SECTION 11 12 00

VEHICLE BARRIER SYSTEMS

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\*\* NOTE TO SPECIFIER \*\* Ameristar Security Products; vehicle barrier systems products.
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This section is based on the products of Ameristar Security Products, which is located at:1555 N. Mingo Rd.Tulsa, OK 74116Toll Free Tel: 800-321-8724Tel: 866-467-2773 - Bollard and Barriers TeamEmail: [request info (vonacox@ameristarfence.com)](https://arcat.com/rfi?action=email&company=Ameristar%252BSecurity%252BProducts&message=RE%253A%2520Spec%2520Question%2520(11155ame)%253A%2520&coid=47267&spec=11155ame&rep=&fax=)
Web: <https://www.ameristarperimeter.com>
 [ [Click Here](https://arcat.com/company/ameristar-security-products-47267) ] for additional information.
ATG Access Inc is a worldwide provider of perimeter security and defense solutions; we are an engineering company which manufactures vehicle barrier systems in the form of wedge barriers, crash beams, fixed bollards, active bollards, removable bollards, manual bollards, swing gates and access control for a wide range of solutions from Anti-Terrorist / High Security applications to Residential.

1. GENERAL
	1. SECTION INCLUDES

\*\* NOTE TO SPECIFIER \*\* Delete items below not required for project.

* + 1. High Security Bollards.
		2. Access Control and Residential Bollards.
		3. Wedge Barriers.
		4. Crash Beams.
	1. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Delete any sections below not relevant to this project; add others as required.

* + 1. Section 31 20 00 - Earth Moving.
		2. Section 32 12 16 - Asphalt Paving.
		3. Section 32 13 13 - Concrete Paving.
		4. Section 03 30 00 - Cast-in-Place Concrete. Concrete, forms and rebar.
		5. Section 28 18 00 - Security Access Detection Equipment.
		6. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.
		7. Section 26 05 23 - Control-Voltage Electrical Power Cables.
		8. Section 26 27 16 - Electrical Cabinets and Enclosures.
	1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete references from the list below that are not actually required by the text of the edited section.

* + 1. Department of the Navy publication Operational Requirement No. 098-09-88: Operational Requirements for Secure Structures Ashore (Locks and Barriers, 1986).
		2. Department of State (DOS) publication SD-STD-02.01, Revision A, dated March 2003 for Vehicle Crash Testing of Perimeter Barriers and Gates.
	1. SYSTEM DESCRIPTION

\*\* NOTE TO SPECIFIER \*\* Select one or both of the following paragraphs as required to define the rising Bollard system required. Locate bollards and set of Bollard on the Drawings as required.

* + 1. Rising Bollard Configuration:
			1. Single bollards individually operated: Each individual bollard shall be operated independently from any other bollard with in the system. Each bollard shall have its own controls and operate under one of the following configurations:-

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs as required and delete those not required.

* + - * 1. Single Direction Traffic flows in one direction only through the bollard system.
				2. Bi-Directional Traffic flows in both directions through the same bollard.
				3. Twin Lane. Traffic flows in both directions through separate bollards where the entry and exit bollards are segregated by a traffic island.
			1. Multi bollards operating in sets: Bollard system as indicated on the Drawings shall have bollards operating together as a set. Each set of bollards shall have its own controls and operate independently of other systems under one of the following configurations:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs as required and delete those not required.

* + - * 1. Single Direction Traffic flows in one direction only through the bollard system.
				2. Bi-Directional Traffic flows in both directions through the same bollard.
				3. Twin Lane. Traffic flows in both directions through separate bollards where the entry and exit bollards are segregated by a traffic island.
	1. SUBMITTALS
		1. Submit under provisions of Section 01 30 00 - Administrative Requirements.
		2. Product Data: Manufacturer's data sheets on each product to be used, including:
			1. Preparation instructions and recommendations.
			2. Storage and handling requirements and recommendations.
			3. Installation methods.
		3. Shop Drawings:
			1. Show locations and details of vehicle barrier systems including each major element, and details of operation, hardware, and accessories.
			2. Indicate materials, dimensions, sizes, weights, and finishes of components.
			3. Include plans, elevations, sections, foundation drawings and other required installation and operational clearances, and details of anchorage.
			4. Installation procedures and instructions.
			5. Provide a written sequence of operation that includes but not limited to vehicle barrier system sequencing, vehicle loop detector functions, gate arm functions, traffic lights, annunciators and all other equipment directly controlled by the PLC.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* + - 1. Controls and Hydraulics: Show locations and details for control components, switches and hydraulic system. Indicate motor size, hydraulic schematic, electrical characteristics, drive arrangement, mounting, and grounding.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* + - 1. Wiring Diagrams: Power and control wiring, communication features, and access control features. Differentiate between factory-installed and field-installed wiring and between components provided by manufacturer and those provided by other sections of the specification.
		1. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and finish.
		2. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
		3. Closeout Submittals:
			1. Provide As-Built Drawings showing the as-built conditions of all equipment provided.
			2. Provide manufacturer's maintenance and service instructions that include recommendations for periodic maintenance and cleaning of all vehicle barrier system components including:
				1. Parts List, or Bill of Material on all major parts and components.
				2. Recommended Spare and Consumables Parts List. Spare parts shall be those that can be field replaced. Consumables include items required for maintenance and service, such as, lights, fuses, lubricants, hydraulic fluid, filter elements, etc. Provide all items with a part number, recommended quantity, and a brief description.
	1. QUALITY ASSURANCE
		1. Manufacturer Qualifications: A company specializing in the supply of vehicle barrier systems with a minimum of 10 years documented experience.
		2. Installer Qualifications: Manufacturer-approved and factory authorized installer specializing in the installation of vehicle barrier systems with a minimum of 5 years documented experience.
	2. DELIVERY, STORAGE, AND HANDLING
		1. Store products in manufacturer's unopened packaging with labels intact until ready for installation.
		2. Store on pallets, under cover and in a location protected from the weather, humidity, excessive temperature variation, dust, dirt and/or other contaminants.
	3. SEQUENCING
		1. Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.
		2. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

\*\* NOTE TO SPECIFIER \*\* Include the following paragraph if maintenance service is required. Delete if not required.

* 1. MAINTENANCE SERVICE
		1. Furnish service and maintenance for vehicle barrier systems and components for the following period from Date of Substantial Completion.
			1. One year.
			2. Two years.
			3. Three years.
			4. Four years.
			5. Five years.
		2. Include periodic examination, adjustment, and lubrication of vehicle barrier equipment. Repair or replace parts whenever required. Use parts produced by manufacturer of original equipment.
		3. Provide emergency call back service for this maintenance period.
		4. Perform maintenance work using competent and qualified personnel approved by manufacturer.
1. PRODUCTS
	1. MANUFACTURERS
		1. Acceptable Manufacturer: Ameristar Security Products, which is located at:1555 N. Mingo Rd.Tulsa, OK 74116Toll Free Tel: 800-321-8724Tel: 866-467-2773 - Bollard and Barriers TeamEmail: [request info (vonacox@ameristarfence.com)](https://arcat.com/rfi?action=email&company=Ameristar%252BSecurity%252BProducts&message=RE%253A%2520Spec%2520Question%2520(11155ame)%253A%2520&coid=47267&spec=11155ame&rep=&fax=);Web: <https://www.ameristarperimeter.com>

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two paragraphs; coordinate with requirements of Division 1 section on product options and substitutions.

* + 1. Substitutions: Not permitted.
		2. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

\*\* NOTE TO SPECIFIER \*\* Edit the following paragraphs to include the Vehicle Barrier Systems required for the project. Delete the products not required.

* 1. HIGH SECURITY BOLLARDS
		1. SP 1200 Rising Bollard (K54 and PAS 68): Below ground assembly consists of a square outer casing complete with cable and drainage duct outlets and an inner bollard of heavy steel cylindrical tube and an aesthetic polymer sleeve capable of being raised above ground into the up position.
			1. Bollards consist of retractable, 12-3/4 inch (323 mm) diameter, round tubular columns with a full guard height of 47-1/4 inches (1200 mm).
			2. When retracted the bollards are flush with the finished roadway.
			3. K54 certified by the U.S. Department of State (DOS) (60,000 lbs at 50 mph).
			4. European standards certified PAS 68 (30T at 80 kph).
			5. Features:
				1. Control: Contains all relays, timers and other devices necessary for all the operations of the system as defined. Locate control equipment above ground within the main control cabinet. Provide the following:

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following paragraphs and delete those not required.

Standard main operator control panel.

Custom main operator control panel.

Remote operator control panel.

* + - * 1. Control Cabinet: Size to house all control circuits, hydraulic pump(s) and other devices for operation of system. Provide control panel with a side access panel to manual override and main power supply isolator.

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs and delete the one not required.

Black Finish.

Stainless Steel finish.

* + - * 1. Hydraulic Unit:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs and delete those not required.

3 HP hydraulic unit.

5 HP hydraulic unit .

10 HP hydraulic unit.

* + - * 1. Barrier Position Sensor:

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following paragraphs and delete those not required.

Barrier-down position sensor.

Barrier-up position sensor .

* + - * 1. Weather proof HPU enclosure
				2. Bollard Finish:

\*\* NOTE TO SPECIFIER \*\* Select of the following paragraphs and delete those not required.

Custom painted finish.

Decorative Sleeve.

Stainless Steel Sleeve.

* + - * 1. PLC Programming
			1. Options:

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following paragraphs and delete those not required.

* + - * 1. Manual hand pump to raise bollard during a power failure.
				2. Hydraulic oil heater/cooler.
				3. Emergency Fast Operate.
				4. Dual channel vehicle detector module.
				5. Traffic signal lights as indicated.
				6. Battery backup.
			1. Electrical Power Voltage Options:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs and delete those not required.

