronic control are interconnected and run in all operating modes. This shall ensure each component AVB system is functioning in accordance with the Customer operating parameters and the quality assurance standards of Nasatka Security, Inc.
- B. Standard system documentation shall contain detailed, step-by-step, information pertaining to all aspects of installation, start up, trouble shooting, and preventative maintenance. Familiarity with vehicle access systems and electronics shall be sufficient to properly install, operate, and maintain any NMSB XII system.

1.3. SUBMITTALS

Submittals shall be limited to those necessary for adequate quality control. When required requests for submittals will be organized using the following eleven classifications:

- SD-01 Preconstruction Submittals
- SD-02 Shop Drawings
- SD-03 Product Data

- SD-04 Samples
- SD-05 Design Data
- SD-06 Test Reports
- SD-07 Certificates
- SD-08 Manufacturer's Instructions
- SD-09 Manufacturer's Field Reports
- SD-10 Operation and Maintenance Data
- SD-11 Closeout Submittals

- A. The manufacturer shall submit to the Buyer a crash test certification on the AVB system.
 - 1. A copy of the DOS crash rating letter or engineering evaluation, certifying the manufacturer's barrier shall be provided. As an alternate, the manufacturer may submit the current DOS website address listing the AVB system certified crash rating.
 - 2. A certificate of conformance that the AVB system delivered conforms to the crash rating, performance and the requirements of this specification.
- B. The Buyer will distribute AVB system submittal documentation and drawings to the Owner/Operator (End User), as necessary.
- C. The manufacturer shall submit to the Buyer drawings on the AVB system.
 - 1. Detail drawings shall show the top assembly layout and overall dimensions of each major element of the AVB system.
 - 2. Detail drawings shall show the foundation and anchoring requirements of the AVB system.
 - 3. Detail drawings shall show the proposed layout of the AVB system.
 - 4. A detailed electrical schematic including associated wiring shall be provided showing all electrically connected components, including the interface points for connection to equipment.
 - 5. The schematic drawings shall represent the entire AVB system, with all manufacturer-supplied equipment connected and integrated together as a system.
 - 6. Detail interconnect drawings shall show the minimum conduit size and number of wires required to run between each of the AVB system equipment.

1.4. QUALITY ASSURANCE

- A. The manufacturer shall be a company specializing in the design and supply of vehicle barrier systems with a minimum of 25 years of experience.
- B. The manufacturer shall design or provide a complete vehicle barrier system that has been fabricated, assembled and tested for proper operation prior to shipment.
- C. The manufacturer shall have had an actual crash test performed on the design/type of vehicle barrier system being provided.

1.5. LOGISTICS

- A. All equipment shall be prepared and protected by the manufacturer to be shipped by conventional shipping methods.
- B. The AVB system equipment shall be protected by suitable methods for the intended shipping and storage environments.
 - 1. Packaging, preservation, pallets and crating shall prevent mechanical damage to the equipment during both shipping and handling.

2. Forklift provisions shall be provided for the lifting and handling of equipment.
 3. Shipping containers and crates shall be identified for the type of equipment.
 4. Shipping documents shall be provided with the contents of each container or crate.
- C. Equipment received on-site shall be placed in a storage area that is protected from the weather, humidity, excessive temperature variation, dust, dirt and/or other contaminants.
1. Equipment shall be stored covered.
 2. Both equipment and structural materials shall be stored on pallets.
 3. Equipment shall not be stored directly on the ground, and shall be protected from standing water, and other conditions that might cause rust or corrosion.
 4. Equipment shall be stored in an area that is not subjected to potential damage by other construction activities.

1.6. WARRANTY

- A. Each item of equipment is under warranty, by Supplier for a period of one year, after delivery F.O.B. plant unless otherwise specified by Supplier.
1. From failure of operation in ordinary use and against defects due to faulty material or workmanship.
 2. Any defective equipment in the AVB system shall be returned to the factory, at Supplier's option, for repair or replacement.
- B. Supplier assumes no responsibility for service at any consumer site. Supplier is in no event responsible for any labor costs under the warranty.
- C. Subject to the above limitation, all service, parts, and replacements necessary to maintain the equipment as warranted shall be furnished by Supplier at no cost to consumer. Supplier shall not have any liability under these specifications, other than for repair or replacement as described above for equipment malfunction or equipment failure of any kind, caused for any reason, including, but not limited to unauthorized repairs, improper installation, installation not performed by Supplier personnel, nor by Supplier authorized personnel, modifications, misuse, accident, catastrophe, neglect, natural disaster, act of God or if at any time the power supplied to any part of the AVB system falls short or exceeds the rate of tolerance for the equipment.
- D. The exclusive remedy for breach of any warranty by Supplier shall be the repair or replacement at supplier's option, of any defects in the equipment. IN NO EVENT SHALL THE SUPPLIER BE LIABLE FOR CONSEQUENTIAL OR SPECIAL DAMAGES OR ANY KIND OF DAMAGES TO ANYONE.
- E. Except as provided herein, Supplier makes no warranties or representations to consumer or to anyone else and consumer hereby waives all liability against Supplier as well as any other person for the design, manufacture, sale, installation, and/or servicing of the AVB system.
- F. The foregoing warranties are in lieu of all other warranties express or implied, including the implied warranty of merchantability and fitness for a particular purpose. No other warranties exist. Any modification or alteration by anyone other than Supplier or Supplier's authorized personnel will render the Supplier warranty null and void.

