

Section 1 Accreditation

1.01 Hydraulic bollard system

1.01.1 Designation – High Security Retractable Bollard System

1.02 ST-STD-02.01, Rev A, January 2006

1.02.1 Test Date January 30, 2006

1.02.2 Tested by KARCO Engineering, LLC

1.02.3 Test Location Adelanto, CA 92301

1.02.4 Certification Rating DOS K12/L3

1.03 Test Vehicle

1.03.1 Make/Type 1987 International S1600

1.03.2 GVW 15,056 Lbs.

1.03.3 Speed achieved 49.30 mph

1.03.4 Penetration -65mm or -2.56 inches

1.03.5 Engine running after test – NO

1.03.6 Vehicle drivable after impact – NO

1.03.7 Follow on vehicle could pass barrier – NO

1.04 Experience

1.04.1 The Manufacturer shall have at least 100 similar systems installed and in operation.

Section 2 General

2.01 Responsibilities

2.01.1 The manufacturer shall be responsible for furnishing each Titan vehicle barrier system and associated equipment as specified.

2.01.2 The installer shall be responsible for furnishing installation materials, and providing installation, and field testing of each anti-ramming Titan vehicle barrier system including the associated equipment as specified.

2.01.3 The Owner/Operator (End User) or facility architect will assume responsibility of providing traffic and safety engineering, including all necessary safety features to be used at each bollard site location, including, but not limited to: sidewalks for pedestrian traffic, sufficient roadway lighting, caution signage, traffic (stop) lights, audible warning alerts, visual warning alerts (such as flashing or strobe lights), secondary traffic control devices (such as gate arms), security guard control points, etc.

2.01.4 The Manufacturer shall supply a Titan vehicle barrier system including multiple bollard type barriers, Hydraulic Power Unit (HPU), operator control panels, and accessories as specified.

2.01.5 The Manufacturer shall insure that the design and materials of the Titan vehicle barrier system are the same as those used in the crash test of the barrier, and approved by the Department of State (DOS).

2.01.6 The vehicle barrier system shall utilize multiple Titan electro hydraulic, retractable, round column bollards.

2.01.7 The installer shall install the Titan vehicle barrier system and shall consist of a minimum of three bollards spaced no greater than 32 inches (813 mm) from centerline to centerline, across a roadway. For roadways exceeding a 10 foot (3 meter) width, additional bollards shall be specified by the Buyer.

- 2.01.8 The Installer shall insure the Bollards are equally spaced across the roadway width for full protection coverage.
- 2.01.9 Retaining walls, fixed bollards or other devices shall be provided by the installer or facility architects on either side of the bollard set, to prevent vehicles from going around the bollards
- 2.01.10 The Buyer, in conjunction with the Owner/Operator (End User) requirements, will provide the manufacturer with a written sequence of operation.
 - 2.01.10.1 Sequence of operation will include but not limited to: the vehicle barrier system sequencing, vehicle loop detector functions, gate arm functions, traffic lights, annunciators and all other equipment directly controlled by the system.
 - 2.01.10.2 If the written sequence of operation is not provided by Buyer, then the manufacturer shall supply a default PLC program for basic Titan vehicle barrier system operation only. Additional sequences or functions requested by the Buyer beyond the basic default functions are to be provided by the manufacturer upon written request only and at additional fees to the Buyer. (PLC Only)

2.02 Quality Assurance

- 2.02.1 The manufacturer shall be a company specializing in the supply of vehicle barrier systems with a minimum of 10 years' experience.
- 2.02.2 The manufacturer shall provide a complete Titan vehicle barrier system that has been fabricated, assembled and tested for proper operation prior to shipment.
- 2.02.3 The manufacturer shall have performed an actual crash test on the type of vehicle barrier system being provided.

2.03 Submittals

- 2.03.1 The manufacturer shall submit to the Buyer drawings on the Titan vehicle barrier system.
 - 2.03.1.1 Detail drawings shall show the top assembly layout and overall dimensions of each major element of the barrier system equipment, including the bollards, HPU and operator control panels.
 - 2.03.1.2 Detail drawings shall show the foundation and anchoring requirements of the Titan vehicle barrier system equipment.
 - 2.03.1.3 Detail drawings shall show the layout of a typical Titan vehicle barrier system.
 - 2.03.1.4 A detail hydraulic schematic drawing shall be provided.
 - 2.03.1.5 A drawing shall be provided showing the size and number of hoses required to run between the bollards and HPU. (Hose length to be determined and provided by installer)
 - 2.03.1.6 A detailed electrical schematic including associated wiring shall be provided showing all electrically connected components, including the interface points for connection to equipment.
 - 2.03.1.7 The schematic drawings shall represent the entire Titan vehicle barrier system, with all manufacturer supplied equipment connected and integrated together as a system.
 - 2.03.1.8 Detail interconnect drawings shall show the minimum conduit size and number of wires required to run between each of the barrier system equipment.