* + - * 1. 208-240 Volt AC, 3- Phase, 60 Hertz.
				2. 115-120 Volt AC, Single-Phase.
				3. 208-240 Volt AC, Single Phase.
				4. 380 Volt AC, 3- Phase.
				5. 440-480 Volt AC, 3- Phase.
		1. SP Titan Hydraulic Rising Bollard (K12): Below ground assembly consists of an outer casing complete with cable and drainage duct outlets and an inner bollard of heavy steel cylindrical tube capable of being raised above ground into the up position. Hydraulic cylinder capable of being removed without removal of the bollard column. Bollard column capable of being be removed without removal of the hydraulic cylinder and associated hydraulic hoses.
			1. Bollards consist of retractable, 10-3/4 inch diameter, round tubular columns with a full guard height of 38 inches (965 mm).
			2. When retracted the bollards are no more than 0.5 inch (13 mm) above the finished roadway.
			3. K12 certified by the U.S. Department of State (DOS) (15,000 lbs at 50 mph).
			4. Provide with replaceable road surface top plates and cover plates for interconnection box with an anti-skid surface, suitable for vehicle traffic.
			5. Features:
				1. Control: Contains all relays, timers and other devices necessary for all the operations of the system as defined. Locate control equipment above ground within the main control cabinet. Provide the following:

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following paragraphs and delete those not required.

Standard main operator control panel.

Custom main operator control panel.

Remote operator control panel.

* + - * 1. Control Cabinet: Size to house all control circuits, hydraulic pump(s) and other devices for operation of system. Provide control panel with a side access panel to manual override and main power supply isolator.

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs and delete the one not required.

Black Finish.

Stainless Steel finish.

* + - * 1. Hydraulic Unit:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs and delete those not required.

3 HP hydraulic unit.

5 HP hydraulic unit .

10 HP hydraulic unit.

* + - * 1. Barrier Position Sensor:

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following paragraphs and delete those not required.

Barrier-down position sensor.

Barrier-up position sensor .

* + - * 1. Weather proof HPU enclosure
				2. Bollard Finish:

\*\* NOTE TO SPECIFIER \*\* Select of the following paragraphs and delete those not required.

Custom painted finish.

Decorative Sleeve.

Stainless Steel Sleeve.

* + - * 1. PLC Programming
			1. Options:

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following paragraphs and delete those not required.

* + - * 1. Manual hand pump to raise bollard during a power failure.
				2. Hydraulic oil heater/cooler.
				3. Emergency Fast Operate.
				4. Dual channel vehicle detector module.
				5. Traffic signal lights as indicated.
				6. Battery backup.
			1. Electrical Power Voltage Options:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs and delete those not required.

* + - * 1. 208-240 Volt AC, 3- Phase, 60 Hertz.
				2. 115-120 Volt AC, Single-Phase.
				3. 208-240 Volt AC, Single Phase.
				4. 380 Volt AC, 3- Phase.
				5. 440-480 Volt AC, 3- Phase.
		1. SP 1000 Rising Bollard (K12 & PAS 68): Below ground assembly consists of a square outer casing complete with cable and drainage duct outlets and an inner bollard of heavy steel cylindrical tube and an aesthetic polymer sleeve capable of being raised above ground into the up position.
			1. Bollards consist of retractable, 12-3/4 inch (323 mm) diameter, round tubular columns with a full guard height of 39 inches (1000 mm).
			2. When retracted the bollards are flush with the finished roadway.
			3. K12 certified by the U.S. Department of State (DOS) (15,000 lbs at 50 mph).
			4. European standards certified PAS 68 (30T at 80 kph).
			5. Features:
				1. Control: Contains all relays, timers and other devices necessary for all the operations of the system as defined. Locate control equipment above ground within the main control cabinet. Provide the following:

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following paragraphs and delete those not required.

Standard main operator control panel.

Custom main operator control panel.

Remote operator control panel.

* + - * 1. Control Cabinet: Size to house all control circuits, hydraulic pump(s) and other devices for operation of system. Provide control panel with a side access panel to manual override and main power supply isolator.

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs and delete the one not required.

Black Finish.

Stainless Steel finish.

* + - * 1. Hydraulic Unit:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs and delete those not required.

3 HP hydraulic unit.

5 HP hydraulic unit.

10 HP hydraulic unit.

* + - * 1. Barrier Position Sensor:

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following paragraphs and delete those not required.

Barrier-down position sensor.

Barrier-up position sensor.

* + - * 1. Weather proof HPU enclosure.
				2. Bollard Finish:

\*\* NOTE TO SPECIFIER \*\* Select of the following paragraphs and delete those not required.

Custom painted finish.

Decorative Sleeve.

Stainless Steel Sleeve.

* + - * 1. PLC Programming
			1. Options:

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following paragraphs and delete those not required.

* + - * 1. Manual hand pump to raise bollard during a power failure.
				2. Hydraulic oil heater/cooler.
				3. Emergency Fast Operate.
				4. Dual channel vehicle detector module.
				5. Traffic signal lights as indicated.
				6. Battery backup.
			1. Electrical Power Voltage Options:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs and delete those not required.

* + - * 1. 208-240 Volt AC, 3- Phase, 60 Hertz.
				2. 115-120 Volt AC, Single-Phase.
				3. 208-240 Volt AC, Single Phase.
				4. 380 Volt AC, 3- Phase.
				5. 440-480 Volt AC, 3- Phase.
		1. SP Defender Hydraulic Rising Bollard (K4): Below ground assembly consists of an outer casing complete with cable and drainage duct outlets and an inner bollard of heavy steel cylindrical tube capable of being raised above ground into the up position. Hydraulic cylinder capable of being removed without removal of the bollard column. Bollard column s capable of being be removed without removal of the hydraulic cylinder, including associated hydraulic hoses.
			1. Bollards consist of retractable, 10-3/4 inch diameter, round tubular columns with a full guard height of 30 inches.
			2. When retracted the bollards are no more than 0.5 inch (13 mm) above the finished roadway.
			3. K4 certified by the U.S. Department of State (DOS) (15,000 lbs at 30 mph).
			4. Provide with replaceable road surface top plates and cover plates for interconnection box with an anti-skid surface, suitable for vehicle traffic.
			5. Features:
				1. Control: Contains all relays, timers and other devices necessary for all the operations of the system as defined. Locate control equipment above ground within the main control cabinet. Provide the following:

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following paragraphs and delete those not required.

Standard main operator control panel.

Custom main operator control panel.

Remote operator control panel.

* + - * 1. Control Cabinet: Size to house all control circuits, hydraulic pump(s) and other devices for operation of system. Provide control panel with a side access panel to manual override and main power supply isolator.

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs and delete the one not required.

Black Finish.

Stainless Steel finish.

* + - * 1. Hydraulic Unit:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs and delete those not required.

3 HP hydraulic unit.

5 HP hydraulic unit.

10 HP hydraulic unit.

* + - * 1. Barrier Position Sensor:

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following paragraphs and delete those not required.

Barrier-down position sensor.

Barrier-up position sensor .

* + - * 1. Weather proof HPU enclosure
				2. Bollard Finish:

\*\* NOTE TO SPECIFIER \*\* Select of the following paragraphs and delete those not required.

Custom painted finish.

Decorative Sleeve.

Stainless Steel Sleeve.

* + - * 1. PLC Programming.
			1. Options:

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following paragraphs and delete those not required.

* + - * 1. Manual hand pump to raise bollard during a power failure.
				2. Hydraulic oil heater/cooler.
				3. Emergency Fast Operate.
				4. Dual channel vehicle detector module.
				5. Traffic signal lights as indicated.
				6. Battery backup.
			1. Electrical Power Voltage Options:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs and delete those not required.

* + - * 1. 208-240 Volt AC, 3- Phase, 60 Hertz.
				2. 115-120 Volt AC, Single-Phase.
				3. 208-240 Volt AC, Single Phase.
				4. 380 Volt AC, 3- Phase.
				5. 440-480 Volt AC, 3- Phase.
		1. SP 400 Rising Bollard (K8 and PAS 68): Below ground assembly consists of a square outer casing complete with cable and drainage duct outlets and an inner bollard of heavy steel cylindrical tube and an aesthetic polymer sleeve capable of being raised above ground into the up position.
			1. Bollards consist of retractable, 8 inch (203 mm) diameter, round tubular columns with a full guard height of 39 inches (1000 mm).
			2. When retracted the bollards are flush with the finished roadway.
			3. K8 certified by the U.S. Department of State (DOS) (15,000 lbs at 40 mph).
			4. European standards certified PAS 68 (7.5T at 64 kph).
			5. Features:
				1. Control: Contains all relays, timers and other devices necessary for all the operations of the system as defined. Locate control equipment above ground within the main control cabinet. Provide the following:

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following paragraphs and delete those not required.

Standard main operator control panel.

Custom main operator control panel.

Remote operator control panel.

* + - * 1. Control Cabinet: Size to house all control circuits, hydraulic pump(s) and other devices for operation of system. Provide control panel with a side access panel to manual override and main power supply isolator.

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs and delete the one not required.

Black Finish.

Stainless Steel finish.

* + - * 1. Hydraulic Unit:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs and delete those not required.

3 HP hydraulic unit.

5 HP hydraulic unit .

10 HP hydraulic unit.

* + - * 1. Barrier Position Sensor:

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following paragraphs and delete those not required.

Barrier-down position sensor.

Barrier-up position sensor .

* + - * 1. Weather proof HPU enclosure
				2. Bollard Finish:

\*\* NOTE TO SPECIFIER \*\* Select of the following paragraphs and delete those not required.

Custom painted finish.

Decorative Sleeve.

Stainless Steel Sleeve.

* + - * 1. PLC Programming
			1. Options:

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following paragraphs and delete those not required.

* + - * 1. Manual hand pump to raise bollard during a power failure.
				2. Hydraulic oil heater/cooler.
				3. Emergency Fast Operate.
				4. Dual channel vehicle detector module.
				5. Traffic signal lights as indicated.
				6. Battery backup.
			1. Electrical Power Voltage Options:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs and delete those not required.