1.7. MAINTENANCE

The AVB system design shall minimize the need for preventive maintenance and servicing activities. The AVB system design and documentation shall provide support for maintenance and servicing activity safety.

1.7.1 Maintenance Service

- A. The AVB system shall be designed to require minimal preventive maintenance.
- B. Minimal preventive maintenance shall be defined as requiring only debris removal/cleaning, lubrication, and operational checks for periodicity of less than annually.
- C. The manufacturer shall supply an Operation and Maintenance Manual (O&M) defining specific quarterly and annual preventative maintenance tasks - in checklist format.

PART 2 PRODUCTS

A. The Active Vehicle Barrier (AVB) system shall be a Nasatka Security Inc. model NMSB XII, NMSB XII-E, or NMSB XII-H manufactured by:

Nasatka Barrier, Inc.

7702B Old Alexandria Rd.

Clinton, MD 20735 USA

Phone: (301) 868-0300

Fax: (301) 868-0524

Web (General): www.nasatka.com

Web (Request a Quote): www.nasatka.com/contact-us-2/requestforquote/

Web (Online Store): webstore.nasatka.com/

B. United States government, local government, and federal agencies may inquire to Nasatka Barrier, Inc. about procuring AVB system model NMSB XII (and options), installation and construction labor through GSA Schedule 84, GS-07F-9776H. For the AVB system see SIN#: 246-35(5) for Installation and Maintenance Services use SIN# 246-50 (ancillary services).

2.1. MANUFACTURED UNITS

A. The foundation dimensions differ based on the AVB rating and foundation type and shall be as follows:

1. DOS K12 crash rated barriers (12 to 18 ft) foundations shall be deep block type and both foundations (L - W - D) shall be 8 ft (243.8 cm) - 4 ft (121.9 cm) - 3 ft (91.4 cm)
2. K12 engineer rated barriers (20 to 24 ft) foundations shall be deep block type and both foundations (L - W - D) shall be 8 ft (243.8 cm) - 4 ft (121.9 cm) - 3 ft (91.4 cm).
3. The manufacturer shall include detail drawings, for foundations and reinforcement. The deep block type foundations do NOT require rebar.

B. Foundation concrete shall be 4,000 psi compressive strength.

2.1.1 XII Dimensions

A. The XII barrier overall dimensions (L - W - H) and weight (excluding foundations) shall be as follows. (Height includes below grade components.)(Weight shown excludes operators; add 80 lb (36 kg) for an electric or 110 lb (50 kg) for a hydraulic operator.)

Clear Opening ft (m)	Overall Dimensions [L - W - H] inches (cm)	Weight lb (kg)
12 (3.65)	234 (594) - 58 (147.3) - 76 (193)	6,020 (2730)
14 (4.26)	258 (655) - 58 (147.3) - 76 (193)	6,690 (3034)
16 (4.87)	282 (716) - 58 (147.3) - 76 (193)	7,465 (3386)
18 (5.48)	306 (777) - 58 (147.3) - 76 (193)	8,455 (3835)
20 (6.09)	330 (838) - 58 (147.3) - 76 (193)	9,145 (4148)
22 (6.70)	360 (914) - 58 (147.3) - 76 (193)	10,030 (4549)
24 (7.31)	390 (990) - 58 (147.3) - 76 (193)	11,025 (5000)

The receiver only weight is 830 lb (376.5 kg) for all clear openings.

2.1.2 XII-E

A. The barrier shall utilize an all-electric operator. The operator shall be as follows.

1. The operator major components shall be American made.
2. The operator shall electrically interface with the Active Vehicle Barrier (AVB) system controller.
3. The operator shall consist of a motor and gearbox assembly, a Variable Frequency Drive (VFD), and a manually releasable mechanical linkage.

The motor shall be a 1 HP (.75kW), three phase, AC motor. The motor shall be 252-272 mm (9.9-10.75 in) long and 145-156 mm (5.75-6.25 in) in diameter (excluding conduit box) or smaller.

The gear box shall attach directly to the end of the motor using a right hand vertical mount. The output shaft shall be 2.375 inch with a gear ratio of 624:1. The gear box shall include a hand crank option.

The VFD shall be UL and cUL listed and CE compliant. The VFD shall be a 115V class VFD. The input power shall be rated 100-120 VAC, single phase, 50-60 Hz, 16 A. The VFD output shall be rated 200-240 VAC (2X input), 3 phase, 0.1-400 Hz, 4.2 A, and shall provide control for a 1 PH (0.75 kW) motor.

As an option, the VFD shall be available in a 230V class. The 230V class VFD shall support single or three phase 200/208/220/230/240 VAC, 50-60 Hz, 11.5 or 6.3 A input power (Customer specified) and provide the same motor controls as the 115V class VFD.

The VFD shall have an IP20 enclosure rating.

