

08/2013

NASATKA SPECIFICATION**ELECTRIC WEDGE PLATE BARRIER****PART 1 GENERAL**

The purpose of this specification is to describe the Nasatka Maximum Security Barrier III-D with an all-electric operator NMSB III-D-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 III-D-E 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 III-D-E system shall consist of one (or multiple) wedge plate barrier with no buttress, as specified.
- C. The design and materials of the active vehicle barrier (AVB) system shall be the same as those used in the crash test of the AVB.
- D. 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

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 III-D-E SYSTEM DESCRIPTION

- A. The barrier shall meet or exceed a crash rating of M50/P1 (equivalent to K12/L3.0).
- B. The vehicle barrier system performance shall be based on the ASTM publication F2656-07, Standard Test Method for Vehicle Crash Testing of Perimeter Barriers, in which the impact conditions and performance levels are:

Crash Rating	Vehicle Weight	Impact Speed	Impact Energy
M50	15,000 pounds(6804 kg)	50 mph(80 km/h)	1,253 ft-kips (1,699 kJ)

Performance Level	Penetration Definition	Permitted Penetration
P1	Vehicle and cargo stopped	<u>1</u> / 1 m (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 vehicle barrier system performance shall meet or exceed P1 - Vehicle and cargo are to be stopped although vehicle partial penetration and/or barrier deflection of up to 1 m (3 feet) shall be permitted.

- D. The vehicle barrier system shall be an electrically operated wedge plate system.
 - 1. The vehicle barrier system shall be as indicated on the manufacturers drawings; each complete with gate plate assembly, electric power unit, system controller, backup battery power, Customer selectable features, equipment, and accessories shall be available.
 - 2. No hydraulic systems shall be required or used.
- E. The system shall comply with Customer specified system requirements.
- F. The barrier shall not have buttresses.
- G. The barrier shall utilize a shallow mount foundation. The foundation depth shall be specified as 16 inches (406.4 mm).
- H. The barrier shall protect a clear opening of 10 ft (3.05 m) as the standard model.
 - 1. The barrier shall additionally protect clear openings of 8, 9, 12, or 14 ft when specified by the Customer.
 - 2. In metric units, the barrier shall protect clear openings of 2.44, 2.75, 3.05, 3.66, or 4.27 m.
- I. The barrier weight restrictions (for vehicles traveling over this barrier) shall be IAW AASHTO HB-17 [axle load = 32,000 lb/14,515 kg (16 ton/14.5 MT)].
- J. The barrier shall utilize an integral linear actuator. The linear actuator shall be made in the USA.
- K. The barrier shall have a gate plate height of 33 inches (838 mm) ± 1 in (813 to 864 mm) above grade.
- L. The barrier gate plate assembly shall have U.S. ASTM, A514 Type-B (T-1) steel with a yield strength of 100 KSI.
- M. The vehicle barrier system shall operate in the following modes:
 - 1. Normal Mode: Barrier shall secure/open and unsecure/close at normal speeds. Barrier shall be capable of being secure or unsecure in 3 to 5 seconds (customer adjustable) when operated at a repetition rate not greater than 300 secure/unsecure cycles per hour. Operator shall be controlled electrically and commands shall be received via human interaction or automation sequence initiation.
 - 2. Manual Mode: Barrier shall unsecure/close via a drift circuit (brake override).
 - 3. Emergency Mode (EFO): Barrier shall secure/open in less than 2 seconds. Barrier normal operation up/down buttons shall be inoperable until the EFO condition is reset. Barrier EFO shall only be reset by a key operated/lockable switch.
- N. The barrier weight restrictions (for vehicles traveling over this barrier) shall be IAW AASHTO HB-17 [axle load = 32,000 lb/14515 kg (16 ton/14.5 MT)].

Template Note: Edit the following list (P. through U.3.) to reflect only the options required for the project.