* + - * 1. 208-240 Volt AC, 3- Phase, 60 Hertz.
				2. 115-120 Volt AC, Single-Phase.
				3. 208-240 Volt AC, Single Phase.
				4. 380 Volt AC, 3- Phase.
				5. 440-480 Volt AC, 3- Phase.
		1. Shallow Mount Fixed Bollards (K4-K-12): Shallow mount requires an excavation of 4 inches (112 mm) and is engineered to meet K12 performance critieria (15,000 lbs vehicle at 50 mph), K4 (15,000 lbs vehicle at 30 mph) and to the European PAS68 standards (7.5T at 80 kph).
			1. Bollards consist of 10.75 inch (273 mm) diameter, round tubular columns with a full guard height of 35.5 inches (902 mm).
				1. Bollard Finish:

\*\* NOTE TO SPECIFIER \*\* Select of the following paragraphs and delete those not required.

Custom painted finish.

Decorative Sleeve.

Stainless Steel Sleeve.

* + 1. SP Titan Fixed Bollards (K-12): Engineered to meet K12 performance critieria (15,000 lbs vehicle at 50 mph).
			1. Bollards consist of 10.75 inch (273 mm) diameter, round tubular columns with a full guard height of 35.5 inches (902 mm).
				1. Bollard Finish:

\*\* NOTE TO SPECIFIER \*\* Select of the following paragraphs and delete those not required.

Custom painted finish.

Decorative Sleeve.

Stainless Steel Sleeve.

* + 1. SP 1000 Fixed Bollards (K-12 and PAS 68): Engineered to meet K12 performance critieria (15,000 lbs vehicle at 50 mph) and European standards certified PAS 68 (30T at 80 kph).
			1. Bollards consist of fixed, 12-3/4 inch (323 mm) diameter, round tubular columns with a full guard height of 39 inches (1000 mm).
				1. Bollard Finish:

\*\* NOTE TO SPECIFIER \*\* Select of the following paragraphs and delete those not required.

Custom painted finish.

Decorative Sleeve.

Stainless Steel Sleeve.

* + 1. SP 400 Fixed Bollard (K8): Engineered to meet K8 certified by the U.S. Department of State (DOS) (15,000 lbs at 40 mph).
			1. Bollards consist of fixed, 8 inch (203 mm) diameter, round tubular columns with a full guard height of 39 inches (1000 mm).
				1. Bollard Finish:

\*\* NOTE TO SPECIFIER \*\* Select of the following paragraphs and delete those not required.

Custom painted finish.

Decorative Sleeve.

Stainless Steel Sleeve.

* + 1. SP Defender Fixed Bollard (K4): Engineered to meet U.S. Department of State (DOS) (4,000 lbs at 30 mph).
			1. Bollards consist of fixed, 10-3/4 inch diameter, round tubular columns with a full guard height of 30 inches.
				1. Bollard Finish:

\*\* NOTE TO SPECIFIER \*\* Select of the following paragraphs and delete those not required.

Custom painted finish.

Decorative Sleeve.

Stainless Steel Sleeve.

* + 1. SP 100 Fixed Bollard (K8): Engineered to meet K8 certified by the U.S. Department of State (DOS) (15,000 lbs at 40 mph).
			1. Bollards consist of fixed, 8 inch (203 mm) diameter, round tubular columns with a full guard height of 39 inches (1000 mm).
				1. Bollard Finish:

\*\* NOTE TO SPECIFIER \*\* Select of the following paragraphs and delete those not required.

Custom painted finish.

Decorative Sleeve.

Stainless Steel Sleeve.

* 1. ACCESS CONTROL AND RESIDENTIAL BOLLARDS
		1. Globoll Rising Bollard: Below ground assembly consists of a square outer casing complete with cable and drainage duct outlets and an inner bollard of heavy steel cylindrical tube and an aesthetic polymer sleeve capable of being raised above ground into the up position.
			1. Bollards consist of retractable, 16 inch (406 mm) diameter, round tubular columns with a full guard height of 27.5 inches (700 mm).
			2. When retracted the bollards are flush with the finished roadway.
			3. Bollard is driven up and down by a hydraulic pump housed within the bollard casing.
			4. Features:
				1. Control: Contains all relays, timers and other devices necessary for all the operations of the system as defined. Locate control equipment above ground within the main control cabinet. Provide the following:

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following paragraphs and delete those not required.

Standard main operator control panel.

Custom main operator control panel.

Remote operator control panel.

* + - * 1. Control Cabinet: Size to house all control circuits, hydraulic pump(s) and other devices for operation of system. Provide control panel with a side access panel to manual override and main power supply isolator.

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs and delete the one not required.

Black Finish.

Stainless Steel finish.

* + - * 1. Hydraulic Unit: \_\_\_ HP.
				2. Bollard Finish:

\*\* NOTE TO SPECIFIER \*\* Select of the following paragraphs and delete those not required.

Custom painted finish.

Decorative Sleeve.

Stainless Steel Sleeve.

* + - * 1. PLC Programming
			1. Options:

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following paragraphs and delete those not required.

* + - * 1. GemGlow vandal resistant lighting in lid.
				2. Dual channel vehicle detector module.
				3. Traffic signal lights as indicated.
			1. Electrical Power Voltage: Control circuit operates from a 240/110 volt, 50Hz single phase supply. Provided with an internal transformer to reduce this to 24VC for all external devices.
		1. VP 200 Rising Bollard: Below ground assembly consists of a square outer casing complete with cable and drainage duct outlets and an inner bollard of heavy steel cylindrical tube and an aesthetic polymer sleeve capable of being raised above ground into the up position.
			1. Bollards consist of retractable, 6.5 inch (168 mm) diameter, round tubular columns with a full guard height of 27.5 inches (700 mm).
			2. When retracted the bollards are flush with the finished roadway.
			3. Features:
				1. Control: Contains all relays, timers and other devices necessary for all the operations of the system as defined. All control equipment shall be situated above ground and within the main control cabinet. Provide with the following access control capabilities:

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following paragraphs and delete those not required.

Intercom.

Radio Transmitter.

Proximity Cards.

Key Pad.

Token Operator.

Vehicle Recognition and Tags.

GPS.

* + - * 1. Control Cabinet: Weatherproof enclosure sized to house all control circuits, hydraulic pump(s) and other devices for operation of the system.

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs and delete the one not required.

Black Finish.

Stainless Steel finish.

* + - * 1. Hydraulic Unit: \_\_\_ HP.
				2. Bollard Finish:

\*\* NOTE TO SPECIFIER \*\* Select of the following paragraphs and delete those not required.

Custom painted finish.

Decorative Sleeve.

Stainless Steel Sleeve.

* + - 1. Options:

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following paragraphs and delete those not required.

* + - * 1. Dual channel vehicle detector module.
				2. Traffic signal lights as indicated.
			1. Electrical Power Voltage: Control circuit operates from a 240/110 volt, 50Hz single phase supply. Provided with an internal transformer to reduce this to 24VC for all external devices.
		1. VP 700 Rising Bollard: Below ground assembly consists of a square outer casing complete with cable and drainage duct outlets and an inner bollard of heavy steel cylindrical tube and an aesthetic polymer sleeve capable of being raised above ground into the up position.
			1. Bollards consist of retractable, 6.5 inch (168 mm) diameter, round tubular columns with a full guard height of 27.5 inches (700 mm).
			2. When retracted the bollards are flush with the finished roadway.
			3. Provided with red and green indicator lights and below grade loops to instruct the bollards to rise once a vehicle has passed and also to prevent bollards from rising underneath vehicles. Other loops such as approach loops are provided to send information to the system.
			4. Features:
				1. Control: Contains all relays, timers and other devices necessary for all the operations of the system as defined. All control equipment shall be situated above ground and within the main control cabinet. Provide with the following access control capabilities:

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following paragraphs and delete those not required.

Intercom.

Radio Transmitter.

Proximity Cards.

Key Pad.

Token Operator.

Vehicle Recognition and Tags.

GPS.

* + - * 1. Control Cabinet: Weatherproof enclosure sized to house all control circuits, hydraulic pump(s) and other devices for operation of the system.

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs and delete the one not required.

Black Finish.

Stainless Steel finish.

* + - * 1. Hydraulic Unit: \_\_\_ HP.
				2. Bollard Finish:

\*\* NOTE TO SPECIFIER \*\* Select of the following paragraphs and delete those not required.

Custom painted finish.

Decorative Sleeve.

Stainless Steel Sleeve.

* + - 1. Options:

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following paragraphs and delete those not required.

* + - * 1. Dual channel vehicle detector module.
				2. Traffic signal lights as indicated.
			1. Electrical Power Voltage: Control circuit operates from a 240/110 volt, 50Hz single phase supply. Provided with an internal transformer to reduce this to 24VC for all external devices.
		1. VP 50 Rising Bollard: Below ground assembly consists of a square outer casing complete with cable and drainage duct outlets and an inner bollard of heavy steel cylindrical tube and an aesthetic polymer sleeve capable of being raised above ground into the up position.
			1. Bollards consist of retractable, 4 inch (103 mm) diameter, round tubular columns with a full guard height of 31.5 inches (800 mm).
			2. When retracted the bollards are flush with the finished roadway.
			3. Features:
				1. Control: Provide with the following access control capabilities:

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following paragraphs and delete those not required.

Push Button.

Keyswitch.

Key Fob

* + - * 1. Control Cabinet: Weather proof enclosure sized to house all control circuits, hydraulic pump(s) and other devices for operation of the system.

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs and delete the one not required.

Black Finish.

Stainless Steel finish.

* + - * 1. Hydraulic Unit: \_\_\_ HP.
				2. Bollard Finish:

\*\* NOTE TO SPECIFIER \*\* Select of the following paragraphs and delete those not required.

Custom painted finish.

Decorative Sleeve.

Stainless Steel Sleeve.