4. Environment:

Storage Temperature Range -20 to +60 °C (-4 to +140 °F)

Operating Temperature Range -10 to +50 °C (14 to 122 °F) without heater

Humidity Range (non-condensing) 20 to 90% Relative

Vibration Range 1.0 G < 10 Hz, 0.6 G 10 to 60 Hz

Altitude 1000 m (3,280 ft) or lower ASL (above sea level)

Locations keep from corrosive gas, liquid, and dust

B. The AVB system shall operate in the following modes:

1. Normal Mode: Barrier shall secure/close and unsecure/open at normal speeds. Barrier shall be capable of being secure or unsecure in 8 to 15 seconds when operated at a repetition rate not greater than 60 complete secure/unsecure cycles per hour. Operator shall be controlled electrically and commands shall be received via operator input or automation sequence initiation.
2. Emergency Mode (ECF): The barrier safety shall be overridden and barrier shall secure/close at Normal Mode speed. Barrier normal operation up/down buttons shall be inoperable until the ECF condition is reset. Barrier ECF shall only be reset by a key operated/lockable switch.
3. Manual Mode: Barrier shall secure/close and unsecure/open by hand via a manual lever after the manual release of the operator linkage.

C. Barrier response time shall be as follows.

Normal Mode operation typical response time shall be 8 to 15 seconds.

Emergency Mode operation response time shall be the same as Normal Mode.

2.1.3 XII-H

Battery HPU

A. The barrier shall utilize a hydraulic operator driven by a DC electric motor. The operator shall be as follows.

1. The operator major components shall be American made.
2. The operator shall electrically interface with the AVB system controller.
3. The operator shall consist of a DC motor, a hydraulic pump and valve assembly, a hydraulic reservoir, a hydraulic cylinder, and a manually releasable mechanical linkage.

The motor shall be 3/4 HP, 24 VDC, permanent magnet, with a TEFC (Totally-Enclosed Fan-Cooled) case.

The pump and valves shall provide 2200 psi and include a flow control (speed adjustment), 2-way cartridge (e-up and down control) and relief valves. The pump assembly shall mount directly between the motor and the reservoir.

The reservoir shall be plastic, vertical mount only, 1.5 gal (5.7 L), and attach directly to the pump assembly. The reservoir shall provide a 1/4 in (NPT) drain and plug. The reservoir cap shall be vented and provide a fill port.

The hydraulic cylinder shall be 13 inch stroke, 2 inch bore

4. Environment:

Storage Temperature Range -20 to +60 °C (-4 to +140 °F)

Operating Temperature Range -10 to +50 °C (14 to 122 °F) without a heater.

Humidity Range (non-condensing) 20 to 90% Relative

Vibration Range 1.0 G < 10 Hz, 0.6 G 10 to 60 Hz

Altitude 1000 m (3,280 ft) or lower ASL (above sea level)

Locations keep from corrosive gas, liquid, and dust

5. Battery Charger

The battery charger shall support 110V-240V/50-60hz/1 phase power

AC HPU

A. The barrier shall utilize a hydraulic operator driven by an AC electric motor. The operator shall be as follows.

1. The operator major components shall be American made.
2. The operator shall electrically interface with the AVB system controller.
3. The operator shall consist of a AC motor, a hydraulic pump and valve assembly, a hydraulic reservoir, a hydraulic cylinder, and a manually releasable mechanical linkage.

The motor shall be 1.5hp.

The pump and valves shall provide 2200 psi and include a flow control (speed adjustment), 2-way cartridge (e-up and down control) and electronic pressure relief valves.

The reservoir shall 3 gallons.

The hydraulic cylinder shall be 13 inch stroke, 2 inch bore.

4. Environment:

Storage Temperature Range -20 to +60 °C (-4 to +140 °F)

Operating Temperature Range -10 to +50 °C (14 to 122 °F) without heater.

Humidity Range (non-condensing) 20 to 90% Relative

Vibration Range 1.0 G < 10 Hz, 0.6 G 10 to 60 Hz

Altitude 1000 m (3,280 ft) or lower ASL (above sea level)

Locations keep from corrosive gas, liquid, and dust

B. The AVB system shall operate in the following modes:

1. Normal Mode: Barrier shall secure/close and unsecure/open at normal speeds when operated. Operator shall be controlled electrically and commands shall be received via operator input or automation sequence initiation.
2. Emergency Mode (ECF): The barrier safety shall be overridden and barrier shall secure/close at Normal Mode speed. Barrier normal operation up/down buttons shall be inoperable until the ECF condition is reset. Barrier ECF shall only be reset by a key operated/lockable switch.
3. Manual Mode: Barrier shall secure/close and unsecure/open by hand via a manual lever after the manual release of the operator linkage.

C. Barrier response time shall be as follows.

Normal Mode operation typical response time shall be 8 to 15 seconds at a repetition rate not greater than 100 complete secure/unsecure cycles per hour.

Emergency Mode operation response time shall be the same as Normal Mode.

2.2. MATERIALS

A. Gate arm materials shall be as follows:

1. Gate arm rectangular tubing shall be 6061 aluminum, 10 inches X 6 inches (254 X 152.4 mm), and 3/8 inch (9.5 mm) wall thickness.
2. The gate arm shall house three nylon endless slings. The slings shall be 5 inches (127 mm) wide and just long enough to form an endless sling when installed over the two 3 inch A36 round bars at each end of the arm.
3. The gate arm's 2 inch (50.8 mm) square tube shall be ASTM A500 grade B.

B. Foundation materials shall be as follows:

1. The foundation shall utilize 4000 psi concrete.

C. All other materials shall be as follows:

1. Bars/counter weight plates/frame/sub frame are A36 structural grade steel.
2. All A36 structural grade steel that be 100% hot dip galvanized

2.3. EQUIPMENT

2.3.1 Electric Control System

- A. The electric control system operates the barrier in accordance with the operator's input.
- B. The electric control system shall be located external of the barrier.
- C. The electric control system and accessories shall be mounted in a weather resistant enclosure.

