

SECTION 34 71 13.19

ACTIVE VEHICLE BARRIERS

12/2019

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN WELDING SOCIETY (AWS)

[AWS D1.1/D1.1M](#) (2010) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

[ASTM F 2656](#) (2007) Standard Test Method for Vehicle Crash Testing of Perimeter Barriers

U.S. DEPARTMENT OF STATE (SD)

[SD-STD-02.01](#) (2003; Rev A) Specification For Vehicle Crash Test of Perimeter Barriers and Gates

1.2 SYSTEM DESCRIPTION

[Barrier systems](#) used must be certified as M50 in accordance with either [ASTM F 2656](#) or [SD-STD-02.01](#). Barrier widths shall be 'as certified' per independent testing agency reports. Alternatively, if a barrier system's width is between the widths of two listed barrier systems that are identical except for their widths, then that barrier system is also acceptable. The design and structural materials of the vehicle barrier furnished shall be the same as those used in the crash tested barrier. Crash test must have been performed and data compiled by an approved independent testing agency in accordance with either [ASTM F 2656](#) or [SD-STD-02.01](#). Barriers successfully tested and certified on the previous Department of State standard, [SD-STD-02.01](#) are also acceptable.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. The following shall be submitted in accordance with Section [01 33 00](#) SUBMITTAL PROCEDURES:

[SD-02 Shop Drawings](#)

- [Installation](#) [; G]
- [Equipment](#) [; G]
- [Electrical Work](#) [; G]

Detail drawings containing complete wiring and schematic diagrams, and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Show on the Drawings proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including foundation and clearances for maintenance and operation. Include with the Detail drawings a copy of the Department of State certificate of barrier performance.

#### SD-03 Product Data

##### Barrier Systems

A complete list of equipment, materials, including industrial standards used and how they apply to the applicable component and manufacturer's descriptive data and technical literature, catalog cuts, and installation instructions. Information necessary to document a minimum 1-year successful field operation performance history for each type of vehicle barrier installed.

#### SD-06 Test Reports

##### Field Testing

Test reports in booklet form showing all field tests, including component adjustments and demonstration of compliance with the specified performance criteria, upon completion and testing of the installed system. Indicate with each test report the final position of controls.

#### SD-10 Operation and Maintenance Data

##### Barrier Systems

##### Operating and Maintenance Instructions

Five (5) copies of operation and maintenance manuals, a minimum of 2 weeks prior to field training. One complete set prior to performance testing and the remainder upon acceptance. Manuals shall be approved prior to acceptance. Operation manuals shall outline the step-by-step procedures required for system startup, operation, and shutdown. The manuals shall include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features. Maintenance manuals shall include routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guide. The manuals shall include equipment layout and simplified wiring and control diagrams of the system as installed.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

Protect components placed in storage from the weather, humidity, and temperature variation, dirt and dust, or other contaminants. Store structural materials on sleepers or pallets and protect them from rust and objectionable materials such as dirt, grease, or oil.

## 1.5 EXTRA MATERIALS

Provide a manufacturer's standard recommended spare parts package, with current unit prices and source of supply complete with detailed manuals on parts replacement, with each barrier to facilitate 1 year of normal operation. Give particular consideration to system components which are not readily available from local or commercial sources and which are critical to the operation of the system.

## PART 2 PRODUCTS

### 2.1 FINAL DENIAL BARRIERS

#### 2.1.1 Retractable Net Barriers

When in the raised position, the total retractable barrier heights shall be no less than 40 inches above the roadway surface and shall extend across the entire roadway with a single barrier. When in the lowered position, the retractable barrier shall match the crown of the roadway and extend no more than 1/4" above the roadway surface at any point. Retractable barriers in the lowered position shall be capable of supporting a 32,000 pound axle load or a 16,000 pound wheel load. Design for this load shall be in accordance with AASHTO HB-17. The retractable barrier shall be capable of sustained operation for 12,000 cycles per year. The retractable barrier motion shall be instantly reversible and shall be capable of raising the barrier from the lowered position to the raised position within 2 seconds during normal use, and within 2 seconds during an emergency. Also, the barrier shall be capable of being lowered from the raised position to the lowered position in not more than 3 seconds. Retractable barrier shall withstand a 15,000 pound vehicle at impact speed of 50 mph with maximum barrier deflection or vehicle penetration of no more than 21 feet. Net Barriers shall include energy absorbing devices, such as pistons, to minimize risk on drivers during impact.