- 2.03.2 The manufacturer shall submit to the Buyer a crash test certification on the Titan vehicle barrier system
- 2.03.2.1 A copy of the DOS crash rating letter, certifying the manufacturer's barrier shall be provided. As an alternate, the manufacturer may submit the current DOS website address listing the barrier system certified crash rating.
- 2.03.2.2 If an Engineered system is provided a certificate of conformance that the Titan vehicle barrier system delivered conforms to the crash rating, performance and the requirements of this specification.
- 2.03.2.3 The manufacturer shall submit to the buyer a complete list of equipment, materials, including the manufacturer's descriptive data and technical literature, catalog cuts, and installation instructions. As well as Nameplate data which shall be permanently attached to each Titan vehicle barrier and power unit. The data shall be legibly marked on corrosion-resistant metal plates and shall consist of the following:
- Manufacturer Name – Ameristar Security Products
 - Model Number – Titan Series
 - Serial Number – (TBD)
 - Type of barrier – Hydraulic, Manual, Fixed, Electric
 - Date of manufacture – (TBD)
- 2.03.2.4 The manufacturer shall submit to the buyer a typical bill of material (BOM) and spare parts data for each different item of material and equipment used.
- 2.03.2.5 The Buyer will distribute Titan vehicle barrier system submittal documentation and drawings to the Owner/Operator (End User), as necessary.

2.04 Final Documentation

- 2.04.1 After completion of field tests the Installer shall provide to the Manufacturer up-dated Red-lined drawings, conforming to the “as-built” equipment provided.
- 2.04.2 After completion of field tests the manufacturer shall provide to the Buyer a comprehensive parts and component documentation on the Titan vehicle barrier system, that conforms to the “as-built” equipment provided.
- 2.04.2.1 A Parts List, or Bill of Material, shall be provided on all major parts and components used in the Titan vehicle barrier system.
- 2.04.2.2 A recommended Spare and Consumables Parts List shall be provided. Spare parts shall be those that can be field replaced. Consumables shall include items frequently required for maintenance and service, such as, but not limited to: lights, fuses, lubricants, hydraulic fluid, filter elements, etc. All items shall be provided with a part number, recommended quantity, and a brief description of the item, with current unit prices and source of supply.
- 2.04.3 After completion of field tests, the manufacturer shall submit to the Buyer an Operation and Maintenance (O&M) Manual.
- 2.04.3.1 A Preface section, with the manufacturer's name, model number and service contact information.
- 2.04.3.2 A Safety Warnings and Cautions section applicable during operation, maintenance, service and/or repair.
- 2.04.3.3 An overview and general description of the Titan vehicle barrier system, including all equipment provided, and a summary of features or characteristics.
- 2.04.3.4 A complete drawing package of the barrier system ordered.
- 2.04.3.5 A theory of operation, for both the hydraulic and electrical circuits.
- 2.04.3.6 An Operating Instructions section, including as a minimum procedures for system start-up, bollard operation, shut down and manual operation.

- 2.04.3.7 A Maintenance Instructions section, including as a minimum routine maintenance requirements, a chart of periodic maintenance activities and intervals, lubrication instructions and component adjustment.
- 2.04.3.8 A Troubleshooting section, with probable cause and an itemized list of equipment checks.
- 2.04.3.9 A Reference Information section, including abbreviations and acronyms, torque values and a list of applicable bollard drawings and documentation.
- 2.04.4 After completion of performance verification tests the installer shall submit to both the Buyer and manufacturer a Titan vehicle barrier system PVT Report.
 - 2.04.4.1 Upon completion and testing of the installed Titan vehicle barrier system, a Test Report shall be submitted showing both the test data and results of any field tests, including the demonstration and compliance with the specified performance criteria of this specification.
 - 2.04.4.2 Each test report shall indicate the final position of component adjustments and set points.
- 2.04.5 The Buyer will distribute Titan vehicle barrier system final documentation and drawings to the Owner/Operator (End User), as necessary.