D. The EPU/HPU to UIP cable runs shall support four interface types with the distance limitations for each listed below.

Encrypted RS-485	1,000 ft (304 m) [4,000 ft max.] (1219 m)	
CeLan (22 gauge stranded)	350 ft (106 m)	
CeLan (18 gauge stranded)	900 ft (274 m)	
Fiber	Nominal Range	Max Range
Ce-FC-N (Multimode)		2.9 M (4.66 km)
Ce-FC-ER (Multimode)	6 M (9.65 km)	
Ce-FC-S (Single Mode)	16 M (25.74 km)	

2.3.2 The System Controller

- A. The system controller shall contain all required circuitry and logic required to properly operate the system when using discrete circuitry and logic devices.
- B. Terminal strips shall be provided to interconnect all AVB system devices.
- C. Customer specified interconnect to external devices shall be supported via optional terminal strips.
- D. Optionally, to support Rampart capability UIPs, the system controller shall utilize a modular designed, AES encrypted, RCU-VBS (Rampart Control Unit - Vehicle Barrier System) processor based control and VBS-N module(s) to provide a microprocessor based link between vehicle barrier(s) and the RCU.
- E. When selected, the RCU shall support the following features:
 - 1. The RCU shall control and monitor the vehicle barrier systems, gate arms, traffic lights, rolling gates, swing gates and garage doors.
 - 2. The RCU shall support eight general purpose inputs for security device monitoring.
 - 3. The RCU shall support up to 20 VBS barrier controllers.
 - 4. The RCU shall support pre-defined input configurations for standardization. Each input shall be capable of reporting the following:
 - Open circuit
 - Short circuit
 - Ground fault
 - 5. The RCU shall support up to 252 definable user codes for system user login/logout option.
 - 6. The RCU shall support onboard 12 VDC 5A auxiliary power output.
 - 7. The RCU shall provide dual CeLAN ports and support for up to 100 devices.
 - 8. The RCU shall support a 6000 event buffer with time and date stamp. The RCU shall support metrics tracking via event data-base to improve performance and reduce costs. Optionally, RCU shall optionally support up to 262 million event via use of a 32GB SD card.
 - 9. The RCU shall support field upgradeable software.

10. The RCU shall support CeLAN expansion - communication copper, fiber optics or TCP/IP.
11. The RCU shall support 5.7 in (145 mm) color touchscreen for high security vehicle barrier operation.
12. The RCU shall support all modules having built in tamper inputs for enclosure protection.
13. The RCU shall support a 12 or 24 hour clock display.
14. The RCU shall provide user and installer help menus.
15. The RCU shall support auto daylight savings option.
16. The RCU shall support dual redundant fiber configuration option.
17. The RCU shall be microprocessor based (NOT PLC control).
18. RCU environment shall be the listed temperatures and humidity.
 - Operating Temp = 32 to 120° F (0 to 49°C). Up to 140° F (60°C) under temporary conditions.
 - Humidity = 90% relative.
19. The RCU shall provide two, panel programmable outputs with Form C relay contacts (COMMON, N/C, N/O). Relay contacts shall be rated 10 A @ 24 VDC, 10 A @ 24 VAC, 10 A @ 40 VAC maximum.
20. The RCU shall allow printing of all system VBS events or events shall be selectable via programming.
21. The RCU shall support real time system battery voltage and current readings.
22. The RCU shall support up to three back-up batteries (54 Ahr). Each battery shall be supervised and charged separately.
23. The RCU shall provide a remote power supply option fully supervised AES encrypted 5 A @ 12 VDC.

The following circuits and/or controls shall be furnished:

- F. A control circuit shall provide interface between all UIPs (optional item or items) and the EPU.
- G. The control circuit shall consist of all relays, timers and other devices necessary for barrier operations.
- H. The circuit controls shall be based on a real time microprocessor.
- I. When a microprocessor controlled system controller is required, the processor shall use a secure, standard-based end-to-end architecture, utilizing a real time AVB microprocessor to control all input and output, data logging, device enrollment and validation.
- J. The microprocessor shall support the following features:
 1. Up to Five Levels of Control Override/Priority
 2. Isolated Onboard Relay Outputs
 3. Redundant Copper or Fiber Capability Between Each Device
 4. Secure DOS Approved (AES 256 bit key) Encrypted Communication
 5. Events History Database and Reporting
 6. Power Management - Isolated from Electrical Shock and EMI
 7. Barrier Monitoring Capabilities
 8. Video Integration

9. Blast Wave Detection

10. Support for RS-485, Single or Multimode Fiber Optic, or Ethernet.

K. The control circuit shall operate from 24 VDC power supply.

L. The control circuit shall be mounted in a general-purpose enclosure.

M. All device interconnect lines shall be run to terminal strips.

2.3.3 UIP (Optional)

A. A UIP may be supplied to control barrier operation.

B. The UIP shall be available with or without Rampart capabilities.

2.3.4 Non-Rampart Capabilities

A. The UIP shall operate on 24 VDC supplied by the system controller.

B. The UIP shall have a key operated/lockable main switch, MAIN POWER ON, and PANEL ON indicator lights.

1. This switch shall also include the Emergency Close Function (ECF) reset function (when ECF is elected). The switch shall require a key to function and the key shall have the following characteristics:

The key distribution shall be controlled.