- O. The manufacturer shall provide a gate arm over the barrier as an option.
- P. The manufacturer shall provide a sump pump as an option.
- Q. The manufacturer shall provide LED wig wags for the barrier as an option.
- R. The manufacturer shall provide traffic lights as an option.
- S. The manufacturer shall provide a concrete heating system as an option.
- T. The manufacturer shall provide the following UPS (uninterruptable power supply) as options:
 - 1. 208 to 240 VAC, single phase, 60 Hz

2. 208 VAC, three phase, 60 Hz
3. 480/277 VAC, three phase, 60 Hz

1.2.1 Performance Requirements

- A. Each system will be 100% factory tested and adjusted for normal installed operating conditions. The barrier, Electric Power Unit (EPU), and the standard (or specific option if selected) electronic control are interconnected and run in all operating modes. This shall ensure each component of the NMSB III-D-E 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 the NMSB III-D-E.

1.3. SUBMITTALS

Template Note: Review submittal description definitions in Section 01 33 00, SUBMITTAL PROCEDURES, and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

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 crash rating letter, certifying the manufacturer's barrier shall be provided. As an alternate, the manufacturer may submit the current DOD or 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, gate plate assembly hinge lubrication, and operational checks for periodicity of less than annually.

1.7.2 Safety

- A. The AVB system shall provide a redundant safety feature to support the gate during maintenance and service activities.
- B. The AVB system shall provide two prop bars, one placed at each end of the Gate Plate Assembly, to support the gate while maintenance is being performed. Maintenance instructions shall require both of these bars to be installed at all times during maintenance and service activities.

A. The Active Vehicle Barrier (AVB) system shall be a Nasatka Security Inc. model NMSB III-D-E 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 III-D-E (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. MATERIALS

A. Barrier Material shall be as follows:

1. High impact steel in accordance with ASTM A514 (T-1) Type B having the following properties:
2. Yield Strength: 100 KSI
3. Tensile Strength: 110/130 KSI
4. Elongation (2 in): Long 18% Trans 16%

B. The foundation dimensions (L - W - D) shall be as follows.

1. The concrete foundation shall be as follows:

Clear Opening	Dimensions [L-W-D] (inches/cm)
8	125 (317.5) – 132 (335.28) – 16 (40.64)
9	137 (348) – 132 (335.28) – 16 (40.64)
10	149 (378.5) – 132 (335.28) – 16 (40.64)
12	173 (439.4) – 132 (335.28) – 16 (40.64)
14	197 (500.4) – 132 (335.28) – 16 (40.64)

2. The manufacturer shall include detail drawings, for foundations and reinforcement.
3. The foundation shall utilize 4000 psi concrete.
4. The foundation shall utilize grade 60 rebar positioned and shaped per Nasatka drawing for reinforcement. (The size and amount of rebar varies according to the size barrier being utilized.)
5. The barrier shall provide the following conduits, two 2-inch conduits and two 1-inch conduits. (If the barrier is NOT equipped with a concrete heater only one 1-inch conduit shall be provided.)
6. The barrier shall provide five 4-inch drain connections.

2.2. MANUFACTURED UNITS

A. System Description:

1. Electrically operated wedge plate system as indicated on drawings; each complete with gate plate assembly, electric actuator, system controller, battery backup, Customer selectable features and equipment, and accessories.

2. The system shall comply with Customer specified system requirements.

B. Gate Plate Assembly:

1. Height shall be 33 +/- 1 in (838.2 mm +/- 25 mm) at fully secure position.
2. Response time shall be as follows.

Normal operation typical response time shall be 3 to 5 seconds.

Emergency operation typical response time shall be 1 second.