2.05 Delivery, Storage & Handling

- 2.05.1 All equipment shall be prepared and protected by the manufacturer to be shipped by conventional shipping methods.
- 2.05.2 The Titan vehicle barrier system equipment shall be protected by suitable methods for the intended shipping and storage environments.
 - 2.05.2.1 Packaging, preservation, pallets and crating shall prevent mechanical damage to the equipment during both shipping and handling.
 - 2.05.2.2 Forklift provisions (min 10,000 pound capability) shall be provided for the lifting and handling of equipment.
 - 2.05.2.3 Shipping containers and crates shall be identified with the type of equipment.
 - 2.05.2.4 Shipping documents shall be provided with the contents of each container or crate.
- 2.05.3 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.
 - 2.05.3.1 Equipment shall be stored covered.
 - 2.05.3.2 Both equipment and structural materials shall be stored on pallets.
 - 2.05.3.3 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.
 - 2.05.3.4 Equipment shall be stored in an area that is not subjected to potential damage by other construction activities.

2.06 Warranty

Ameristar Security Products hereby provides the following warranty for any new product purchased from Ameristar Security Products.

The Titan Bollard system by Ameristar® is manufactured from the highest quality materials by skilled craftsmen to meet the highest standards of workmanship in the industry. Ameristar warrants its Titan Bollard system against defects in material and workmanship for a period of 1 year from the date of substantial completion, or 1.5 years from the date of shipment. Barrier warranty requires that the requirements and instructions described in the operation and maintenance manual be followed and records of all maintenance activities be kept. Records should be available upon request and may be required for warranty claims.

Should the barrier fail in accordance with the details described herein, Ameristar warrants to the original purchaser their redemption through replacement, renewal or issuance of a pro-rated credit. Notice of failure under the conditions of this warranty shall be sent to Ameristar or its authorized representative, in writing, together with proof of purchase and shall specify the nature of the defect and when it was first observed. Documented authorization from Ameristar must be received

prior to performing any repair, modification, or part replacement, which may be considered under warranty, or deemed necessary for normal system functionality, failure to do so may void warranty in total.

Should the barrier be improperly installed, Ameristar shall not be responsible for guaranteed performance or appearance of barrier. Failure to install barrier with a professionally licensed and manufacturer-approved installer shall negate warranty.

Warranty does not apply when failure or damage is due to improper use or application, abuse or misuse, vandalism, natural disasters/catastrophes, or if products have been altered or modified, subjected to improper storage, improper maintenance, negligence, or used with parts not authorized by the manufacturer including but not limited to: excessive vehicle speed, excessive vehicle weight, temperature extremes, long term flooding or lack of drainage, packed debris, snow or ice under the barrier, improper electrical power feed voltage or frequency.

This warranty excludes wear, scratches and/or other damage to finishes and painted surfaces due to normal use. The manufacturer shall not be liable for damage to the product which results in the use of the barrier as a protective device (i.e. sustains a vehicle crash), due to damage caused by any other vehicle contact when the barrier is not in the active barrier position, and/or due to damage caused by snow plow operations. The manufacturer shall not be liable for any special, incidental or consequential damages, which result from the use of the products by Buyer, Owner/Operator (End User) and/or any other party, and limits the liability to the amounts paid by Buyer for the Product.

Ameristar reserves the right to inspect the material to determine validity of the claim. Upon validation of the claim by Ameristar or its authorized representative, redemption by replacement, renewal or issuance of a pro-rated credit shall be made by Ameristar. If a warranty claim does not meet the warranty criteria, then the Buyer or Owner/Operator (End User) shall be responsible for reimbursing the manufacturer for service and/or repair costs. This warranty may exclude any on-site labor, travel costs to site and/or expenses in performing service or repair on-site and freight charges, for valid warranty claims. Equipment and components that are not manufactured by Ameristar shall be subject to the original manufacturer's specified warranty.

The above constitutes the complete warranty by the manufacturer. No other agreement, written or implied, is valid. Ameristar does not authorize any other person or agent to make any other express warranties. Ameristar neither assumes nor authorizes any other person or agent to assume any other liability in connection with the barrier. Some jurisdictions do not allow limitations on how long an implied warranty lasts, nor do they allow an exclusion or limitation of incidental or consequential damages; therefore, the limitations and exclusions noted herein may not apply.

Section 3 System Configuration

3.01 Bollards

- 3.01.1 Minimum of a 3 bollard array for a certified product
- 3.01.2 Diameter equal to 10.75 in (273 mm)
- 3.01.3 As Tested Height from top of grade level to top of bollard equal to 38 in (965 mm) The Titan Bollard array was tested without the ¾" thick 16" diameter top hat. With this Hat installed the Height from top of grade level to top of bollard is equal to 39 in (991 mm)
- 3.01.4 Spacing from bollard center to bollard center equal to 32 in (813 mm)
- 3.01.5 The clear opening from bollard to bollard equal to 22.25 in (565 mm)

3.02 Finish

- 3.02.1 The bollards and casing shall be protected from the effects of long term corrosion.
 - 3.02.1.1 All bollard casings shall be hot dipped galvanized.
 - 3.02.1.2 The bollard shall be painted with an exterior grade, standard black color.
 - 3.02.1.3 When an alternate color is required, the Buyer will specify the custom color to the manufacturer at the time of ordering.