* + - 1. Electrical Power Voltage: Control circuit operates from a 240/110 volt, 50Hz single phase supply. Provided with an internal transformer to reduce this to 24VC for all external devices.
		1. Genie MK11 Rising Bollard: Below ground assembly consists of a square outer casing complete with cable and drainage duct outlets and an inner bollard of heavy steel cylindrical tube and an aesthetic polymer sleeve capable of being raised above ground into the up position.
			1. Bollards consist of retractable, 4 inch (103 mm) diameter, round tubular columns with a full guard height of 19.5 inches (495 mm).
			2. When retracted the bollards are flush with the finished roadway.
			3. Features:
				1. Control: Provide with the following access control capabilities:

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following paragraphs and delete those not required.

Push Button.

Keyswitch.

Key Fob

* + - * 1. Control Cabinet: Weather proof enclosure sized to house all control circuits, hydraulic pump(s) and other devices for operation of the system.

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs and delete the one not required.

Black Finish.

Stainless Steel finish.

* + - * 1. Hydraulic Unit: \_\_\_ HP.
				2. Bollard Finish:

\*\* NOTE TO SPECIFIER \*\* Select of the following paragraphs and delete those not required.

Custom painted finish.

Decorative Sleeve.

Stainless Steel Sleeve.

* + - 1. Electrical Power Voltage: Control circuit operates from a 240/110 volt, 50Hz single phase supply. Provided with an internal transformer to reduce this to 24VC for all external devices.
	1. WEDGE BARRIERS
		1. SP Sentinel K12 Wedge Barrier: K12 crash test certified wedge features automatic raising and lowering, and installs flush to the finished roadway when retracted.
			1. Certification: K12 certified by the U.S.Department of State (DOS) 15,000 lbs at 50 mph (6804 kg at 80 km/h).
			2. Construction: Welded structural frame encloses all barrier mechanisms, and to reacts to crash loads when in the fully deployed position.
				1. Frame shall not exceed 12 inches (305 mm) high.
				2. Frame incorporates a field installed anchoring method to ensure the barrier is properly secured to reinforced concrete foundation.
				3. Barrier shall be capable of being installed at an excavation depth not exceeding 18 inches (457 mm).
				4. Each barrier pivot joint is provided with a grease-less bushing system.
				5. Provide with hydraulic cylinder for raising the barrier.

Hydraulic cylinder capable of being removed without requiring removal of the barrier wedge mechanism.

Upward movement of the barrier wedge shall use the hydraulic cylinder as the mechanical stop, so that there are no forces and/or loads applied into the barrier frame in the raised position.

* + - * 1. Hydraulic cylinder cap and rod end clevis pivots provided with replaceable grease-less bushings.
				2. Provide barrier with a road surface top plate, constructed of steel plate with an anti-skid surface.
			1. Operation:
				1. Barrier capable of at least 120 complete up/down cycles per hour.
				2. Barrier shall rise in approximately 3-5 seconds, when operating at normal ambient temperature conditions.
				3. Barrier shall be capable of being lowered in not more than 5 seconds, when operating at normal ambient temperature conditions.
				4. Barrier motion shall be instantly reversible in either direction
				5. Barrier shall be capable of operating in a temperature range of 32 degrees F to 120 degrees F (0 degrees C to 48 degrees C), without heaters or heat exchangers.

\*\* NOTE TO SPECIFIER \*\* Include one of the following two optional paragraphs if required for lower or higher ambient temperatures. Delete if not required.

* + - * 1. When site ambient operating temperatures are at or below 32 degrees F (0 degrees C) provide with an HPU reservoir heater, hose and barrier heaters, and associated controls and circuitry.
				2. When site ambient operating temperatures exceed 120 degrees F (48 degrees C) provide with a hydraulic fluid (Air-to-oil) heat exchanger, electrical enclosure cooling system and associated controls.
				3. Vehicle barrier system shall provide two methods of operation for use during electrical power loss or selected equipment failures:

Stored hydraulic pressure utilizing a hydro-pneumatic accumulator, sized to allow no less than a 1-cycle operation, on a fully charged system.

Integrated, manual hand pump to raise and lower of the barrier.

\*\* NOTE TO SPECIFIER \*\* Include the following optional paragraph if required. Delete if not required.

* + - * 1. Provide with Emergency Fast Operation (EFO) function capable of raising the barrier to the full guard position in 1.5 seconds.
			1. Hydraulics and Hydraulic Power Unit:
				1. Provide Hydraulic Power Unit (HPU) for supplying hydraulic fluid power to raise and lower the barrier.
				2. HPU shall be remotely located at a maximum distance of 100 feet (30.5 meters) from the barrier.
			2. Electrical:
				1. Electrical Power Voltage Options:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs and delete those not required. Note: Single phase input power is not recommended as it will limit the installed system horsepower, increase operating noise and may reduce motor life.

115-120 Volt AC, Single-Phase, 60Hz

230 Volt AC, Three-Phase, 60 Hz

460 Volt AC, Three-Phase, 60 Hz

575 Volt AC, Three-Phase, 60 Hz

220 Volt AC, Three-Phase, 50 Hz

380 Volt AC, Three-Phase, 50 Hz

400 Volt AC, Three-Phase, 50 Hz

* + - * 1. Provide all electrical circuits with overload and short circuit protection.
			1. Controls:
				1. Electrical controls and monitoring shall be programmable, utilizing a ruggedized, industrial type Programmable Logic Controller (PLC) conforming to the following:

Standard commercial, off-the-shelf PLC, and shall not use "custom" sole-source printed circuit type control boards, proprietary programming language or use of machine code.

Solid state and microprocessor based to manage all control and monitoring functions.

Utilize replaceable or expandable I/O modules on terminal strips to prevent disturbing wiring.

Hard-wired control relays alone may not be used.

PLC programming monitoring and troubleshooting shall be capable of being performed utilizing a laptop computer or integrated system monitoring option, to aid in fault diagnostics.

* + - * 1. All control and monitoring circuits, including signals, shall operate using low voltage, 24 VDC for safety, outside of the main electrical enclosure.
				2. Mount all high voltage electrical switchgear mounted inside the electrical enclosure including, electrical power feed circuit breaker, motor starters, heater contactors, etc.
				3. Electrical switchgear components shall be UL and/or CE labeled.
				4. Low voltage proximity sensor shall be provided for monitoring the position of the barrier.
			1. Control Panels:
				1. Provide operator control panels and associated control circuits to between all barrier locations, operator control panels and the HPU.

Main Operator Control Panel shall be located where indicated on the Drawings.

Remote Operator Control Panels shall be physically located in close proximity to each barrier.

Operator control panels shall be mounted in an indoor, covered environment, and shall not be exposed to weather and environmental conditions.

Operator control panels shall be mounted in such way that the operator always has visual (eye or camera) supervision on the barrier, when operating the barrier.

* + - * 1. Control circuit shall be part of the PLC and associated equipment, integral with the HPU electrical enclosure.

Control circuit functions and monitoring is programmed into the PLC.

Operator control panel switches and indicators shall interface with the PLC Inputs/Outputs.

All operator control panel switches and indicators are pre-wired to wiring terminal strips.

* + - * 1. Electrical switch and indicator components UL and/or CE labeled.
				2. Electrical switch and indicator components shall be mounted in a sealed, NEMA 12 (or IP 65 equivalent) enclosure.
				3. Main Operator Control Panel for control and indication of all vehicle barrier system functions. Provide with:

Key lockable Main Power On/Off switch (key switch), with an associated green color main power On/Off indicator light.

Set of illuminated pushbuttons for Up/Down control, to raise and lower each set of Barriers.

Set of Up/Down indicator lights for indicating the position of each set of Barriers. The Up indicator lights shall be red, and the down indicator lights shall be green. Indicators lights shall be provided integral to the Up/Down illuminated pushbuttons switches.

Key lockable Enable/Disable switch to permit operation of each of the Remote Operator Control Panels.

Red color illuminated switch for Emergency Fast Operate (EFO) to rapidly raise all Barriers in the vehicle barrier system. The EFO switch shall be provided with a transparent flip cover.

Reset: A White color pushbutton for EFO Reset, to restore the vehicle barrier system to normal operation after activating the EFO function.

Emergency stop switch to immediately stop the movement of barrier in any position. Button will be yellow/red. Emergency stop cannot be activated when the EFO is active. EFO can be activated when emergency stop is active. Reset for emergency stop, to restore the vehicle barrier system to normal operation after activating the emergency stop function, is integrated in the emergency stop pushbutton by means of turn-to-reset function.

Red color Check Oil indicator light for indicating a low level in the reservoir, or a hydraulic fluid over-temperature condition.

Main operator control panels provided as a standard sloped, electrical enclosure console, suitable for countertop or wall mounting.

* + - * 1. Remote Operator Control Panels as indicated, shall be provided for control and indication of each barrier within the overall vehicle barrier system. Provide with:

Green color panel On indicator light for indicating the panel has been enabled for operation by the key switch on the Main Operator Control Panel.

Set of illuminated pushbuttons for Up/Down control, to deploy and retract each set of Barriers.

Set of Up/Down indicator lights for indicating the position of each set of Barriers. Up indicator lights shall be red, and down indicator lights shall be green. Indicators lights shall be provided integral to the Up/Down illuminated pushbuttons switches.

Key lockable Enable/Disable switch to permit operation of each of the Remote Operator Control Panels in the vehicle barrier system.

Covered Red color illuminated switch for Emergency Fast Operate (EFO) to rapidly deploy all Barriers in the vehicle barrier system. EFO switch is provided with a transparent flip cover.

Reset: White color pushbutton for EFO Reset, to restore the vehicle barrier system to normal operation after activating the EFO function.

Emergency stop switch to immediately stop movement of the barrier in any position. Button will be yellow/red. Emergency stop cannot be activated when the EFO is active. EFO can be activated when emergency stop is active. Reset for emergency stop, to restore the vehicle barrier system to normal operation after activating the emergency stop function, is integrated in the emergency stop pushbutton by means of turn-to-reset function.

Red color Check Oil indicator light for indicating a low level in the reservoir, or a hydraulic fluid over-temperature condition.

Operator control panels provided as a standard sloped, electrical enclosure console, suitable for countertop or wall mounting.

