

SECTION 34 71 13.19
ACTIVE VEHICLE BARRIERS

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.

ASTM INTERNATIONAL (ASTM)

ASTM F 2656 (2007)

Standard Test Method for Vehicle Crash
Testing of Perimeter Barriers

UNIFIED FACILITIES CRITERIA (DoD)

4-022-02

Selection and Application of Vehicle
Barriers

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS

AASHTO HB-17

(2002; Errata 2003; Errata 2005) Standard
Specifications for Highway Bridges

U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA)

MUTCD

(2000) Manual of Uniform Traffic Control
Devices

UNDERWRITERS LABORATORIES (UL)

UL 486A-486B

(2003; Rev thru Aug 2006) Standard for
Wire Connectors

1.2 SYSTEM DESCRIPTION

Barrier systems used must be listed in the Department of Defense (DoD) approved anti-ram vehicle barrier lists. Barrier widths shall be 'as certified/approved' on these lists. 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. Exceptions and acceptable widths will only be taken from the DoD anti-ram vehicle barrier list. 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 ASTM F 2656 or SD-STD-02.01. Barriers tested and certified on the previous Department of State lists, per SD-STD-02.01, April 1985, are also acceptable. Barriers shall be of all electric operation, non-hydraulic. Electrical drawings detail voltage requirements. This specification also defines a certified, crash tested high security active vehicle net barrier system for placement as a reusable, re-settable barrier to safeguard strategic access control points, protect high-risk security assets, facilities and personnel.

1.3 SUBMITTALS

Owner / Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. All submittals shall be in hard and/or soft copy. The following shall be submitted:

SD-02 Shop Drawings

Installation; G, A/E

Equipment; G, A/E

Electrical Work; G, A/E

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.

SD-03 Product Data

Barrier Systems

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 4-year successful field operation performance history for each type of vehicle barrier installed.

Spare Parts

Spare parts data for each different item of material and equipment used, after approval of the detail drawings. Include in the data a complete list of parts and supplies, with current unit prices and source of supply.

SD-06 Test Reports

Field Testing

Test reports in Showing field tests, including demonstration of compliance with the specified performance criteria, upon completion and testing of the installed system.

SD-10 Operation and Maintenance Data

Barrier Systems; G, A/E

Operating and Maintenance Instructions Data

Six copies of operation and maintenance manuals provided a minimum of 2 weeks prior to field training. 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. The manuals shall include equipment layout, and simplified wiring and control diagrams of the system as installed.

PART 2 PRODUCTS

2.1 Ground Retractable Automobile Barrier (GRAB)

A ground retractable barrier is an attenuating device designed to span a roadway or traffic lane to bring an encroaching vehicle to a stop and prevent its passage. The system consists of a steel anchor post at each end, four hydraulic energy absorbers, and a cable/net assembly. The anchor posts are made from two sections of A36 steel pipe - a fixed inner pipe with an outer pipe which is free to rotate around the anchor post. Reusable energy absorbing cylinders are set between the anchor posts and the net (two at each end). The net consists of upper and lower 38-mm diameter Extra High Strength (EHS) wire strands, with a 16-mm diameter wire rope in the center and 16-mm diameter wire rope woven up and down along the width of the net and attached to the top, middle, and bottom cables with clamps. The barrier system shall be tested and certified by an ASTM Certified anti-ram testing facility to the ASTM standard for M50 testing with a dynamic penetration rating of P2 or better as issued in designation F 2656-07 published August 2007.

K12 / ASTM M50: The barrier system shall be tested and certified by an ASTM Certified anti-ram testing facility to the ASTM standard for M50 testing with a dynamic penetration rating of P2 or better as issued in designation F 2656 - 07 published August 2007 or U.S. State Department Certified anti-ram testing facility to the DOS standard for K12 testing (penetration rating not specified) as called out in SD-STD-02.01, revision A March 2003.