##### 2.1.1.1 Failure Modes of Operation

The system shall be designed to remain in the last commanded position in the event of electrical or mechanical failure. A manual gear operated with a cordless drill or other system, shall be included for operation of barriers without power.

##### 2.1.1.2 Electric Motors

Electric motors shall be variable-frequency driven devices.

##### 2.1.1.3 System

The system shall be designed to maintain the barriers in the raised position, without inspection, for periods of time of up to 1 week. If a hydraulic system is used, it shall be equipped with pressure relief valves to prevent overpressure. The system shall not require continuous running of the motor to stay in the raised position, excluding the use of manual pinning to do so.

##### 2.1.1.4 Construction

The system shall require an excavation depth as noted on the drawings. The foundation shall utilize a rebar reinforced concrete slab to properly anchor

the retractable barrier.

All metal surfaces exposed to the environment shall be pre-treated using a zinc or iron phosphate pre-wash. All exposed surfaces shall be powder coat finished or liquid spray with UV inhibitors for extended paint life and oven cured for final moisture barrier.

The retractable net barrier electrical supply standard shall be 208 VAC three phase 60 Hz. However, optional power sources may be specified in the contract and utilized by the barrier, i.e. 208 VAC through 480 VAC, single or three phase.

A 24 VDC control circuit shall be provided to interface between the control panel and the retractable barrier. This control circuit shall contain all relays, timers, programmable logic circuits and other devices necessary for operation. The control circuit shall include all necessary control logic to override the normal up-down operation in the event of an emergency deployment.

The primary control panel shall be supplied to control all barrier system functions. Optional terminals may be provided to interface with client access control systems and operation devices.

The retractable net barrier shall be designed to inherently reduce risk of injury to vehicle occupants and property. Energy absorbing techniques shall be incorporated into the barrier design to reduce energy released at impact.

The retractable net barrier shall be designed to stop a vehicle attempting to gain unauthorized entry from either direction.

#### 2.1.1.5 Finish

Surfaces shall be painted in accordance with requirements of Section 09 90 00 PAINTS AND COATINGS. The barrier net shall be red with white retro-reflective tape applied in a pattern accepted by the US Army Corps of Engineers Protective Design Center.

#### 2.2 NAMEPLATES

Nameplate data shall be permanently attached to each vehicle barrier. The data shall be legibly marked in an indelible format on a decal or on metal plates and shall consist of at least the following:

- a. Manufacturer's name.
- b. Model number.
- c. Serial number.
- d. Date of manufacture.

#### 2.3 ELECTRICAL WORK

Motors, manual or automatic motor control equipment and protective or signal devices required for the operation specified herein shall be provided in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. All field wiring for loop detectors, communication lines, and power circuits shall have surge protection. Any wiring required for the operation specified herein, but not shown on the electrical plans, shall be provided under this

section in accordance with Sections 26 20 00 INTERIOR DISTRIBUTION SYSTEM and 33 71 02.00 20 UNDERGROUND ELECTRICAL DISTRIBUTION.

## 2.4 CONTROL PANEL

A control panel and control circuit shall be provided to interface between all barrier control stations and the barrier control panel. The control station is defined as the main control panel and the remote control panel as shown. The control circuit shall contain all relays, timers, and other devices or an industrial programmable controller programmed as necessary for the barrier operation. The control panel shall allow direct interface with auxiliary equipment such as card readers, remote switches, loop detectors, infrared sensors, and gate limit switches. Loop controllers shall not cause an automatic barrier raise following power loss or restoration. The enclosure shall be as indicated on the drawings. All device interconnect lines shall be run to terminal strips.

### 2.4.1 Voltage

The control circuit shall operate from a 120 volt 60 Hz supply. The control circuit voltage shall be 24 vdc for all external control panels.

### 2.4.2 Main (or Master) Control Panel

A main control panel shall be supplied to control barrier function. This panel shall have a key-lockable main switch with main power "ON" and panel "ON" lights. Buttons to raise and lower each barrier shall be provided. Barrier "UP" and "DOWN" indicator lights shall be included for each barrier.

An emergency fast operate circuit (EFO) shall be operated from a push button larger than the normal controls and have a flip safety cover installed over the push button. The EFO shall also be furnished with an EFO-active light and reset button. The main control panel shall have a key lockable switch to arm or disable the remote control panel. An indicator light shall show if the remote control panel is enabled.

### 2.4.3 Remote (or Maintenance) Control Panel

A remote control panel, one panel for each barrier control panel, shall have a panel "ON" light that is lit when enabled by a key lockable switch on the main control panel. Buttons to raise and lower each barrier shall be provided. Barrier "UP" and "DOWN" indicator lights shall be included for each barrier.