3.03 Foundation

- 3.03.1 The foundation can be free formed to local soil.
- 3.03.2 Excavation Depth equal to 69 in (1753 mm)
- 3.03.3 Width front to back equal to 72 in (1829 mm)
- 3.03.4 Length of 3 bollard array equal to 120 in (3048 mm)
- 3.03.5 Concrete strength minimum of 3000 psi concrete must be used
- 3.03.6 Soil Compaction of not less than 95% maximum dry density

3.04 Bollard Performance & Parameters

- 3.04.1 When in the lowered position the bollard shall extend no more than 0.5 inch (13 mm) above the roadway surface.
- 3.04.2 The bollards, when in the lowered position, shall be capable of supporting a 32,000 pound (14,515 kg) Axle load or a 16,000 pound (7255 kilogram) wheel load. The Owner/Operator (End User) shall be responsible for providing and posting weight limit signage to prevent bollard damage due to excessive vehicle weight, in accordance with AASHTO HB-17.
- 3.04.3 Vehicle speed over bollards shall be rated for speeds up to, but not exceeding 20 mph. The Owner/Operator (End User) shall be responsible for providing and posting speed limit signage to prevent bollard damage due to excessive vehicle speed.
- 3.04.4 The bollard column shall not require lubrication.
- 3.04.5 The hydraulic cylinder shall be capable of being removed without requiring removal of the bollard column.
- 3.04.6 The bollard column shall be capable of being removed without requiring removal of the hydraulic cylinder, including associated hydraulic hoses.
- 3.04.7 The bollard shall be provided with road surface top plates, suitable for vehicle traffic. The road surface top plates shall be constructed of steel plate, provided with an anti-skid surface, and shall be replaceable.
- 3.04.8 The bollard shall be capable of being installed using an excavation depth not exceeding 69 inches (1753 mm)
- 3.04.9 The bollards shall be capable of at least 120 complete up/down cycles per hour.

- 3.04.10 The bollard motion shall be instantly reversible in either direction.
- 3.04.11 The bollards shall rise in approximately 3-8 seconds, when operating at normal ambient temperature conditions.
- 3.04.12 The bollards shall be capable of being lowered in not more than 3 seconds, when operating at normal ambient temperature conditions.
- 3.04.13 The height of the bollards while raising and lowering is not required to be synchronized (i.e. the heights are not required to match during movement).
- 3.04.14 The bollard shall be capable of operating in a temperature range of 50°F to 120°F (10°C to 48°C), without heaters or heat exchangers. When the site ambient operating temperatures are not within the standard operating temperature range, the Buyer shall specify cold temperature and/or hot temperature operation.
- 3.04.15 The Titan vehicle barrier system shall provide two optional methods of operation, for use during electrical power loss, or selected equipment failures:
 - 3.04.15.1 Provide stored hydraulic pressure utilizing a hydro pneumatic accumulator, sized to allow no less than a 1-cycle operation, on a fully charged system.
 - 3.04.15.2 Provide an integrated, manual hand pump to permit rising and lowering of the bollards.
- 3.04.16 An Emergency Fast Operation (EFO) function is optional and can be provided which is capable of raising the bollards to the full guard position in no greater than 1.5 seconds.

Section 4 Hydraulic (HPU), Electric

4.01 HPU & Hydraulics

- 4.01.1 A Hydraulic Power Unit (HPU) shall be provided for supplying hydraulic fluid power to raise and lower the bollards.
- 4.01.2 The HPU shall be remotely located at a standard maximum distance of 100 feet (30.5 meters) from the bollards. Any distance greater than 100 feet (30.5 meters) must be approved by the manufacturer.
- 4.01.3 The Installer shall provide hydraulic hoses between the HPU and each bollard hydraulic cylinder. Due to the uncertainties in exact hose length, the installer shall supply the hoses rather than the bollard manufacturer, to the site specific requirements. Hydraulic hoses shall be:
 - 4.01.3.1 Rated to no less than 3000 PSIG (20.7 Mpa) by the hose manufacturer. The hose manufacturer's factor of safety shall be no less than 4:1 for this rating, with a burst pressure of at least 12,000 PSIG (82.8 Mpa).
 - 4.01.3.2 Provided with protective wear sleeves at the bollard, to protect the hydraulic hoses from abrasion and other mechanical damage.
 - 4.01.3.3 Configured using two different sizes, including connections at the bollard hydraulic cylinder, to eliminate the possibility of inadvertently connecting the hoses backwards.
- 4.01.4 Hydraulic component connections shall utilize all O-ring boss seal connections and fittings.
- 4.01.5 Hydraulic Hose connections shall utilize JIC connections and fittings
- 4.01.6 If required, the HPU and hydraulic circuit shall use an environmentally friendly hydraulic fluid which does not degrade over time. Standard petroleum based hydraulic fluids are permitted if the installation site is not environmentally sensitive. Vegetable based oil with limited shelf shall not be used.
- 4.01.7 The HPU reservoir shall:
 - 4.01.7.1 Be a standard reservoir design conforming to hydraulic industry standards.
 - 4.01.7.2 Be a vertical mount reservoir with lift off lid for maintenance, and can be provided with an optional filtered filler/breather.