The key shall be of the type or marked to prevent unauthorized duplication.

2. All switch positions shall function as dry contacts.

3. All switch indicators shall be wired separately from the switch portion and shall be powered by 24 VDC.

C. The UIP shall have a button to SECURE (raise) and a button to UNSECURE (lower) each barrier.

1. The SECURE (UP) button shall provide dry contact to command the barrier to the SECURE (UP) position.

2. The UNSECURE (DOWN) button shall provide dry contact to command the barrier to the UNSECURE (DOWN) position.

3. The SECURE (UP) button shall illuminate to indicate the barrier is positioned SECURE (UP).

4. The UNSECURE (DOWN) button shall illuminate to indicate the barrier is positioned UNSECURE (DOWN).

5. All button indicators shall be wired separately from the button portion and shall be powered by 24 VDC.

D. An ECF feature shall be available as an option.

E. When elected, the ECF feature shall be activated from an inadvertent-activation-protected switch and/or from a remotely locatable switch of the same type.

F. The activating ECF switch shall illuminate to indicate when ECF is active.

G. When elected, the ECF feature shall include an ECF ACTIVE light and RESET key switch. The ECF RESET shall be the clockwise most position on the key operated/lockable main switch.

H. The UIP shall be a console mount or rack mount panel with all devices wired to a terminal strip. The panel shall conform to the following:

1. The panel shall be fabricated from 14 gauge carbon steel or type 304 stainless steel with continuously welded seams. Enclosure dimensions shall be per drawing. Customer specified dimensions may be supported.

2. The panel cover shall be secured with captivated screws. The cover may be hinged per the drawing or per customer specification.
3. The panel shall have oil resistant gasket(s) applied to the cover.
4. The panel shall have external mounting feet for wall or machinery mounting.
5. The universal pushbutton holes shall be selectable as 22 mm or 30.5 mm. Number and placement of holes shall be per drawing or customer specification.
6. The panel finish options shall include:
 - Standard RAL 7035 texture polyester powder coat finish on interior and exterior of enclosure.
 - Recoatable, smooth, white or ANSI-61 gray shall be available.
 - Custom match finishes shall be available.
 - NOTE: All powder coat finishes applied over cleaned phosphatized surfaces.
 - Stainless steel enclosure shall be available and shall have a polished #4 finish.
7. The panel shall meet the following industry standards:
 - UL 50 Listed
 - CUL 50 Listed
 - Type 12
- I. UIP panel switches and indicators shall be finger safe (IP20 contacts and IP65/66 from panel) and marked for CE, UL, CSA, CCC, and TUV approval. UL Types 1, 3R, 4, 4X, 12 and 13.

2.3.5 Rampart Capabilities

- A. The UIP shall operate on 12 VDC supplied by remote power boards/kits.
- B. System I/O protection shall be designed and tested to exceed UL1076. Protection shall be provided for data, power, and zone lines.
- C. Optional terminal strips shall be provided to interface with Customer specified access/traffic control systems and operations devices.
- D. Optional remote memory module (RMM) shall be supported with the following features.
 1. RMM shall provide a secure way to review and manage security events.
 2. RMM shall support 2, 4, 8, 16, or 32 GB SD memory cards (or micro SD and a size adaptor). RMM shall store a minimum of 16, 32, 65, 131, 262 million events respective to SD card size. Note actual event count may vary due to event file size.
 3. RMM data shall not require a printer. RMM data file shall be compatible with MS Excel. RMM data shall be tamper protected via watermarking.
 4. RMM shall operate on 12 VDC nominal (± 2.0 VDC) with a maximum current draw of 25 mA.
 5. RMM input shall be supervised (3.0 K ohm EOL resistor).
 6. RMM environment shall be the listed temperatures and humidity.
 - Operating Temp = 32 to 120° F (0 to 49°C). Up to 140° F (60°C) under temporary conditions.
 - Storage Temp = -30 to 140° F (-34 to 60°C).
 - Humidity = 90% relative (non-condensing).

7. RMM shall support AES encrypted communications, be field upgradeable, dual CeLAN configurable, Read/Write and SD busy LEDs, and card removal switch.
- E. Optional manual mode selector (MMS) or manual barrier card (MBC) shall be supported with the following features.
1. MBS/MMS shall convert manual controller devices into RS-485 AES encrypted communications to the control panel for barrier operation mode needs, based on operator selection.
 2. MBS/MMS shall provide 4-conductor connections between master and remote controls to allow cleaner installation with less cabling. MMS shall also ease adding or moving master or remotes control locations.
 3. MBS shall provide four independent inputs for up, down, ECF and reset operation of a single barrier. MBS shall allow "by barrier" reset option capability when used with this control system.
 4. MMS shall provide three independent inputs for mode control: Normal- Gate and barrier together, Gate Arm only, Access Control.
 5. MMS shall allow for mode selection for traffic needs, include operation with or without gate arm during peak times. MMS shall allow/disallow access readers operation.
 6. MBS/MMS shall operate on 12 VDC nominal (± 2.0 VDC) with a maximum current draw of 80 mA.
 7. MBS/MMS input shall be four 5VDC powered input zones.
 8. MBS/MMS environment shall be the listed temperatures and humidity.
 - Operating Temp = 32 to 120° F (0 to 49°C). Up to 140° F (60°C) under temporary conditions.
 - Storage Temp = -30 to 140° F (-34 to 60°C).
 - Humidity = 85% ($\pm 5\%$) relative (non-condensing), 86° F $\pm 3^\circ$ (28.33 to 31.67°C).
 9. MBS/MMS shall support wire gauge 18AWG to 22AWG.
 10. MBS output shall be three open collector, 30 milliamp/each @ 6VDC.
 11. MMS output shall be five open collector, 30 milliamp/each @ 6VDC.
- F. The UIP shall be equipped with a barrier left UNSECURE timer circuit and an audible annunciator.
1. The audible annunciator shall notify the operator that the barrier has been left in the UNSECURE (DOWN) position for too long.
 2. The time interval for the circuit shall be Customer specified and/or selectable.
- G. Optional vehicle barrier controller (VBS-EZ) card shall be supported with the following features.
1. The VBS-EZ shall provide a microprocessor based standalone or support a multiple barrier system.
 2. The VBS-EZ shall provide 11 supervised digital inputs.
 3. The VBS-EZ shall provide an onboard 2 x 16 LCD display.
 4. The VBS-EZ shall support 2, 4, 8, 16, or 32 GB SD memory cards (or micro SD and a size adaptor). The VBS-EZ shall store a minimum of 16, 32, 65, 130, 260 million events respective to SD card size. Note actual event count may vary due to event file size.