* + - 1. Finish:
				1. Barrier frame, mechanism linkages and top plate shall be protected from the affects of long-term corrosion.
				2. Barrier top plate shall be painted with a zinc-rich primer and a zinc-rich exterior grade top coat in standard black color.
				3. Barrier front plate shall be painted with an exterior grade standard black color with high visibility diagonal yellow stripes, visible when the barrier is in the raised position.

\*\* NOTE TO SPECIFIER \*\* Select the following optional paragraph if required and delete if not required.

* + - * 1. Face Plate Light Package: Provide two 4 inch diameter red LED lights on the ends of the face plate and one White strobe light in the center of the face plate.
		1. Magnum K12 Anti-Ram Wedge Barrier: K12 crash test certified wedge features automatic raising and lowering, and installs flush to the finished roadway when retracted.
			1. Certification: K12 certified by the U.S.Department of State (DOS) 15,000 lbs at 50 mph (6804 kg at 80 km/h).
			2. Construction: Welded structural frame encloses all barrier mechanisms, and to reacts to crash loads when in the fully deployed position.
				1. Height: Guard shall be no less than 32 inches (813 mm) high.
				2. Width:

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following paragraphs and delete those not required. The following are standard widths available. Contact the manufacturer for custom width availability.

8 feet (2.4 mm).

10 feet (3.0 meters).

12 feet (3.6 meters).

As indicated on the Drawings.

* + - * 1. Frame incorporates a field installed anchoring method to ensure the barrier is properly secured to the surrounding reinforced concrete foundation.
				2. Barrier shall be capable of being installed at an excavation depth not exceeding 51.5 inches (1308 mm).
				3. Each barrier pivot joint is provided with a grease-less bushing system.
				4. Provide with hydraulic cylinder for raising the barrier.

Hydraulic cylinder shall be capable of being removed without requiring removal of the barrier wedge mechanism.

Upward movement of the barrier wedge shall use the hydraulic cylinder as the mechanical stop, so that there are no forces and/or loads applied into the barrier frame in the raised position.

* + - * 1. Hydraulic cylinder cap and rod end clevis pivots provided with replaceable grease-less bushings.
				2. Provide barrier with a road surface top plate, constructed of steel plate with an anti-skid surface.
			1. Operation:
				1. Barrier shall be capable of at least 60 complete up/down cycles per hour.
				2. Barrier shall rise in approximately 5 seconds, when operating at normal ambient temperature conditions.
				3. Barrier shall be capable of being lowered in not more than 5 seconds, when operating at normal ambient temperature conditions.
				4. Barrier motion shall be instantly reversible in either direction
				5. Barrier shall be capable of operating in a temperature range of 50 degrees F to 120 degrees F (10 degrees C to 48 degrees C), without heaters or heat exchangers.

\*\* NOTE TO SPECIFIER \*\* Include one of the following two optional paragraphs if required for lower or higher ambient temperatures. Delete if not required.

* + - * 1. When site ambient operating temperatures are at or below 32 degrees F (0 degrees C) provide with an HPU reservoir heater, hose and barrier heaters, and associated controls and circuitry.
				2. When site ambient operating temperatures exceed 120 degrees F (48 degrees C) provide with a hydraulic fluid (Air-to-oil) heat exchanger, electrical enclosure cooling system and associated controls.
				3. Vehicle barrier system shall provide two methods of operation for use during electrical power loss or selected equipment failures:

Stored hydraulic pressure utilizing a hydro-pneumatic accumulator, sized to allow no less than a 1-cycle operation, on a fully charged system.

Integrated, manual hand pump to raise and lower of the barrier.

\*\* NOTE TO SPECIFIER \*\* Include the following optional paragraph if required. Delete if not required.

* + - * 1. Provide with optional Emergency Fast Operation (EFO) function capable of raising the barrier to the full guard position in no more than 1.5 seconds.
			1. Hydraulics and Hydraulic Power Unit:
				1. Provide a Hydraulic Power Unit (HPU) for supplying hydraulic fluid power to raise and lower the barrier.
				2. HPU shall be remotely located at a maximum distance of 100 feet (30.5 meters) from the barrier.
			2. Electrical:
				1. Electrical Power Voltage Options:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs and delete those not required. Note: Single phase input power is not recommended as it will limit the installed system horsepower, increase operating noise and may reduce motor life.

115-120 Volt AC, Single-Phase, 60Hz

230 Volt AC, Three-Phase, 60 Hz

460 Volt AC, Three-Phase, 60 Hz

575 Volt AC, Three-Phase, 60 Hz

220 Volt AC, Three-Phase, 50 Hz

380 Volt AC, Three-Phase, 50 Hz

400 Volt AC, Three-Phase, 50 Hz

* + - * 1. Provide all electrical circuits with overload and short circuit protection.
			1. Controls:
				1. Electrical controls and monitoring shall be programmable, utilizing a ruggedized, industrial type Programmable Logic Controller (PLC) conforming to the following:

Standard commercial, off-the-shelf PLC, and shall not use "custom" sole-source printed circuit type control boards, proprietary programming language or use of machine code.

Solid state and microprocessor based to manage all control and monitoring functions.

Utilize replaceable or expandable I/O modules on terminal strips to prevent disturbing wiring.

Hard-wired control relays alone may not be used.

PLC programming monitoring and troubleshooting shall be capable of being performed utilizing a laptop computer or integrated system monitoring option, to aid in fault diagnostics.

* + - * 1. All control and monitoring circuits, including signals, shall operate using low voltage, 24 VDC for safety, outside of the main electrical enclosure.
				2. Mount all high voltage electrical switchgear mounted inside the electrical enclosure including, electrical power feed circuit breaker, motor starters, heater contactors, etc.
				3. Electrical switchgear components shall be UL and/or CE labeled.
				4. Low voltage proximity sensor shall be provided for monitoring the position of the barrier.
			1. Control Panels:
				1. Provide operator control panels and associated control circuits to between all barrier locations, operator control panels and the HPU.

Main Operator Control Panel shall be located where indicated on the Drawings.

Remote Operator Control Panels shall be physically located in close proximity to each barrier.

Operator control panels shall be mounted in an indoor, covered environment, and shall not be exposed to weather and environmental conditions.

Operator control panels shall be mounted in such way that the operator always has visual (eye or camera) supervision on the barrier, when operating the barrier.

* + - * 1. Control circuit shall be part of the PLC and associated equipment, integral with the HPU electrical enclosure.

Control circuit functions and monitoring is programmed into the PLC.

Operator control panel switches and indicators shall interface with the PLC Inputs/Outputs.

All operator control panel switches and indicators are pre-wired to wiring terminal strips.

* + - * 1. Electrical switch and indicator components UL and/or CE labeled.
				2. Electrical switch and indicator components shall be mounted in a sealed, NEMA 12 (or IP 65 equivalent) enclosure.
				3. Main Operator Control Panel for control and indication of all vehicle barrier system functions. Provide with:

Key lockable Main Power On/Off switch (key switch), with an associated green color main power On/Off indicator light.

Set of illuminated pushbuttons for Up/Down control, to raise and lower each set of Barriers.

Set of Up/Down indicator lights for indicating the position of each set of Barriers. The Up indicator lights shall be red, and the down indicator lights shall be green. Indicators lights shall be provided integral to the Up/Down illuminated pushbuttons switches.

Key lockable Enable/Disable switch to permit operation of each of the Remote Operator Control Panels.

Red color illuminated switch for Emergency Fast Operate (EFO) to rapidly raise all Barriers in the vehicle barrier system. The EFO switch shall be provided with a transparent flip cover.

Reset: A White color pushbutton for EFO Reset, to restore the vehicle barrier system to normal operation after activating the EFO function.

Emergency stop switch to immediately stop the movement of barrier in any position. Button will be yellow/red. Emergency stop cannot be activated when the EFO is active. EFO can be activated when emergency stop is active. Reset for emergency stop, to restore the vehicle barrier system to normal operation after activating the emergency stop function, is integrated in the emergency stop pushbutton by means of turn-to-reset function.

Red color Check Oil indicator light for indicating a low level in the reservoir, or a hydraulic fluid over-temperature condition.

Main operator control panels provided as a standard sloped, electrical enclosure console, suitable for countertop or wall mounting.

* + - * 1. Remote Operator Control Panels as indicated, shall be provided for control and indication of each barrier within the overall vehicle barrier system. Provide with:

Green color panel On indicator light for indicating the panel has been enabled for operation by the key switch on the Main Operator Control Panel.

Set of illuminated pushbuttons for Up/Down control, to deploy and retract each set of Barriers.

Set of Up/Down indicator lights for indicating the position of each set of Barriers. Up indicator lights shall be red, and down indicator lights shall be green. Indicators lights shall be provided integral to the Up/Down illuminated pushbuttons switches.

Key lockable Enable/Disable switch to permit operation of each of the Remote Operator Control Panels in the vehicle barrier system.

Covered Red color illuminated switch for Emergency Fast Operate (EFO) to rapidly deploy all Barriers in the vehicle barrier system. EFO switch is provided with a transparent flip cover.

Reset: White color pushbutton for EFO Reset, to restore the vehicle barrier system to normal operation after activating the EFO function.

Emergency stop switch to immediately stop movement of the barrier in any position. Button will be yellow/red. Emergency stop cannot be activated when the EFO is active. EFO can be activated when emergency stop is active. Reset for emergency stop, to restore the vehicle barrier system to normal operation after activating the emergency stop function, is integrated in the emergency stop pushbutton by means of turn-to-reset function.

Red color Check Oil indicator light for indicating a low level in the reservoir, or a hydraulic fluid over-temperature condition.

Operator control panels provided as a standard sloped, electrical enclosure console, suitable for countertop or wall mounting.

* + - 1. Finish:
				1. Barrier frame, mechanism linkages and top plate shall be protected from the affects of long-term corrosion.
				2. Barrier top plate shall be painted with a zinc-rich primer and a zinc-rich exterior grade top coat in standard black color.
				3. Barrier front plate shall be painted with an exterior grade standard black color with high visibility diagonal yellow stripes, visible when the barrier is in the raised position.