3. The gate plate assembly dimensions (L - W - D) and weight shall be as follows.

Clear Opening	Dimensions [L-W-D] (inches/cm)	Weight (lb/kg)
8	101 (256.5) – 74.5 (189.23) – 16 (40.64)	2727/1237
9	113 (287) – 74.5 (189.23) – 16 (40.64)	2901/1316
10	125 (317.5) – 74.5 (189.23) – 16 (40.64)	3034/1376
12	149 (378.5) – 74.5 (189.23) – 16 (40.64)	3426/1554
14	173 (439.4) – 74.5 (189.23) – 16 (40.64)	3781/1715

4. Gate Plate LED warning light(s) shall be provided on the gate plate. (Visible when the plate is raised.)
5. Each Gate Plate LED warning light shall be in 3.2 ft (1 m) in length. A minimum of two lights shall be used, equally centered on the gate plate.
6. The warning light shall have the following characteristics.
 - The LED rope light diameter shall be 1/2 (12.7 mm).
 - The LED light color shall be red.
 - The number of LEDs per meter (3.2 Ft) shall be 30 to 36.
 - The warning light shall use 3.2 W.
 - The luminosity per meter (3.2 Ft) shall be 48-80 lm.
7. The warning light shall flash 56 to 60 times per minute with a 50% duty cycle.

C. EPU:

1. The EPU shall be located external to the barrier assembly.
2. The EPU shall house:
 - The system controller.
 - Any optional components, such as an uninterruptible power supply (UPS).
3. The EPU shall accept the following input signals (dry contact):
 - System enable
 - Raise
 - Lower
 - Emergency Fast Operate
 - Coast
4. The EPU shall accept the following output signals (dry contact):
 - System Ready
 - Barrier is up
 - Barrier is down
 - Obstruction detected

2.3. EQUIPMENT**2.3.1 Electric Actuator**

A. The electric actuator shall:

1. Utilize high efficiency recirculating ball screw technology.
2. Utilize rare earth permanent magnet 12 pole brushless servomotor.
3. Have a continuous stall force $\geq 4,100$ lbf.
4. Have a peak stall force $\geq 9,400$ lbf.
5. Provide ingress protection not less than IP67.
6. Achieve a top speed ≥ 15 inches per second (381 mm/s).
7. Provide a peak force of:
 - ≥ 9000 lbf at 9.5 inches per second (241.3 mm/s) from 230 VAC 3 phase power (-895-011)
 - ≥ 9000 lbf at 10 inches per second (254 mm/s) from 400 VAC 3 phase power (-895-013)
8. Provide thermal monitoring to servo drive for over and under temperature.
9. Provide absolute position feedback to servo drive.
10. Have a dynamic load rating not less than 16500 lbf per ISO/DIS 3408-5 2006.
11. Have a pin to pin dimension of 28.05 inches (± 0.1 in) (712.47 mm) with 1 inch (25.4 mm) nominal pin diameter.
12. Be able to fit within a height of 5.5 inches (139.7 mm).
13. Include a permanent magnet, power off holding brake capable of holding not less than 4,980 lbf.
14. Have a stroke of 11.8 inches (300 mm).
15. Be interchangeable with any other actuator of the same model without servo drive reconfiguration.

2.3.2 Servo Drive

A. The servo drive shall:

1. Operate from service voltages from 48 VDC to 500 VAC.
2. Recognize connected actuator and pre-configure stroke limits, peak force and speeds.
3. Protect power supply from over current by adjusting speed of actuation.
4. Monitor actuator position for holding brake slippage and correct position.
5. Monitor actuator temperature and:
 - Apply heating current to the actuator if temperature approaches lower limit.
 - Fault if actuator temperature exceeds upper limit.

2.3.3 Subpanel

A. The subpanel shall:

1. Provide EMC filtering for AC power.
2. Provide dynamic braking of servo motor when servo drive is disabled.
3. Provide battery backup power for servo drive.
4. Include a built-in charging circuit capable of operating from the control panel three phase power source.
5. Provide a nominal 96 VDC bus power with overload protection.

6. Provide an isolated 24 VDC logic supply.

2.3.4 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.

2.3.5 Electric Power Unit (EPU)

Template Note: Edit the following to reflect only the options required for the project, delete all others.