5. The VBS-EZ data shall not require a printer. The VBS-EZ data file shall be compatible with MS Excel. The VBS-EZ data shall be tamper protected via watermarking.
6. The VBS-EZ shall operate from an external power supply of 12 VDC nominal (± 2.0 VDC) with a minimum current of 5A. The VBS-EZ shall output 12 and 24 VDC nominal power at a maximum of 300 mA.
7. The VBS-EZ input shall be supervised (3.0 K ohm EOL resistor).
8. The VBS-EZ output shall be seven Form A relays and one Form C relay each rated for 10A at 120 VAC and 10A at 30 VDC.
9. The VBS-EZ environment shall be the listed temperatures and humidity.

Operating Temp = 23 to 131° F (-5 to 55°C). Up to 140° F (60°C) under temporary conditions.

Storage Temp = 23 to 131° F (-5 to 55°C).

Humidity = 90% relative (non-condensing).

10. The VBS-EZ shall support the following AVB inputs:

Manual ECF and Manual ECF reset

Gate arm

Card reader and reader valid

Traffic safety 1 and 2

Manual up and down

Limit switch secure and unsecure

Linear position

11. The VBS-EZ shall support the following AVB outputs:

ECF valve relay

Non-secure valve relay

Secure valve relay

Motor run relay

Warning horn relay

Traffic light(s)

Gate arm

Limit switch up and down status outputs

2.3.6 Touchscreen UIP (Optional)

- A. The standard Touchscreen UIP shall provide a 5.7 in (144.8 mm) color touchscreen display with protective Lexan shield.
- B. Touchscreen UIP upgrades shall be available to provide larger sizes of 8-, 10-, 12-, or 17-inches (203, 254, 305, or 432 mm) and may include custom user interface and optionally a background site map.
- C. The touchscreen controller display shall:
 1. Have a minimum of 320 x 240 resolution with 16 bit color.
 2. Be assignable per barrier controller.

3. Provide a simple, easy to use Graphical User Interface (GUI), with built-in (on-line) help and diagnostic screens, including self-test diagnostics enabling the user or installer to test AVB functions.
 4. Provide complete prompt messaging and display all relevant operating and test data.
- D. The touchscreen data bus shall accommodate connection to system expanders, output expanders, and other interface devices.
- E. The touchscreen controller shall be monitored independently; each touchscreen unique address shall be monitored and supervised independently using AES 256 bit encrypted communications via: RS485, Single or Multimode Fiber Optic, or Ethernet.
- F. Each touchscreen controller shall have two spare inputs for tamper circuit input connections.
- G. Optional terminal strips shall be provided to interface with Customer specified access/traffic control systems and operations devices.

2.3.7 Master UIP (Optional)

- A. If elected, a Master UIP shall be supplied to control barrier function.
- B. The Master UIP shall:
1. House a key operated/lockable main switch, MAIN POWER ON, and PANEL ON indicator lights.

This switch shall also include the Emergency Close Function (ECF) reset function (when ECF is elected). The switch shall require a key to function and the key shall have the following characteristics:

The key distribution shall be controlled.

The key shall be of the type or marked to prevent unauthorized duplication.
 2. House a button to SECURE (raise) and a button to UNSECURE (lower) the barrier.

The SECURE (UP) button shall illuminate to indicate the barrier is positioned SECURE (UP).

The UNSECURE (DOWN) button shall illuminate to indicate the barrier is positioned UNSECURE (DOWN).
 3. Provide, as an option, an EFO feature.
- C. When elected, the EFO feature shall be operated from an inadvertent-activation-protected switch and/or from a remotely locatable switch of the same type. When elected, the EFO feature shall include an EFO ACTIVE light and a reset function. The EFO reset shall be the clockwise most position on the key operated/lockable main switch.
1. House a key operated/lockable switch to arm or disarm the remote slave panel.
 2. House an indicator light to show when the slave panel is armed.
 3. Operate on 24 VDC.
 4. Be a console mount or rack mount panel with all devices wired to a terminal strip.
 5. Be equipped with a barrier left UNSECURE timer circuit and an audible annunciator.