## 2.6 MISCELLANEOUS EQUIPMENT

### 2.6.1 Safety Equipment

#### 2.6.1.1 Barrier Systems Sensors

The barrier system sensors shall consist of the following:

- a. Suppression Loops - Two inductive loops (minimum) whose outputs shall be used to prevent barriers from raising when a vehicle is within a prescribed distance of the barrier. The output of the loops shall override all barrier rise signals until one second after a vehicle clears the suppression loop.

b. Over Speed Detection System - A combination of radar sensors shall be employed to detect vehicles approaching the ID Check at a speed above the calculated threshold. The system shall cause a warning message to be displayed on a dedicated warning panel and to annunciate a warning sound alerting the guard to make a decision as to whether the barrier should be raised or not.

c. Wrong Way Detection System - A combination of radar sensors and/or inductive loop pairs shall be employed to detect vehicles approaching the ID Check in the outbound lanes, or that have turned the wrong way into the outbound lanes after being rejected at the ID Check. The system shall cause a warning message to be displayed on a dedicated warning panel and to annunciate a warning sound alerting the guard to make a decision as to whether the barrier should be raised or not.

The sensors shall be compatible with the barrier controller and shall function as part of a complete barrier control system.

#### 2.6.1.2 Barrier Signals

Red/yellow/green 12 inch traffic lights shall be supplied for each entrance and exit to alert motorists of the barrier position. Traffic lights are not required for manual barriers. The green light shall indicate that the barrier is fully open. All other positions shall cause the light to show red. Signals are to be pole mounted on top of 10 foot high traffic pole or mounted on a mast arm assembly as dictated by site conditions and approval of the contracting officer.

#### 2.6.2 Warning Annunciator

Provide a warning annunciator built into the barrier control panel that produces a pulsing audible sound when the radar detects a vehicle entering the facility with excess speed. Provide a warning annunciator built into the barrier control panel that produces a continuous sound whenever a wrong way loop detects a vehicle entering from the exit. The warning annunciator shall sound until a warning annunciator silence reset button is pressed or until 3 seconds after the condition clears.

#### 2.8 CONCRETE

The concrete shall conform to Section 03 30 00 CAST-IN-PLACE CONCRETE.

#### 2.9 WELDING

Welding shall be in accordance with AWS D1.1/D1.1M.

#### 2.10 PAVEMENT

After placement of the vehicle barrier, the pavement sections shall be replaced to match the section and depth of the surrounding pavement. Pavement shall be warped to match the elevations of existing pavement. Positive surface drainage, away from the vehicle barrier, shall be provided by pavement slope.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Perform installation in accordance with manufacturers instructions and in the presence of a representative of the manufacturer. Manufacturer's representative shall be experienced in the installation, adjustment, and operation of the [equipment](#) provided. The representative shall also be present during adjustment and testing of the equipment. If the active vehicle barrier is crash rated and/or certified, then the barrier system shall be installed in an 'as-tested' condition.

- a. Perform excavation and backfill as specified in Section 31 00 00 EARTHWORK.
- b. Excavate for drainage as shown in the drawings.
- c. Construct base course for barriers as shown and as specified in Section 31 00 00 EARTHWORK.

### 3.2 ELECTRICAL

Electrical work shall be completed as specified in Section 34 41 26.00 10 ACCESS CONTROL POINT CONTROL SYSTEM.

### 3.3 FIELD TRAINING

Provide a field training course for designated operating staff members. Training shall be provided for a total period of not less than [8 hours] [1 hour] of normal working time and shall start after the system is functionally complete but prior to final acceptance tests. Field training shall cover all of the items contained in the [operating and maintenance instructions](#). Training on the operation and maintenance of the over speed and wrong way detection systems shall be included in this period of instruction.

### 3.4 FIELD TESTING

Upon completion of construction, perform a field test for each vehicle barrier. The test shall include raising and lowering the barrier, both electrically and manually, through its complete range of operation. Notify the Contracting Officer at least 7 days prior to the beginning of the field test. Furnish all equipment and make all necessary corrections and adjustments prior to tests witnessed by the Contracting Officer. Any conditions that interfere with the proper operation of the barrier disclosed by the test shall be corrected at no additional cost to the Government. Adjustments and repairs shall be done by the Contractor under the direction of the Contracting Officer. After adjustments are made to assure correct functioning of components, applicable tests shall be completed.

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