2.2 System configuration

2.2.1 Reduced risk. The barrier system shall by design inherently reduce risk of injury to vehicle occupants using four hydraulic energy absorbers free to rotate around the steel anchor post at each end attached at each end of the cable/net assembly. Energy absorbing techniques shall be incorporated into

the barrier design to reduce energy released at impact.

2.2.2 Bi-directional barrier. The barrier system shall be designed to stop a vehicle attempting to gain unauthorized entry from either direction.

2.2.3 Reusable / Re-settable barrier. The barrier system shall be designed to be a reusable barrier and be re-settable in as little as 30 minutes after impact.

2.2.4 Emergency operation. The barrier system shall be capable of being raised in less than 2 seconds when activated by the emergency deploy button.

2.2.5 Barrier application. The barrier system shall be configured in accordance with site conditions. A single barrier system may span the entire roadway(s) which must be secured.

2.2.6 Foundation. The BARRIER SYSTEM foundation shall require an excavation depth of no greater than 18" as measured from the roadway surface. The foundation shall utilize a rebar reinforced concrete slab to properly anchor the BARRIER SYSTEM.

2.2.7 Anchor Stanchion. Anchor Stanchions shall be set in a concrete foundation for transference of energy upon impact. The Net of the barrier system shall be recessed into the roadway surface in order to ensure smooth vehicle crossing. When deployed, the barrier shall present a formidable obstacle to approaching vehicles. Upon impact, forces shall be first absorbed by Net, Pistons, and Anchor Stanchions and then transferred to the foundation of the unit.

2.2.8 Net. The net shall use high strength aircraft cable and assembled with high pressure pressed-swage fittings. The typical net height is approximately 50 inches as measured from the top of the net to the finished road surface. Typical Net height from grade is approximately 14 inches to bottom of the net. Length of net will be determined by width of the roadway, height of crown in roadway, and other site conditions. The Net shall be raised and lowered in a 90 degree fashion by the lifting arms.

2.2.9 Pre-Deployment Position. The net shall be recessed in virgin rubber pads made of materials typically used in grade level railroad crossings. The rubber pads shall be 5 inches thick with recessed preformed pattern to accept net in the pre-deployment position.

2.2.10 Lifting Arm Assembly. Each lifting arm assembly shall be equipped and operated by a variable frequency drive (VFD) 3hp (up to 10hp) electric motor. The size of the electric motor will depend on the length of net specified. The motor shall be inverter duty rated. Electric motor shall have double shaft ends and C-face mount for direct inputs and direct torque transfer. Each lifting arm assembly shall incorporate a single square steel

mast with a single pivot point to raise and lower the net. The lifting arm shall incorporate shear pins for net release in the event of an impact. The specified barrier shall not utilize pneumatic or hydraulic pumps, rams or hoses to deploy the barrier.

2.2.11 Configuration. The system consists of a steel anchor post at each end, four hydraulic energy absorbers, and a cable/net assembly. The anchor posts are made from two sections of A36 steel pipe - a fixed inner pipe with an outer pipe which is free to rotate around the anchor post. Reusable energy absorbing cylinders are set between the anchor posts and the net (two at each end). The net consists of upper and lower 38-mm diameter Extra High Strength (EHS) wire strands, with a 16-mm diameter wire rope in the center and 16-mm diameter wire rope woven up and down along the width of the net and attached to the top, middle, and bottom cables with clamps.

2.2.12 Multiple barrier application. Each barrier system shall have its own control and operate independently from each other as well as simultaneously under necessary conditions.

2.3 Construction

2.3.1 Foundation. The barrier system foundation shall require an excavation depth of no greater than 18" as measured from the roadway surface. The foundation shall utilize a rebar reinforced concrete slab to properly anchor the barrier system.

2.3.2 Finish. 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.

2.3.3 Main power. The barrier system electrical supply standard shall be 480VAC 3 phase 60 Hz. However, optional power sources may be specified in and utilized by the barrier, i.e. 208 through 480VAC, single or 3 phase.

2.3.4 Control circuit. A control circuit shall be provided to interface between the control panel and the barrier system. 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.