The audible annunciator shall notify the operator that the barrier has been left in the UNSECURE (DOWN) position for too long.

The time interval for the circuit shall be Customer specified and/or selectable.

- D. The Master UIP shall be available with or without Rampart capabilities. See paragraph 2.3.4, H.
- E. Optional terminal strips shall be provided to interface with Customer specified access/traffic control systems and operations devices.

2.3.8 Slave UIP (Optional)

- A. If elected, a Slave UIP shall be supplied to control the barrier operation.
 - 1. This panel shall have a PANEL ON indicator that is lit when the Slave UIP is enabled by a switch on the Master UIP.
 - 2. This panel shall house a button to SECURE (raise) and a button to UNSECURE (lower) each barrier.
 - The SECURE (UP) button shall illuminate to indicate the barrier is positioned SECURE (UP).
 - The UNSECURE (DOWN) button shall illuminate to indicate the barrier is positioned UNSECURE (DOWN).
 - 3. This panel shall provide an EFO feature operated from an inadvertent-activation-protected switch and/or from a remotely locatable switch of the same type. When the slave panel EFO is pushed, an EFO ACTIVE indicator light will light and of the barrier operation will not be possible until reset at the Master Panel.
- B. The Slave UIP shall operate on 24 VDC.
- C. The Slave UIP shall be a console mount or rack mount panel with all devices wired to a terminal strip.
- D. The Slave UIP shall be available with or without Rampart capabilities. See paragraph 2.3.4, H.
- E. Optional terminal strips shall be provided to interface with Customer specified access/traffic control systems and operations devices.

2.4. ACCESSORY EQUIPMENT

Any or all of the following may be selected.

2.4.1 Traffic Lights (Optional)

- A. When elected Stop/Go traffic lights, Red/Amber 8 inch (203 mm) stand-alone traffic lights shall be supplied to alert vehicle operators of the barrier position.
 - 1. The amber light shall indicate that the barrier is fully down.
 - 2. All other positions shall cause the light to show red.
 - 3. Brackets shall be supplied to allow the light(s) to be located on a [3.5 inch (88.9 mm)] OD post or wall [3.5 inch (88.9 mm) OD post - back to back].
 - 4. The light operating voltage shall be 24 VDC.
 - 5. The lights shall be LED type.
- B. When elected three-light traffic lights, Red/Amber/Green 12 inch (304.8 mm) stand-alone traffic lights shall be supplied to alert vehicle operators of the barrier position.
 - 1. A traffic pole and mast shall be supplied to allow the light(s) to be located above the barrier(s) per local traffic specifications.
 - 2. The light operating voltage shall be 24 VDC.
 - 3. The lights shall be LED type.

2.4.2 Optional Vehicle Detectors

- A. When elected, a vehicle detector module (or modules) shall be supplied to provide any of the following functions (or valid combinations thereof):
 - 1. Safety
 - 2. Vehicle presence (for access control via card reader or RFID)
 - 3. Over speed
 - 4. Wrong way
 - 5. Auto close
 - 6. Free exit
- B. The detector module shall provide normally open dry contact to the system.
- C. The system shall support up to four detectors. The detector modules may be available in dual channel.
- D. The detector module shall be compatible with the selected type of detection device (Customer specified from the following list).
 - 1. Inductive loop (see paragraph 2.4.3)
 - 2. Doppler/microwave/laser radar
 - 3. Photo eye
 - 4. Infrared
 - 5. Ultrasonic or acoustic
 - 6. VIP (video image processing)
- E. The system shall support an alert function. When an alert function is elected, the detector/system output shall be dry contact (normally open - closed = true).

2.4.3 Safety Loop Detection

- A. When a safety loop (accomplished via an inductive loop) is elected, a detector module shall be supplied to provide fully automatic tuning.
- B. The detector module shall be available in dual channel.
- C. When a safety loop is elected, the barrier shall be prevented from being accidentally raised under an authorized vehicle in normal operation.
- D. When an EFO function is also elected, the EFO/Safety interaction shall be selectable from the following.
 - 1. EFO overrides safety present
 - 2. Safety present delays EFO activation
 - 3. Safety present overrides EFO
- E. As an option, an enhanced loop monitor detector module shall be supplied that conforms to NEMA TS1-1989 (R2005) requirements and provides the following.
 - 1. Automatic tuning, with temperature compensation
 - 2. Loop input protection up to 2000 V
 - 3. Eight, user selectable, loop frequencies (minimizes cross talk for adjacent loops.
 - 4. Sensitivity supporting user selectability, 20 ranges, 20 to 2500 micro Henry, and a Q factor greater than 5
 - 5. Diagnostics and related indications for short and open loop circuit.

6. Relay outputs supporting: an AC rating of 5A @ 240 VAC and a DC rating of 5A @ 30 VDC
7. Optionally relay outputs supporting: optically isolated outputs with the following characteristics.
 - True (low, 50 mA) less than 1.5 Vdc
 - False (high) greater than 16 Vdc
 - Maximum Leakage Current (high) less than 1 uA
 - Maximum Current 100 mA
8. Environmental
 - Storage Temperature Range -45 to +85 °C
 - Operating Temperature Range -34 to +74 °C
 - LCD Operating Temperature Range -20 to +74 °C
 - Humidity Range (non-condensing) 0 to 95% Relative
9. User selectable modes of:
 - Loop modes:
 - Normal (normal inductive loops)
 - Rail (special loops - supports light rail applications)
 - Output modes:
 - Presence
 - Pulse
 - Paired channel modes:
 - 3RD car
 - Directional logic
 - Vehicle counting
 - Operational modes:
 - Presence
 - Timing
10. Input voltages of:
 - 90 to 270 VAC, 50/60Hz
 - Optionally 24 VDC
11. The module and loop combination shall be capable of detecting motorcycles, passenger vehicles, and high bed trucks with the same sensitivity setting.