\*\* NOTE TO SPECIFIER \*\* Select the following optional paragraph if required and delete if not required.

* + - * 1. Face Plate Light Package: Provide two 4 inch diameter red LED lights on the ends of the face plate and one White strobe light in the center of the face plate.
	1. CRASH BEAM BARRIERS
		1. Patriot K12 Crash Beam Barrier: K12 crash test certified rising beam deters both vehicle and pedestrian traffic.
			1. Certification: K12 certified by the U.S.Department of State (DOS) 15,000 lbs at 50 mph (6804 kg at 80 km/h).
			2. Construction: Welded structural frame encloses all barrier mechanisms, and to reacts to crash loads when in the fully deployed position.
				1. Height: Guard shall be no less than 36 inches (914 mm) high. When lowered the beam shall extend no more than 0.5 inch (13 mm) above the roadway surface.
				2. Width:

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following paragraphs and delete those not required. The following are standard widths available. Contact the manufacturer for custom width availability.

12 feet (3.6 meters).

18 feet (5.5 meters).

24feet (7.3 meters).

As indicated on the Drawings.

* + - * 1. Rising beam is semi-floating.

Beam and mechanism permits the use of the barrier on roadways that are not perfectly level or flat.

Barrier shall be capable of being installed and operated on cross-sloped roadways.

Provide large clearances between the beam and side columns to permit both forward/back and side-to-side movement.

Beam shall be replaceable after a low impact crash if the side columns are undamaged.

* + - * 1. Provide welded structural side columns s to enclose the barrier mechanisms, and react crash loads when the beam is raised.

Space underground portion of the barrier side columns to the outboard side of the roadway, so as to not interfere with utilities at the center of a roadway.

Barrier shall be capable of being installed using excavation depth not exceeding 66 inches (1676 mm) deep.

Above roadway structural side columns and beam actuator shall not exceed 86.5 inches (2197 mm) high.

* + - * 1. Side columns on each side of barrier shall:

Allow a variety of different type of building or trim materials to be used around the side columns.

Provide a convenient place to mount accessories, such as traffic lights, warning lights, caution signage, roadway lighting, additional IR sensors for detecting the presence of vehicles and/or pedestrians.

* + - * 1. Provide a welded and formed trough to contain the beam in the lowered position.

The below roadway surface for the trough spanning across the roadway shall not exceed 16.25 inches (413 mm) deep, to permit the routing of properly buried utilities located under the roadway.

Clearances in the trough shall accommodate some permanent deflection of the beam after a crash (attack), dependant on the severity of the crash. The clearances shall be provided to permit short-term continued use of the barrier after vehicle wreckage is cleared from the barrier.

Clearances between the sides of the beam and sides of the trough shall be tolerant of some roadway debris, sediment, snow and ice build-up, before affecting barrier operation.

Trough shall be easy to clean when the beam is in the up position.

Provide with water drain connections at both ends.

* + - * 1. No active parts, components and/or mechanism shall protrude beyond or underneath the bottom of the trough.
				2. Beam and mechanism clearances shall be controlled by the use of bearing (rub) pads.

Pads shall be easily removable and replaceable, using small hand tools without any major disassembly of barrier parts and/or elements.

All rubbing or contact surfaces shall be non-lubricated.

Barrier shall not require lubrication and utilize no grease fittings.

* + - * 1. Hydraulic cylinders for raising the beam.

Locate above grade to permit easy access for repair, and to prevent effects due to corrosion or deterioration due to flooding, or sitting submerged in water.

Hydraulic cylinder shall be capable of being removed without requiring removal of the barrier beam and/or supporting structure.

Upward movement of the beam shall use the hydraulic cylinders as the mechanical stop, so that there are no forces and/or loads applied into the barrier side columns in the raised position.

* + - * 1. Provide hydraulic cylinder with swivel ball type joints that shall:

Permit a limited amount of rotation in all directions.

Permit semi-floating of the beam, to prevent damage to the cylinder rod.

Prevent side loads being induced into the cylinder tp increase cylinder life.

Be corrosion resistant, non-metallic type that does not corrode.

Be capable of operating dry, and shall not require lubrication.

Not gall like brass or metal bushings, shall not extrude or creep under barrier loads and shall not absorb moisture.

* + - * 1. Provide Shim Sets for installation and future adjustment. Shim sets shall:

Set clearances between the cylinder rod end and the beam, and the cylinder mount and the barrier columns.

Slotted shims so they can be installed and removed by merely loosening the clamping bolt. Bolts shall not need to be fully removed to make shim adjustments, nor require major disassembly of parts and/or elements to add or remove shims.

* + - * 1. Provide beam with a anti-skid road surface suitable for vehicle traffic.
				2. Provide rubber jounce bumpers at both ends of beam movement. Jounce bumpers shall:

Dampen mechanical shock by decelerating the movement at both ends of beam stroke, and also minimize noise, essentially eliminating the stopping "clang" noise.

Provide on the stationary columns for the beam raised-position.

Provide in the trough for the beam lowered-position.

Support the beam on a small annulus area and create a natural space approximately 4 inches (101 mm) from bottom of beam to bottom of trough. Space provided between the beam and bottom of trough shall permit the barrier to be tolerant of some roadway debris, sediment, snow and ice build-up, before affecting barrier operation.

High load carrying capacity capable of supporting the weight of a vehicle when the beam is in the lowered, at rest position.

Easily replaceable and require no maintenance.

* + - 1. Operation:
				1. Barrier shall be capable of at least 60 complete up/down cycles per hour.
				2. Barrier motion shall be instantly reversible in either direction.
				3. Barrier shall rise in approximately 3-5 seconds, when operating at normal ambient temperature conditions.
				4. Barrier shall be capable of being lowered in not more than 5 seconds, when operating at normal ambient temperature conditions.
				5. Barrier shall be capable of operating in a temperature range of 50 degrees F to 120 degrees F (10 degrees C to 48 degrees C), without heaters or heat exchangers.

\*\* NOTE TO SPECIFIER \*\* Include one of the following two optional paragraphs if required for lower or higher ambient temperatures. Delete if not required.

* + - * 1. When site ambient operating temperatures are at or below 32 degrees F (0 degrees C) provide with an HPU reservoir heater, hose and barrier heaters, and associated controls and circuitry.
				2. When site ambient operating temperatures exceed 120 degrees F (48 degrees C) provide with a hydraulic fluid (Air-to-oil) heat exchanger, electrical enclosure cooling system and associated controls.
				3. Vehicle barrier system shall provide two methods of operation for use during electrical power loss or selected equipment failures:

Stored hydraulic pressure utilizing a hydro-pneumatic accumulator, sized to allow no less than a 1-cycle operation, on a fully charged system.

Integrated, manual hand pump to raise and lower of the barrier.

\*\* NOTE TO SPECIFIER \*\* Include the following optional paragraph if required. Delete if not required.

* + - * 1. Provide with optional Emergency Fast Operation (EFO) function capable of raising the barrier to the full guard position in no more than 1.5 seconds.
			1. Hydraulics and Hydraulic Power Unit:
				1. Provide a Hydraulic Power Unit (HPU) for supplying hydraulic fluid power to raise and lower the barrier.
				2. HPU shall be remotely located at a maximum distance of 100 feet (30.5 meters) from the barrier.
			2. Electrical:
				1. Electrical Power Voltage Options:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs and delete those not required. Note: Single phase input power is not recommended as it will limit the installed system horsepower, increase operating noise and may reduce motor life.

115-120 Volt AC, Single-Phase, 60Hz

230 Volt AC, Three-Phase, 60 Hz

460 Volt AC, Three-Phase, 60 Hz

575 Volt AC, Three-Phase, 60 Hz

220 Volt AC, Three-Phase, 50 Hz

380 Volt AC, Three-Phase, 50 Hz

400 Volt AC, Three-Phase, 50 Hz

* + - * 1. Provide all electrical circuits with overload and short circuit protection.
			1. Controls:
				1. Electrical controls and monitoring shall be programmable, utilizing a ruggedized, industrial type Programmable Logic Controller (PLC) conforming to the following:

Standard commercial, off-the-shelf PLC, and shall not use "custom" sole-source printed circuit type control boards, proprietary programming language or use of machine code.

Solid state and microprocessor based to manage all control and monitoring functions.

Utilize replaceable or expandable I/O modules on terminal strips to prevent disturbing wiring.

Hard-wired control relays alone may not be used.

PLC programming monitoring and troubleshooting shall be capable of being performed utilizing a laptop computer or integrated system monitoring option, to aid in fault diagnostics.

* + - * 1. All control and monitoring circuits, including signals, shall operate using low voltage, 24 VDC for safety, outside of the main electrical enclosure.
				2. Mount all high voltage electrical switchgear mounted inside the electrical enclosure including, electrical power feed circuit breaker, motor starters, heater contactors, etc.
				3. Electrical switchgear components shall be UL and/or CE labeled.
				4. Low voltage proximity sensor shall be provided for monitoring the position of the barrier.
			1. Control Panels:
				1. Provide operator control panels and associated control circuits to between all barrier locations, operator control panels and the HPU.

Main Operator Control Panel shall be located where indicated on the Drawings.

Remote Operator Control Panels shall be physically located in close proximity to each barrier.

Operator control panels shall be mounted in an indoor, covered environment, and shall not be exposed to weather and environmental conditions.

Operator control panels shall be mounted in such way that the operator always has visual (eye or camera) supervision on the barrier, when operating the barrier.

* + - * 1. Control circuit shall be part of the PLC and associated equipment, integral with the HPU electrical enclosure.

Control circuit functions and monitoring is programmed into the PLC.

Operator control panel switches and indicators shall interface with the PLC Inputs/Outputs.

All operator control panel switches and indicators are pre-wired to wiring terminal strips.