- A. The EPU enclosure shall comply with IS3 standards as follows.
 - 1. NEMA Type 3R, 12 and Type 13
 - 2. UL Listed Type 3R and 12
 - 3. CSA Type 3R and 12
 - 4. IEC 60529 IP 55
- B. As an option, the EPU enclosure shall comply with IS5 standards as follows.
 - 1. NEMA Type 4, 4X, 12 and Type 13
 - 2. UL Listed Type 4, 4X and 12
 - 3. CSA Type 4, 4X and 12
 - 4. IEC 60529 IP 66
- C. The EPU to barrier assembly cable length shall be up to 300 ft (91 m).
NOTE: The wire size must be in accordance with current NEC code (with focus on allowable voltage drop vs. distance between each VFD and the connected barrier).
- D. The EPU 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)	

- E. EPU finish shall be ANSI-61 gray powder coat inside and out. Subpanels are powder coated white. When the IS 5 EPU option is elected, the finish shall be #4 brushed stainless steel (Type 304). Customer specified finishes shall be supported for both IS3 and IS5 EPU's.

2.3.6 The System Controller

Template Note: Edit the following to reflect project requirements, delete any that are NOT desired.

- 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. The system controller shall be protected by Type 2 SPD surge suppression with the following characteristics.
 - Complies with ANSI/IEEE C62.41 and C62.45 Category B standards
 - Provides diagnostic indication for: ground presence, power, SPD function
 - Available for 120V and 240V
 - Peak Surge Current shall be 19.5 kA for a single phase device and 13 kA/Phase or 6.5 kA/Mode for split phase devices.
 - UL 1449 rated at 700V L-N, L-G; 600V N-G; 1200V L-L VPR for applicable Modes and an Inormal rating of 3 kA.
- E. 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.
- F. 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 support up to 262 million events 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:

- G. A control circuit shall provide interface between all UIPs (optional item or items) and the EPU.
- H. The control circuit shall consist of all relays, timers and other devices necessary for barrier operations.
- I. The circuit controls shall be based on a real time microprocessor.
- J. 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.
- K. 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.
- L. The control circuit shall operate from 24 VDC power supply.
- M. The control circuit shall be mounted in a general-purpose enclosure.
- N. All device interconnect lines shall be run to terminal strips.

2.3.7 UIP (Optional)

- A. A UIP may be supplied to control barrier operation.
- B. The UIP shall be available with or without Rampart capabilities.

Template Note: Select Non-Rampart Capabilities only if a single barrier will operate (stand-alone) from a single UIP and utilize only human control (via pushbutton switches). If 2.3.8 Non-Rampart Capabilities is selected, delete paragraphs 2.3.9, Rampart Capabilities through 2.3.12, Slave UIP.

2.3.8 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 Fast Operation (EFO) reset function (when EFO 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 EFO feature shall be available as an option.
- E. When elected, the EFO feature shall be activated from an inadvertent-activation-protected switch and/or from a remotely locatable switch of the same type.
- F. The activating EFO switch shall illuminate to indicate when EFO is active.
- G. When elected, the EFO feature shall include an EFO ACTIVE light and RESET key switch. The EFO 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.

2.3.9 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, EFO 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 EFO and Manual EFO 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:

EFO 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

2.3.10 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 circuits.
- G. Optional terminal strips shall be provided to interface with Customer specified access/traffic control systems and operations devices.

2.3.11 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 Fast Operation (EFO) reset function (when EFO 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 2.3.8, H.

- E. Optional terminal strips shall be provided to interface with Customer specified access/traffic control systems and operations devices.

2.3.12 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 2.3.8, 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.

Template Note: Edit the following to reflect only the options required for the project, delete all others.