2.3.5 Primary control panel. 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.

2.3.6 Primary control panel construction. The primary control panel shall be a Stainless Steel NEMA enclosure approximately 36" x 30" x 10" deep or as applicable. Terminal strips shall be provided to interconnect all devices.

2.3.7 All-electric operation. The barrier system shall function without the use of pneumatics, hydraulic pumps, cylinders, hoses or reservoirs.

2.3.8 Experience. The barrier system shall be of proven design. Manufacturer shall have installed at least 50 barrier systems and provide references for this work in their response.

2.3.9 Qualification tests. The barrier system design shall have successfully passed actual full scale crash testes conducted by a qualified independent agency.

2.3.10 Weather conditions. The barrier system shall operate satisfactorily under the following environmental conditions:

2.3.10.1 Temperature. The barrier system shall be able to function in extreme temperature ranges of -20°f to 120°f regardless of humidity.

2.3.10.2 Snow and ice. Freezing precipitation shall be addressed by installing heat strips as required by ambient weather at the site.

2.3.10.3 Flooding. The barrier system shall be operable during flood conditions of up to 6 inches of standing water on the road surface.

2.4 ELECTRICAL WORK

Motors, automatic motor control equipment and protective or signal devices required for the operation specified shall be provided by this section. Any control wiring required for the operation within 1,000' provided by this section. Pathways for control wiring outside barrier foundation shall not be provided by this section. Coordinate with site contractor for definition of electrical scope of work. Electrical power terminated in Barrier Control Panel not provided by this section.

2.5 CONTROLS

A master and/or remote control panel shall be provided to interface between all barrier control stations and the power unit. The same control panel may be provided for multiple barriers where applicable. The control circuit shall contain all relays, timers, and other devices or an industrial programmable controller programmed as necessary for the barrier operation. The enclosure shall be as indicated on the drawings.

2.5.1 Main Control Panel

A main control panel shall be supplied to control barrier functions. 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 or toggle switch. 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.

2.5.2 Remote Control Panel

A remote control panel (where applicable) 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. The EFO shall be operated from a push button larger than the normal controls and have a flip safety cover installed over the push button or toggle switch. Activation of either EFO will operate all barriers. The EFO shall be interconnected with an EFO-active light. When the remote control panel EFO is pushed, operation of the barrier will not be possible from this panel until reset at the main control panel or maintenance panel.

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:

Suppression Loops - Two inductive loops whose outputs shall be used to prevent barriers rising when a vehicle is within a prescribed distance of the barrier. The output of the loops shall override all barrier rise signals until 1/2 second after a vehicle clears the suppression loop.

2.6.1.2 Traffic Lights

Red/yellow 8 inch traffic lights shall be supplied for each entrance and exit to alert motorists of the barrier position. The yellow flashing light shall indicate that the barrier is fully open. All other positions shall cause the light to show Red.

2.6.2 Heater

A waterproof barrier heater with a thermostat control and NEMA 4 junction box connection point shall be provided for de-icing and snow melting. The heater shall provide barrier operation to an ambient temperature of -20 degrees F.

2.6.3 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.

2.7 FINISH

Surfaces shall be coated in accordance with manufacture's requirements. White and Red coloring for net in roadway.

2.8 CONCRETE

Concrete shall be 5,000psi.

PART 3 EXECUTION

3.1. INSTALLATION

Perform installation in accordance with manufacturer's 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.

3.2. MANUFACTURER'S SERVICES

Provide the services of a manufacturer's representative who is experienced in the installation, adjustment, and operation of the equipment supplied. The representative shall supervise the installation, adjustment, and testing of the equipment.

3.3. FIELD TRAINING

Provide a field training DVD for designated operating staff members. Training DVD shall be Train the Trainer format.

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, through its complete range of operation. Furnish all equipment and make all necessary corrections and adjustments prior to tests witnessed by the owner. Any conditions that interfere with the proper operation of the barrier disclosed by the test shall be corrected at no additional cost. Adjustments and repairs shall be done by the Contractor. After adjustments are made to assure correct functioning of components, applicable tests shall be completed.

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