* + - * 1. Electrical switch and indicator components UL and/or CE labeled.
				2. Electrical switch and indicator components shall be mounted in a sealed, NEMA 12 (or IP 65 equivalent) enclosure.
				3. Main Operator Control Panel for control and indication of all vehicle barrier system functions. Provide with:

Key lockable Main Power On/Off switch (key switch), with an associated green color main power On/Off indicator light.

Set of illuminated pushbuttons for Up/Down control, to raise and lower each set of Barriers.

Set of Up/Down indicator lights for indicating the position of each set of Barriers. The Up indicator lights shall be red, and the down indicator lights shall be green. Indicators lights shall be provided integral to the Up/Down illuminated pushbuttons switches.

Key lockable Enable/Disable switch to permit operation of each of the Remote Operator Control Panels.

Red color illuminated switch for Emergency Fast Operate (EFO) to rapidly raise all Barriers in the vehicle barrier system. The EFO switch shall be provided with a transparent flip cover.

Reset: A White color pushbutton for EFO Reset, to restore the vehicle barrier system to normal operation after activating the EFO function.

Emergency stop switch to immediately stop the movement of barrier in any position. Button will be yellow/red. Emergency stop cannot be activated when the EFO is active. EFO can be activated when emergency stop is active. Reset for emergency stop, to restore the vehicle barrier system to normal operation after activating the emergency stop function, is integrated in the emergency stop pushbutton by means of turn-to-reset function.

Red color Check Oil indicator light for indicating a low level in the reservoir, or a hydraulic fluid over-temperature condition.

Main operator control panels provided as a standard sloped, electrical enclosure console, suitable for countertop or wall mounting.

* + - * 1. Remote Operator Control Panels as indicated, shall be provided for control and indication of each barrier within the overall vehicle barrier system. Provide with:

Green color panel On indicator light for indicating the panel has been enabled for operation by the key switch on the Main Operator Control Panel.

Set of illuminated pushbuttons for Up/Down control, to deploy and retract each set of Barriers.

Set of Up/Down indicator lights for indicating the position of each set of Barriers. Up indicator lights shall be red, and down indicator lights shall be green. Indicators lights shall be provided integral to the Up/Down illuminated pushbuttons switches.

Key lockable Enable/Disable switch to permit operation of each of the Remote Operator Control Panels in the vehicle barrier system.

Covered Red color illuminated switch for Emergency Fast Operate (EFO) to rapidly deploy all Barriers in the vehicle barrier system. EFO switch is provided with a transparent flip cover.

Reset: White color pushbutton for EFO Reset, to restore the vehicle barrier system to normal operation after activating the EFO function.

Emergency stop switch to immediately stop movement of the barrier in any position. Button will be yellow/red. Emergency stop cannot be activated when the EFO is active. EFO can be activated when emergency stop is active. Reset for emergency stop, to restore the vehicle barrier system to normal operation after activating the emergency stop function, is integrated in the emergency stop pushbutton by means of turn-to-reset function.

Red color Check Oil indicator light for indicating a low level in the reservoir, or a hydraulic fluid over-temperature condition.

Operator control panels provided as a standard sloped, electrical enclosure console, suitable for countertop or wall mounting.

* + - 1. Finish:
				1. Barrier frame, mechanism linkages and top plate shall be protected from the affects of long-term corrosion.
				2. Paint barrier top plate with zinc-rich primer and zinc-rich exterior grade top coat in standard black color.
				3. Paint barrier front plate with exterior grade standard black color with high visibility diagonal yellow stripes, visible when barrier is in the raised position.
		1. SSP Sidewinder Drop Arm: Certified by Department of the Navy publication Operational Requirement No. 098-09-88: Operational Requirements for Secure Structures Ashore (Locks and Barriers, 1986 (10,000 lbs at 50 mph (4535 kg at 80 km/h) / 10,000 lbs at 15 mph (4535 kg at 24 km/h).
			1. Construction: Welded structural side posts provided to support drop arm on both sides of the roadway, and to react crash loads when drop arm is lowered.
				1. Height: No less than 44 inches (1117 mm) high when lowered.
				2. Width:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs and delete the one not required. The following are standard widths available.

12 feet (3.6 meters).

13 feet (3.9 meters).

As indicated on the Drawings.

* + - * 1. Drop arm constructed of carbon steel with a 1 inch (25.4 mm) diameter high strength cable through the center of the beam.
				2. Provide welded structural side columns to enclose the barrier mechanisms, and react crash loads when the beam is raised.

Barrier shall be capable of being installed using excavation depth not exceeding 48 inches (1219 mm) deep.

Above roadway structural side columns and beam actuator shall not exceed 52 inches (1321 mm) high.

* + - * 1. Provide external, industrial grade, adjustable shock absorbers at the end of travel for drop arm up position, and a high-compression, elastomeric composite dampening pad or the down position.
				2. All wear items of the barrier, and the majority of the items that might be damaged due to accidental vehicle contact shall be field-replaceable.
				3. Barrier components shall be configured to allow easy replacement of items that might be damaged due to accidental vehicle contact.
				4. Drop arm pivot pin, and associated wear bushings shall be capable of being removed and replaced without requiring removal of the drop arm.
				5. Provide each barrier drop arm pivot joint with a standard grease fitting
				6. Drop arm can be removed without requiring removal of the hydraulic cylinder and associated hydraulic hoses.
				7. Hydraulic cylinder for raising and lowering the drop arm.

Capable of being removed without removal of drop arm.

Use hydraulic cylinder as the mechanical stop for upward movement, so that no forces or loads are applied into the barrier posts in the raised position.

Locate between the two roadside support posts.

Provided with removable clevis pins, retained with spring clips.

* + - * 1. Hydraulic cylinder cap and rod end clevis pivots shall be provided with a replaceable bushing.

Corrosion resistant, non-metallic type that does not corrode.

Flanged type, to accommodate both axial and radial loads.

Capable of operating dry, and shall not require lubrication.

Not gall like brass or metal bushings.

Not change dimensions under the broad temperature range that the barriers are used.

* + - 1. Operation:
				1. Barrier shall be capable of at least 60 complete up/down cycles per hour.
				2. Barrier motion shall be instantly reversible in either direction.
				3. Barrier shall be capable of operating in a temperature range of 50 degrees F to 120 degrees F (10 degrees C to 48 degrees C), without heaters or heat exchangers.

\*\* NOTE TO SPECIFIER \*\* Include one of the following two optional paragraphs if required for lower or higher ambient temperatures. Delete if not required.

* + - * 1. When site ambient operating temperatures are at or below 32 degrees F (0 degrees C) provide with an HPU reservoir heater, hose and barrier heaters, and associated controls and circuitry.
				2. When site ambient operating temperatures exceed 120 degrees F (48 degrees C) provide with a hydraulic fluid (Air-to-oil) heat exchanger, electrical enclosure cooling system and associated controls.
				3. Provide manual operation, for use during electrical power loss, or equipment failures using an integrated, manual hand pump.
			1. Hydraulics and Hydraulic Power Unit:
				1. Provide a Hydraulic Power Unit (HPU) for supplying hydraulic fluid power to raise and lower the barrier.
				2. HPU shall be remotely located at a maximum distance of 100 feet (30.5 meters) from the barrier.
			2. Electrical:
				1. Electrical Power Voltage Options:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs and delete those not required. Note: Single phase input power is not recommended as it will limit the installed system horsepower, increase operating noise and may reduce motor life.

115-120 Volt AC, Single-Phase, 60Hz

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575 Volt AC, Three-Phase, 60 Hz

220 Volt AC, Three-Phase, 50 Hz

380 Volt AC, Three-Phase, 50 Hz

400 Volt AC, Three-Phase, 50 Hz

* + - * 1. Provide all electrical circuits with overload and short circuit protection.
			1. Controls:
				1. Electrical controls and monitoring shall be programmable, utilizing a ruggedized, industrial type Programmable Logic Controller (PLC) conforming to the following:

Standard commercial, off-the-shelf PLC, and shall not use "custom" sole-source printed circuit type control boards, proprietary programming language or use of machine code.

Solid state and microprocessor based to manage all control and monitoring functions.

Utilize replaceable or expandable I/O modules on terminal strips to prevent disturbing wiring.

Hard-wired control relays alone may not be used.

PLC programming monitoring and troubleshooting shall be capable of being performed utilizing a laptop computer or integrated system monitoring option, to aid in fault diagnostics.

* + - * 1. All control and monitoring circuits, including signals, shall operate using low voltage, 24 VDC for safety, outside of the main electrical enclosure.
				2. Mount all high voltage electrical switchgear mounted inside the electrical enclosure including, electrical power feed circuit breaker, motor starters, heater contactors, etc.
				3. Electrical switchgear components shall be UL and/or CE labeled.
				4. Low voltage proximity sensor shall be provided for monitoring the position of the barrier.
			1. Control Panels:
				1. Provide operator control panels and associated control circuits to between all barrier locations, operator control panels and the HPU.

Main Operator Control Panel shall be located where indicated on the Drawings.

Remote Operator Control Panels shall be physically located in close proximity to each barrier.

Operator control panels shall be mounted in an indoor, covered environment, and shall not be exposed to weather and environmental conditions.

Operator control panels shall be mounted in such way that the operator always has visual (eye or camera) supervision on the barrier, when operating the barrier.

* + - * 1. Control circuit shall be part of the PLC and associated equipment, integral with the HPU electrical enclosure.

Control circuit functions and monitoring is programmed into the PLC.

Operator control panel switches and indicators shall interface with the PLC Inputs/Outputs.

All operator control panel switches and indicators are pre-wired to wiring terminal strips.

* + - * 1. Electrical switch and indicator components UL and/or CE labeled.
				2. Electrical switch and indicator components shall be mounted in a sealed, NEMA 12 (or IP 65 equivalent) enclosure.
				3. Main Operator Control Panel for control and indication of all vehicle barrier system functions. Provide with:

Key lockable Main Power On/Off switch (key switch), with an associated green color main power On/Off indicator light.

Set of illuminated pushbuttons for Up/Down control, to raise and lower each set of Barriers.