2.4.1 Electro-Mechanical Gate Arm (Optional)

- A. When elected, an electrically operated aluminum gate arm shall be supplied to alert vehicle operators of the barrier (s) position (s).
- B. The gate operator shall interface with the barrier at the control circuit.
- C. The control circuit shall close the gate at the barrier SECURE (UP) command and the gate shall remain closed unless the barrier is fully in the UNSECURE (DOWN) position.
- D. The gate arm shall be 8 feet (2.4 m) long unless otherwise specified by the Customer.
 - 1. The Customer may specify a gate arm length of 6, 8, 10, or 12 feet (1.8, 2.4, 3.0, or 3.7 m).
 - 2. Gate arms shall be fully retro reflectorized on both sides and shall have vertical stripes alternating red and white at 16-inch (406 mm) intervals measured horizontally per the current MUTCD.
 - 3. The gate assembly shall be mountable directly to the roadway surface.

2.4.2 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.

2.4.3 Sump Pump (Optional)

- A. When elected, a self-priming sump pump shall be supplied to prevent water from collecting in the barrier foundation.
 - 1. The pump shall have the capacity to remove rainfall to the distance of the Customer supplied discharge drain.
 - 2. The pump shall have the capacity to remove the water as specified by the Customer.

3. Pump operating voltage shall be 120 VAC/1-Ph/50-60 Hz unless the Customer alternately specifies 240 VAC/1-Ph/50-60 Hz.

2.4.4 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 2.4.5)
 - 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).

2.4.5 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.

Template Note: [Edit the following to reflect only the options required for the project, delete all others.](#)

- F. As an option, the enhanced loop monitor detector module shall be Customer selectable to operate at one of the following two voltage ranges.
 - 1. LMA-1250-LV operates on 12 VDC, 24 VDC, and 24 VAC.
 - 2. LMA-1250-HV operates on 120 VAC and 240 VAC.
- G. The enhanced loop monitor detector module shall provide the following.
 - 1. Automatic tuning, with temperature compensation
 - 2. Built-in set-up tools, frequency, and sensitivity meters.

3. Non-volatile memory to maintain a diagnostic history.
4. A front panel 7-segment display that provides visual feedback and assistance for setting correct sensitivity, reading loop frequency, reporting faults, and indicating delay and extension timing functions.
5. Automatic quantitative feedback of operation ensures the detector is set to the most optimum sensitivity level to detect all vehicles, including motorcycles and high-bed vehicles.
6. Automatic loop frequency settings keeping loops separated by at least 5 KHz to avoid crosstalk problems.
7. Diagnostics and related indications for short and open loop circuit along with 25% sudden changes in inductance.
8. Lightning and surge protection.
9. Four (4) frequency levels.
10. Sensitivity boost.
11. Fail safe and fail secure configurations.
12. Separate color-coded led indicators.
13. Wide loop inductance range: 20 to 2500 micro Henry.
14. Relay outputs supporting: an AC rating of 5A @ 250 VAC and a DC rating of 5A @ 30 VDC
15. Environmental
 - Operating Temperature Range -34 to +74 °C (-30 to +165 °F)
 - Humidity Range (non-condensing) 0 to 95% Relative
16. Rear panel DIP switches.

2.4.6 Battery Backup

- A. The barrier shall be capable of operation on battery backup power.

NOTE: EFO speed may be reduced in some configurations contact Nasatka Security Inc. for details and optional configurations.

2.4.7 Uninterruptible Power Supply (UPS - Optional)

- A. When elected, the standard Uninterruptible Power Supply (UPS) shall be sized to meet at a minimum three complete up/down cycles before UPS depletion. The standard UPS shall be single phase.

NOTE: EFO speed may be reduced in some configurations contact Nasatka Security Inc. for details and optional configurations.

- B. When elected, the UPS shall be Customer selectable to support three phase operators.
- C. When Customer specified, the UPS shall be sized to meet higher cycle counts before UPS depletion and/or provide no EFO speed reduction.

2.4.8 Concrete Pavement Heater

- A. The concrete pavement heater shall perform snow melting and anti-icing for the AVB concrete foundation.

- B. The concrete pavement heater shall be a self-regulating heating cable.

1. The heating cable shall automatically reduce output as the pavement warms.
2. The heating cable shall prevent failure due to overheating.

- C. Installation shall be in accordance with Article 426 of the NEC (National Electric Code) The use of a 30 mA GFPD (Ground Fault Protection Device) shall be required.

- D. The heater shall consist of the following items. Quantity of each item shall be specified by drawing.

1. Self-regulating heating cable shall be EM2-XR. Minimum bend radius shall be 2 in (50.8 mm).
2. Power connection kit shall include 3 ft (91.4 cm) end seal.
3. Splice kit shall include 1 ft (30.5 cm) cable seal each.
4. Expansion kit shall be used for crossing each expansion joint and be 1.5 ft (45.7 cm).
5. Snow controller and sensor shall be available as an option.

Snow controller shall operate on 120 VAC (50 W).

The snow sensor shall be located within 200 ft (61 m) of the controller.

6. Weatherproof junction box shall be of UL508 standard and rated for a temperature range of -40 to 185°F (-40 to 85°C). The box shall utilize 1 in (25.4 mm) rigid metal electrical conduit.

- E. The heater shall operate on the following AC power.

1. 208 to 277 VAC, single phase 60 Hz.
2. 480/277 VAC, three phase, 4-wire, 60 Hz. (Optional)

- F. The heater documentation shall include installation, operation, testing, and corrective/preventative maintenance.

2.4.9 Card Reader

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

2.4.10 Wig Wag LED Lights

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

B. The lights shall be as Customer specified.

Template Note: Please provide details for Wig Wag placement, configuration, and signage required for the project.

2.4.11 In Pavement Lights (IPL)

A. As an option, LED warning lights (IPLs) shall be provided.

1. There shall be six IPLs per traffic lane, located three on each side of the AVB each facing traffic. Twelve IPLs (two traffic lanes) shall be controlled by each controller. The controller may provide backup power for the 12 IPLs.
2. Each IPL shall utilize an in roadway installed base plate and an easily replaced light module.

Template Note: Edit the following to reflect if snow removal is required for the project. Only specify the options required for the project, delete all others.

In areas where snow removal is never required, the IPL shall utilize standard base plates with the following characteristics.

The standard base plate shall be made of fiberglass composite. The standard base plate shall be 10 inches (254 mm) in diameter and 1.5 inches (38.1 mm) in depth. The signal head shall not project more than 0.5 inch (12.7 mm) above the road surface.

As an option (in all areas where snow removal does or may occur), the Customer shall specify snowplow base plates with the following characteristics.

The snowplow base plate shall be made of case-hardened steel alloy coated with a corrosion resistant steel primer. The snowplow base plate shall be 14 inches (355.6 mm) in diameter and 1.5 inches (38.1 mm) in depth. The signal head shall not project more than 0.5 inch (12.7 mm) above the road surface.

The standard or snowplow base plate shall mount securely in the pavement and protect the light module. A two-part epoxy compound shall be used to permanently bond either type of base plate to the road surface.

The IPL shall utilize light modules with the following characteristics.

Each light module shall utilize 16 red LEDs, an acrylic prism, and a buffed smooth sealed finish surface.

Each light module shall utilize a snap-together watertight cable connector, solid-state electronics, and potted LED modules (sealed) to isolate electronic components from environmental moisture intrusion. The installed module will operate under water without becoming disabled.

Each light module shall utilize a self-clearing design to eliminate most lens blockage caused by debris.

Each light module shall utilize a design that eliminates voids inside the signal head. This design shall enhance the rugged reliability of the unit.

The light module shall be powered by 12 VDC and not exceed 2 W per module. Optionally, when Customer specified the light module may be powered by 120 VAC, 24 VDC, or via solar panels.

3. The IPLs shall be visible from up to 600 ft (182.88 m) in day light and up to 1500 ft (457.2 m) at night, when visibility is not diminished by inclement conditions.
4. The IPLs shall emit unidirectional, steady (non flashing), red light when illuminated.

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, EPU, 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 barrier 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 barrier 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 barriers 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 Interface with Other Products

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