2.4.4 Uninterruptible Power Supply (UPS - Optional)

- A. When elected, the standard Uninterruptible Power Supply (UPS) shall be sized to meet at a minimum 10 complete up/down cycles before UPS depletion. The standard UPS shall be single phase.
- B. When Customer specified, the UPS shall be sized to meet higher cycle counts of 50, 100, or 200 complete up/down cycles before UPS depletion.

2.4.5 Card Reader

- A. As an option, a card reader shall be provided.
- B. The card reader shall be Customer specified.

2.4.6 Wig Wag LED Lights

- A. As an option, LED warning lights (Wig Wag Lights) shall be provided.
- B. The lights shall be Customer specified.

2.4.7 Electromagnetic Locks

- A. As an option, electromagnetic locks shall be provided.
- B. The electromagnetic locks shall provide 1600 lb of holding force.

PART 3 EXECUTION**3.1. EXAMINATION**

- A. The manufacturer shall comply with the specified performance requirements by providing an employee to perform the following activities:
1. Attend pre-installation meeting.
 2. Onsite to certify barrier placement, leveling, rebar (if required) and spacing prior to concrete pour.
 3. Onsite for concrete pour.
 4. Onsite for Commissioning and Training to certify that manufacturer documented procedures are followed.
- B. Upon completion, the system will be fully tested in the manufacturer's shop. In addition to complete cycle testing to verify function and operating speeds the following checks shall be made:
1. Identification.
A nameplate with manufacturer's name, model number, serial number and year built shall be located on the barrier, HPU, system controller box, and UIP(s).
 2. Workmanship.
The system shall have a neat and workmanlike appearance.
 3. Dimensions.
Dimensions shall be checked against drawings and ordering information.
 4. Finish.
Coatings shall be checked against ordering information and shall be workmanlike in appearance.

3.2. PREPARATION

This paragraph covers actions required to physically prepare the surface, area, or site.

3.2.1 Protection

The Installer shall protect the barrier surfaces and surrounding areas during the concrete pour.

3.2.2 Surface Preparation

The Installer shall provide the following before installing the barrier.

- A. Order the marking of subsurface utility locations.
- B. Obtain local permits for road way work, excavation, electrical, plumbing, and concrete.

3.3. QUALITY ASSURANCE**3.3.1 Testing**

- A. Upon completion, the bollard system will be fully tested in the manufacturer's shop. In addition to complete cycle testing to verify function and operating speeds the following checks shall be made:
1. Identification.
A nameplate with manufacturer's name, model number, serial number and year built shall be located on the electric power unit (EPU).
 2. Workmanship.

The bollard and subsystems shall have a neat and workmanlike appearance.

3. Dimensions.

Shall be checked against drawings and ordering information.

4. Finish.

Coatings shall be checked against ordering information and shall be workmanlike in appearance.

3.3.2 Compliance

- A. Comply with all laws, ordinances, rules, regulations and orders of public authorities having jurisdiction over this part of the Work.

3.3.3 Installer Qualifications

- A. Engage an experienced installer who is an authorized representative of the bollards manufacturer.

3.3.4 Manufacturer Qualifications

- A. The manufacturer shall be a company specializing in the design and supply of vehicle barrier systems with a minimum of 25 years of experience.
- B. The manufacturer shall design or provide a complete vehicle barrier system that has been fabricated, assembled and tested for proper operation prior to shipment.
- C. The manufacturer shall have had an actual crash test performed on the design/type of vehicle barrier system being provided.

3.4. INSTALLATION

This paragraph covers actions required to accomplish barrier installation.

3.4.1 Special Techniques

The installer shall be experienced with high pressure hydraulics (operating pressure range of 1100 to 2500 psi).

3.4.2 Interface with Other Products

- A. When required, the NMSB XII-E-H shall provide compatibility and transition to or from other barrier systems.
- B. When required, the NMSB XII-E-H shall provide control of the LED wig wags.
- C. When required, the NMSB XII-E-H shall provide control of the traffic safety lights.
- D. When required, the NMSB XII-E-H shall provide compatibility with the loop detector loops.

3.5. FIELD QUALITY CONTROL

3.5.1 Tests

- A. The Manufacturer or Installer shall perform a Commissioning PVT Procedure.
- B. The Manufacturer or Installer shall supply a NASATKA Certificate of Completion.
- C. The Manufacturer or Installer shall supply a NASATKA Equipment Warranty Notification.

3.5.2 Inspection

- A. The Manufacturer or Installer shall complete a Barrier Installation Checkoff Form.
- B. The Manufacturer or Installer shall complete a Barrier Sequence of Ops Checkoff Form.

3.5.3 Manufacturer Field Service

- A. The Manufacturer shall supply an online support request system (support.nasatka.com).
- B. When Customer specified, the Manufacturer shall provide system training.

3.5.4 ADJUSTING AND CLEANING

- A. Adjusting and cleaning procedures shall be provided in the manufacturer user manual.