- 4.01.7.3 Have a capacity to allow the full charging of accumulators, with a safety margin, to prevent cavitation of the pump.
- 4.01.8 Based on number of bollards, duty cycle, and number of accumulators provided, the HPU shall be provided with one of the following tank sizes: 10 Gallons (37.8l), or 26 Gallons (98.4 l). The manufacturer shall determine the proper configuration and tank size.
- 4.01.9 The HPU shall use SAE Straight Thread, O-ring boss seals for tubing connections, to minimize hydraulic fluid leakage, and no pipe threads shall be used.
- 4.01.10 The HPU shall use standard industrial components, which conform to hydraulic industry standards, and have interchangeable mounting dimensions.
- 4.01.11 The majority of hydraulic components shall be manifold mounted to minimize connection points, hydraulic leakage and permit component replacement without requiring the removal of other hydraulic components. The use of in-line valves alone shall not be used.
- 4.01.12 The pump/motor shall be mounted, using male/female spline shafts.
- 4.01.13 The HPU shall be covered and shielded from direct exposure to weather, direct sunlight and associated environmental elements. The HPU shall be covered with a weather resistant enclosure, or placed in a facility equipment room.
 - 4.01.13.1 The HPU weatherproof enclosure shall be a powder coat painted, sheet metal enclosure.
 - 4.01.13.2 The HPU weatherproof enclosure shall be provided with locking hinged doors for normal maintenance and service access.
- 4.01.14 The HPU electrical motors driving the hydraulic pumps shall run at speed of less than 1800 RPM, for lower noise emission, and longer pump/motor life.
- 4.01.15 The HPU electrical motors shall have a sufficient horsepower rating to operate the hydraulic pump at the combined full rated flow and pressure, within the motor's nameplate rating.
- 4.01.16 Based on required cycle duty of the bollards, the HPU shall be provided with one of the following horsepower configurations: 2hp, or 5hp, the manufacturer shall determine the proper configuration and horsepower rating for the Titan vehicle barrier system.
- 4.01.17 All control valves for bollard operation shall be provided as hydraulic solenoid poppet valves. Solenoid valves shall be:
 - 4.01.17.1 Provided with international, industry standard, sealed DIN connectors, on flexible cable assemblies. Solenoid coil wiring shall be configured so that the connection does not need to be unwired when replacing a valve. Solder connections, crimped ring lugs and wire nuts shall not be used.
 - 4.01.17.2 Manifold or sub plate mounted, for superior sealing, and ease of replacement. Hydraulic lines shall be configured so that they do not need to be removed when replacing a valve.
 - 4.01.17.3 Provided with electrical surge suppression at the solenoid coils, for long-term reliability of electrical switching controls (contacts).
 - 4.01.17.4 Provided with LED indicators at the valve, to indicate if the solenoid is energized or de-energized, to aid during troubleshooting and when performing fault diagnostics.
 - 4.01.17.5 A spring return to a fail-safe position. Fail safe position shall default to a known safe state during the start-up of equipment and after valve replacement. Detented type valves which can cause unintended motion of the Titan vehicle barrier system shall not be used.
- 4.01.18 Optional HPU monitoring, indication and shutdown shall be provided.
 - 4.01.18.1 Low hydraulic fluid level switch shall be provided to indicate insufficient hydraulic fluid in the reservoir. OPTIONAL
 - 4.01.18.2 High hydraulic fluid temperature switch shall be provided to indicate a hydraulic fluid over temperature condition. OPTIONAL

4.02 **Electrical**

4.02.1 The Titan vehicle barrier system shall operate on a standard 208-240 VAC, 3-Phase, 60 Hertz electrical power feed. When the standard electrical power feed is not available, the Buyer will specify an alternate electrical power feed to the manufacturer at the time of ordering.

Note: Single phase facility power will limit the installed system horsepower.

4.02.1.1 *Optional* – Electrical power voltages which may be factory configured are as follows:

Description	Conductors	Voltage	Frequency
Single Phase	2 Wire w/neutral	120 VAC	60 HZ
Single Phase	2 Wire wo/neutral	208 - 240 VAC	60 HZ
3 Phase	3 Wire wo/neutral	460 - 480 VAC	60 HZ

4.02.1.2 *Optional* – Electrical power frequency may be factory configured for 50 Hz electrical service.

4.02.2 The site facility shall provide a main power disconnect, circuit protection (such as a circuit breaker or fusible disconnect) and utility electrical power feed wiring, for connection to the Titan vehicle barrier system HPU electrical enclosure, sump pumps, bollard heaters, electric gate arms and/or other equipment as required.

4.02.3 All voltages required by electrical circuits other than the main electrical power feed, shall be provided by additional electrical circuit components, such as control transformers and DC power supplies.

4.02.4 All electrical circuits shall be provided with overload and short circuit protection.

4.02.4.1 The main incoming electrical power feed shall be provided with a circuit breaker. BY SITE INSTALLERS.

4.02.4.2 Each motor starter shall be provided with overload relays.

4.02.5 Electrical controls shall be provided integral to the HPU, with self-contained wiring to all mounted components. Field wiring requirements shall be minimized.

4.02.6 Electrical controls shall be enclosed in an integral, sealed, NEMA 12,3R, 4, or 4X (or IP 65 equivalent) enclosure, for protection of electrical switchgear from moisture and weather conditions.

4.02.7 Electrical controls such as circuit breakers, fuses, terminal blocks, power supply, motor starter, relays and PLC shall be DIN rail mounted for ease of replacement.

4.02.8 The electrical enclosure shall be mounted integral to the HPU, and located up front where accessible from the weather proof enclosure hinged maintenance access door.

4.02.9 The enclosure internal wiring shall be provided in easy to access wiring raceways, with removable raceway covers.

4.02.10 The electrical enclosure shall have additional space inside for DIN rail mounted accessories, such as traffic light relays, heater contactors, and vehicle loop detector modules.

4.02.11 All high voltage electrical switchgear shall be mounted inside the electrical enclosure (including, but not limited to: motor starters, heater contactors, etc.).

4.02.12 Electrical switchgear components shall be either UL and/or CE labeled.

4.02.13 When site ambient operating temperatures will be below 50°F (10°C), the Buyer will specify the lowest anticipated on-site ambient temperature condition to the manufacturer at the time of ordering.

4.02.13.1 When cold temperature operation is specified by the Buyer, the manufacturer shall then provide HPU reservoir and bollard heaters for both HPU and bollard operation.

- 4.02.13.2 When cold temperature operation is specified by the Buyer, the installer shall provide electrical circuit breakers, switchgear and controls for operating the bollard heaters, and hose heating (if required).
- 4.02.13.3 When cold temperature operation is specified by the Buyer, the installer shall provide additional electrical wiring for the bollard heaters, and hose heating (if required).
- 4.02.14 When site ambient operating temperatures will exceed 120°F (48°C) requiring high temperature operation, the Buyer will specify the highest anticipated on-site ambient temperature condition to the manufacturer at the time of ordering.
 - 4.02.14.1 When high temperature operation is specified by the Buyer, the manufacturer shall then provide an air-conditioning unit to maintain the hydraulic fluid at acceptable temperature levels during HPU and bollard operation.
 - 4.02.14.2 When high temperature operation is specified by the Buyer, the manufacturer shall provide electrical switchgear and controls (as required) for operating a circulation pump motor and the air-conditioning unit.

Section 5 System Controls

5.01 PLC System:

- 5.01.1 Shall have electrical controls and monitoring programmable, utilizing either a ruggedized, industrial type Programmable Logic Controller (PLC).
 - 5.01.1.1 The PLC shall be a standard commercial, off the shelf PLC, and shall not use “custom” sole source printed circuit type control boards.
 - 5.01.1.2 The PLC shall be microprocessor based, to permit programming of the Titan vehicle barrier system control and monitoring functions.
 - 5.01.1.3 Control and monitoring functions for the control circuit shall function through the PLC.
 - 5.01.1.4 The PLC shall utilize solid state electronic input switching for high reliability.
- 5.01.2 Shall have HMI interface screen integrated into the PLC.
- 5.01.3 Shall be NEMA 4 and door mounted on circuit enclosure panel
- 5.01.4 Shall have FREE downloadable software which does not require licensing agreements.
- 5.01.5 Have easy to replace I/O modules. Modules shall utilize removable terminal strips and be capable of replacement without disturbing wiring. The PLC shall utilize I/O module slots for expandable I/O. The PLC shall be capable of being programmed by factory trained and authorized technicians.
 - 5.01.5.1 The PLC programming shall allow simplified configuration of controls and monitoring to suit specific on-site conditions. Hard-wired control relays alone shall not be used.
 - 5.01.5.2 The PLC programming shall be capable of being field reprogrammed on-site, utilizing a standard laptop PC, with Windows based programming software. Software shall be in an industry standard programming format. A proprietary programming language or use of machine code shall not be used. The PC, programming cable and programming software are not deliverable items with the vehicle barrier system.
 - 5.01.5.3 The PLC programming logic (code) and configuration for the Titan vehicle barrier system shall be capable of being stored as an electronic file for re-load of the microprocessor in the future.
 - 5.01.5.4 The PLC programming monitoring and troubleshooting shall be capable of being performed utilizing a laptop computer, to aid in fault diagnostics.
- 5.01.6 Shall be able to update via micro SD card
- 5.01.7 Shall utilize Terminal blocks
 - 5.01.7.1 Shall be PCB Style with screw terminations.
 - 5.01.7.2 PCB's shall be for hardware specific terminations (i.e. 3 wires of the down sensor)

5.02 Controls General

- 5.02.1 All control and monitoring circuits, including signals, shall operate using low voltage, +24 VDC for safety, outside of the main electrical enclosure. To minimize the possibility of electrical noise, AC voltage signals shall not be used (PLC Only). This requirement is **not** applicable to electric motor electrical power, sump pumps, bollard heaters, electric gate arms and/or other equipment as required.
- 5.02.2 The control circuit shall have additional optional interfaces with auxiliary equipment for control and monitoring such as: card readers, loop detectors, traffic lights, etc. made possible through connection to a main terminal strip.
- 5.02.3 Proximity switches shall be provided for monitoring the bollard raised/lowered position. The proximity switches shall be:
 - 5.02.3.1 Shock resistant, and use an electronic, solid state construction. The non-contact type sensor shall have no moving parts, and shall not be sensitive to adjustment and/or affected due to the bollard movement or stopping.
 - 5.02.3.2 Resistant to water and shall be capable of being submerged (i.e. due to rain water, melting snow, wash down, etc.).
 - 5.02.3.3 Provided with a connector, so that the switch can be easily disconnected, without requiring the removal of wiring.
 - 5.02.3.4 Provided with an LED indicator, to provide a visual indication of the switch state (i.e. on or off) to assist during adjusting, and also during troubleshooting. LEDs shall be visible from any angle.
 - 5.02.3.5 Used at a low voltage signal level for safety (i.e. not high voltage).

5.03 Operator Control Panels

- 5.03.1 Operator control panels and associated control circuit shall be provided to interface between all bollard locations, operator control panels and the HPU.
 - 5.03.1.1 The Main Operator Control Panel shall be physically located at the site (such as a security room) to allow operation of all bollards.
 - 5.03.1.2 The Remote Operator Control Panels shall be physically located in close proximity to each set of bollards, (such as a guard booth).
 - 5.03.1.3 All operator control panels shall be mounted in an indoor, covered environment, and shall not be exposed to weather and environmental conditions.
 - 5.03.1.4 All operator control panels will be mounted in such way that the operator always has visual (eye or camera) supervision on the barrier, when operating the barrier.
- 5.03.2 The control circuit shall be part of the PLC and associated equipment, integral with the HPU electrical enclosure.
 - 5.03.2.1 The control circuit functions and monitoring shall be programmed into the PLC.
 - 5.03.2.2 The operator control panel switches and indicators shall interface with the PLC Inputs/Outputs.
 - 5.03.2.3 All operator control panel switches and indicators shall be pre-wired to wiring terminal strips. The terminal strips shall provide an interconnection side to allow connection of site field wiring.
- 5.03.3 All operator control panel circuits, including signals, shall operate using low voltage, +24 VDC for safety.
- 5.03.4 A Main Operator Control Panel shall be supplied for control and indication of all Titan vehicle barrier system functions. The Default Main Operator Control Panel shall have:
 - 5.03.4.1 A key lockable main Power On/Off switch (key switch), with an associated green color main power On/Off indicator light.
 - 5.03.4.2 A set of illuminated pushbuttons for Up/Down control, to raise and lower each set of bollards.

- 5.03.4.3 A set of Up/Down indicator lights for indicating the position of each set of bollards when in the full Up or full down position. The Up indicator lights shall be red, and the down indicator lights shall be green. The indicators lights shall be provided integral to the Up/Down illuminated pushbuttons switches.
- 5.03.4.4 A key lockable Arm/Disable switch to permit operation of each of the Remote Operator Control Panels in the vehicle barrier system.
- 5.03.4.5 A red color illuminated switch for Emergency Fast Operate (EFO) to rapidly raise all bollards in the vehicle barrier system. The EFO switch shall be provided with a transparent flip cover.
- 5.03.4.6 Reset: A keyed switch for EFO Reset, to restore the vehicle barrier system to normal operation after activating the EFO function.
- 5.03.4.7 An optional emergency stop switch to immediately stop the movement of the barrier in any position. The button will be red, following safety standards. The emergency stop cannot be activated when the EFO is active. EFO can be activated when emergency stop is active. OPTIONAL
- 5.03.4.8 Reset: A keyed switch for emergency stop Reset, to restore the vehicle barrier system to normal operation after activating the emergency stop function.
 - 5.03.4.9 A red color Check Oil indicator light for indicating a low level in the reservoir, or a hydraulic fluid over temperature condition.
- 5.03.5 Custom Master Control panels can be built to conform to all site requirements.
- 5.03.6 One or more Remote Operator Control Panels shall be provided for control and indication of each set of bollards within the overall Titan vehicle barrier system. Each Default Remote Operator Control Panel shall have:
 - 5.03.6.1 A green color panel on indicator light for indicating the panel has been enabled for operation by the remote armed key switch on the Main Operator Control Panel.
 - 5.03.6.2 A set of illuminated pushbuttons for Up/Down control, to raise and lower each set of bollards.
 - 5.03.6.3 A set of Up/Down indicator lights for indicating the position of each set of bollards when in the full Up or full down position. The Up indicator lights shall be red, and the down indicator lights shall be

- green. The indicators lights shall be provided integral to the Up/Down illuminated pushbuttons switches.
- 5.03.6.4 A key lockable Arm/Disable switch to permit operation of each of the Remote Operator Control Panels in the vehicle barrier system.
 - 5.03.6.5 A red color illuminated switch for Emergency Fast Operate (EFO) to rapidly raise all bollards in the vehicle barrier system. The EFO switch shall be provided with a transparent flip cover.
 - 5.03.6.6 Reset: A keyed switch for EFO Reset, to restore the vehicle barrier system to normal operation after activating the EFO function.
 - 5.03.6.7 An optional emergency stop switch to immediately stop the movement of the barrier in any position. The button will be red, following safety standards. The emergency stop cannot be activated when the EFO is active. EFO can be activated when emergency stop is active.
 - 5.03.6.8 Reset: A keyed switch for emergency stop Reset, to restore the vehicle barrier system to normal operation after activating the emergency stop function.
 - 5.03.6.9 A red color Check Oil indicator light for indicating a low level in the reservoir, or a hydraulic fluid over temperature condition.
- 5.03.7 Custom Remote, Overwatch, or Local controls panels can be built to conform to all site requirements.
 - 5.03.8 Operator control panel labeling shall use both text and graphic elements. A clear plastic overlay shall be provided to protect the panel surface and labeling from normal usage, and occasional panel cleaning.
 - 5.03.9 Operator control panels shall be provided as a standard sloped, electrical enclosure console, suitable for countertop mounting. When alternate industry standard 19 inch (483 mm) rack mount panels are required in lieu of the console, the Buyer will specify the use of 19 inch (483 mm) panels to the manufacturer at the time of ordering. **Note:** Only the panels are provided (i.e. the rack enclosure is excluded).
 - 5.03.10 The operator control panels shall use electrical industry standard, industrial grade, electrical components. Switches and indicators shall be no less than the 0.89 inch (22.5 mm) switch industry standard size.
 - 5.03.11 Electrical switch and indicator components shall be either UL and/or CE labeled.
 - 5.03.12 Electrical switch and indicator components shall be mounted in a sealed, NEMA 1, 3 or 12 (or IP 64 equivalent) enclosure, for protection against moisture and weather conditions, excluding the 19 inch (483 mm) panels.
 - 5.03.13 All wiring to operator control panel components shall be terminated at terminal blocks, for ease of on-site field interconnection with other vehicle barrier system equipment and accessories.
 - 5.03.13.1 The terminal strips shall be standard high density, industrial grade, PCB style connectors for field wiring, and screw type connectors for internal system wiring, and fixed count, ring lug type terminals shall not be used.
 - 5.03.13.2 The terminal blocks shall be DIN rail mounted.

Section 6 Products

6.01 Manufacturer and model procurement

- 6.01.1 The vehicle barrier system shall be a **Titan Model** active electro hydraulic, bollard type manufactured by:

Ameristar Perimeter Security USA.
1555 N Mingo Road
Tulsa, OK, 74116
Phone: 918-835-0898
Fax: 918-835-1002
www.ameristarsecurity.com