Set of Up/Down indicator lights for indicating the position of each set of Barriers. The Up indicator lights shall be red, and the down indicator lights shall be green. Indicators lights shall be provided integral to the Up/Down illuminated pushbuttons switches.

Key lockable Enable/Disable switch to permit operation of each of the Remote Operator Control Panels.

Red color illuminated switch for Emergency Fast Operate (EFO) to rapidly raise all Barriers in the vehicle barrier system. The EFO switch shall be provided with a transparent flip cover.

Reset: A White color pushbutton for EFO Reset, to restore the vehicle barrier system to normal operation after activating the EFO function.

Emergency stop switch to immediately stop the movement of barrier in any position. Button will be yellow/red. Emergency stop cannot be activated when the EFO is active. EFO can be activated when emergency stop is active. Reset for emergency stop, to restore the vehicle barrier system to normal operation after activating the emergency stop function, is integrated in the emergency stop pushbutton by means of turn-to-reset function.

Red color Check Oil indicator light for indicating a low level in the reservoir, or a hydraulic fluid over-temperature condition.

Main operator control panels provided as a standard sloped, electrical enclosure console, suitable for countertop or wall mounting.

* + - * 1. Remote Operator Control Panels as indicated, shall be provided for control and indication of each barrier within the overall vehicle barrier system. Provide with:

Green color panel On indicator light for indicating the panel has been enabled for operation by the key switch on the Main Operator Control Panel.

Set of illuminated pushbuttons for Up/Down control, to deploy and retract each set of Barriers.

Set of Up/Down indicator lights for indicating the position of each set of Barriers. Up indicator lights shall be red, and down indicator lights shall be green. Indicators lights shall be provided integral to the Up/Down illuminated pushbuttons switches.

Key lockable Enable/Disable switch to permit operation of each of the Remote Operator Control Panels in the vehicle barrier system.

Covered Red color illuminated switch for Emergency Fast Operate (EFO) to rapidly deploy all Barriers in the vehicle barrier system. EFO switch is provided with a transparent flip cover.

Reset: White color pushbutton for EFO Reset, to restore the vehicle barrier system to normal operation after activating the EFO function.

Emergency stop switch to immediately stop movement of the barrier in any position. Button will be yellow/red. Emergency stop cannot be activated when the EFO is active. EFO can be activated when emergency stop is active. Reset for emergency stop, to restore the vehicle barrier system to normal operation after activating the emergency stop function, is integrated in the emergency stop pushbutton by means of turn-to-reset function.

Red color Check Oil indicator light for indicating a low level in the reservoir, or a hydraulic fluid over-temperature condition.

Operator control panels provided as a standard sloped, electrical enclosure console, suitable for countertop or wall mounting.

* + - 1. Finish:
				1. Barrier frame, mechanism linkages and top plate shall be protected from the affects of long-term corrosion.
				2. Paint barrier top plate with zinc-rich primer and zinc-rich exterior grade top coat in standard black color.
				3. Paint barrier front plate with exterior grade standard black color with high visibility diagonal yellow stripes, visible when barrier is in the raised position.
1. EXECUTION
	1. EXAMINATION
		1. Verify existing conditions before starting work. Do not proceed until unsatisfactory conditions are corrected in manner acceptable.
		2. Verify that foundation, applied finishes and adjacent construction are ready to receive vehicle barrier systems and are within tolerances acceptable to manufacturer.
		3. Verify that required services and utilities are in correct location and are of correct capacities for specified products.
		4. If preparation and condition is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
	2. PREPARATION
		1. Prepare the grade and remove surface irregularities, if any, which may cause interference with the installation of fencing.
		2. If preparation and condition is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
	3. INSTALLATION
		1. Install vehicle barrier systems in accordance with manufacturer's instructions and the authorities having jurisdiction.
		2. Provide all related materials for the vehicle barrier system installation, including, but not limited to: underground conduit, piping, interconnection wire, interconnection hydraulic hoses, hydraulic fluid, lubricants, and other materials required for the complete and functional installation of the vehicle barrier system.
			1. Coordinate with Excavation and Backfill specified in Section 31 20 00 - Earth Moving
			2. Coordinate with Cast-In-Place concrete specified in Section 03 30 00 - Cast-in-Place Concrete.
			3. Coordinate with Security Access and Surveillance connection specified in Section 28 18 00 - Security Access Detection Equipment.
			4. Coordinate with Electrical services and connections specified in Division 16.
			5. Coordinate with Paving specified in Section 32 10 00 - Bases, Ballasts, and Paving.
		3. Ensure that all vehicle barrier system equipment to be installed is properly located at the site.
		4. Place and align barrier system equipment prior to placement of cast-in-place concrete specified in Section 03 30 00 - Cast-in-Place Concrete.
		5. Provide both hydraulic and electrical underground conduit runs for interconnecting hydraulic hoses and wiring between equipment locations, including any accessories.
		6. Provide barrier drains and hook-ups to a storm drain or sewer connection, to prevent water from accumulating inside the barrier frames. Provide a properly sized, self-priming sump pump if no storm drains or sewer exist in close proximity of the barrier location, or if a gravity drain cannot be utilized.
		7. Install and interconnect the hydraulic power unit (HPU) and associated hydraulics to the barrier equipment provided with a weatherproof enclosure, if the HPU is not located inside a facility equipment room.
		8. Install, mount and wire the Main Operator Control Panel, and Remote Operator Control Panels, and interconnect to the barrier equipment.
		9. Install, mount and wire accessory equipment and sensors, and interconnect to the barrier equipment.
		10. Hook-up and wire the facility electrical power feed to the HPU. T
		11. Install and wire the roadway vehicle loop detector wiring if required, and interconnect to the HPU.
	4. FIELD TESTING AND COMMISSIONING
		1. General: Vehicle barrier system shall be initially started and commissioned by a certified manufacturer-authorized field service technician. Perform tests in accordance with the manufacturer's instructions.
		2. Facility Electrical Power: Verify all wiring terminations before turning on electrical power. Verify voltage from facility electrical power feed.
		3. Hydraulic Power Unit (HPU) Hydraulic Fluid Filling: Fill the HPU with hydraulic fluid, using the type and to the level required by the manufacturer.
		4. Hydraulic Power Unit (HPU) Start-up: Prepare for initial start-up by a factory-trained, manufacturer-authorized field service technician.
			1. Check and adjust accumulator nitrogen gas pre-charge to the pre-charge pressure specified by the manufacturer, at the specific ambient temperature conditions prevailing at the site.
			2. Pump/motor shall be jog started (but not run) to verify the correct direction of electric motor rotation.
			3. Using the HPU, fill hydraulic hoses with hydraulic fluid prior to barrier operation. Reservoir level shall be replenished to the proper level prior to field testing and operation.
			4. Perform Pre-Operation checks in accordance with the manufacturer's Operation and Maintenance manual.
			5. Start HPU allow accumulators to fully charge. Check for automatic pump stopping when the accumulators are at the manufacturer's specified operating pressure.
		5. Initial Barrier Operation: Cycle vehicle barrier to raise and lower the barrier and ensure proper, smooth operation.
			1. Correct and repair operational anomalies, failures, malfunctions and/or other equipment trouble for proper operation.
			2. Make adjustments required for the proper operation of the overall vehicle barrier system specific to site conditions.
			3. Verify all functions, control, monitoring, indications of all integrated equipment is properly operating as a system.
			4. Verify hydraulic circuits and connections to ensure that they are leak-free, and correct any leaks found.
	5. CLEANING
		1. Leave immediate work area neat at end of each work day.
		2. Clean surfaces with mild household detergent and clean water rinse well. Concrete should be removed from exposed surfaces.
		3. Touch up scratched surfaces using materials recommended by manufacturer. Match touchup paint color to finish.
	6. FIELD TESTING
		1. Upon completion of installation and commissioning perform a site field test on each equipment piece and the overall vehicle barrier system. During testing, allow the hydraulic system pressure to recover between operations of the equipment, and between cycles.
			1. Notify the Architect 72 hours prior to the start of field testing.
			2. Test the vehicle barrier system shall not be tested until the system is commissioned, and fully operational.
		2. Test shall include:
			1. Raising and lowering the equipment, both electrically and manually, through their complete range of operation.
			2. Verifiy the amount of time to raise and lower the bollards.
			3. Cycle each set of bollards using the specified duty cycle for not less than 30 minutes, to test for heat build-up in the hydraulic system.
			4. Verify no less than 10 operations of the EFO function.
			5. Verify the use of all operator control panel functions and indicators.
			6. Verify operation of any installed equipment directly operated by the vehicle barrier system, including accessories.
		3. During testing, any PLC programming changes that deviate from the original specified or manufacturer's default program, shall be submitted to the manufacturer as a written change request that defines the changes for any programming changes.
		4. Notify the Architect and manufacturer of any equipment failures and/or malfunctions during field testing.
		5. Submit a Test Report with test data verified by the manufacturer to the Architect after completion of field testing.

\*\* NOTE TO SPECIFIER \*\* The following two paragraphs for Field Training and On-Site Maintenance and Service are optional. Select the paragraphs required and delete those not required.

* 1. FIELD TRAINING
		1. Provide manufacturer's on-site field-training for up to 5 designated Owner/Operator supervisors, operators and service technicians. Field training shall include:
			1. No less than 8 hours of training during the normal working day.
			2. Training shall commence after the vehicle barrier system is functionally complete and operational, but prior to final acceptance tests.
			3. Cover all aspects of safely operating the vehicle barrier system.
			4. Cover all of the items contained in the Operation and Maintenance manual.
	2. MAINTENANCE SERVICE
		1. Provide on-site maintenance and service by factory-trained, field service technicians for technical support, maintenance, service and/or repair. Services to include:
			1. Complete periodic maintenance, service, troubleshooting and/or repair of the vehicle barrier system, in accordance with the manufacturer's drawings and instructions, as needed.
			2. Provide Emergency on-call, service response for barriers in non-operational status.
	3. PROTECTION
		1. Protect installed products until completion of project.
		2. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION