

# Product Specifications

## Predator M50 Arrestor Net Barrier

### (Model VA-NET-300)

#### **PART 1 GENERAL**

##### **1.1 REFERENCES**

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

- A. AMERICAN SOCIETY OF TESTING (ASTM) F2656-07, Standard Test Method for Vehicle Crash Testing of Perimeter Barriers
- B. UNIFIED FACILITIES CRITERIA (DoD), Selection and Application of Vehicle Barriers
- C. DoD ANTI-RAM VEHICLE BARRIER LIST, prepared by the Protective Design Center (PDC) located on Omaha, NE, including appendices, correspondence, emails, memos and notices regarding the approved barriers on list.

##### **1.2 SYSTEM DESCRIPTION**

- 1.2.1 Active Net Barrier must be listed on the current Department of Defense (DoD) approved Anti-Ram Vehicle Barrier List as an Active Net with ASTM F2656-07 M50 P2 rating, where it is certified to stop a 15,000 lbs. vehicle at 50 mph impact. The barrier net's actual clear span length for the project shall be between the certified crash tested clear span lengths of a shorter net crash test and longer net crash test. For example, if Net Barrier has been crash-tested and certified at a 23 foot and an 80-foot span distances, then all net span lengths in between are certified. This is the DoD's requirement to be listed and approved on Anti-Ram Vehicle Barrier List as an Active Net.
- 1.2.2 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, third-party testing agency in accordance with ASTM F2656-07, where testing Agency is DoD approved.
- 1.2.3 The barrier net must be crash tested and certified with ASTM F2656-07 M50 P2 crash test from vehicle impacts in both the inbound and outbound traffic directions to verify bi-directional stopping capability. An approved independent, third-party testing agency shall confirm bi-directional stopping capability by crash testing in accordance with ASTM F2656-07. Bi-directional certifications shall be provided.
- 1.2.5 Barrier Net Cables shall be rust proof and unaffected by water, salt, ice, temperature change, UV degradation or other weather. Barrier net cables must be pliable and shall not "kink" or bend from impact by a vehicle. To demonstrate that barrier net is reusable, Barrier net must be qualified by using same net in

two (2) subsequent ASTM F2656-07 M50 crash tests (15,000 lbs. vehicle at 50 mph), and demonstrate same net successfully arrested the vehicle impacts during subsequent tests.

- 1.2.7 After a typical real time impact into the net such as 5,000 lb SUV hitting net at 35 mph, the Active Net Barrier System shall be able to immediately reset and operate without replacing parts or components. The active net barrier shall be able to retract and operate while only requiring minor adjustments. The energy absorption systems shall immediately and automatically reset without requiring specialty tools or technicians.
- 1.2.8 Power supply required to operate Barrier shall operate with a 60-amp 110-volt single phase service. Single electrical subpanel to be installed on 1 side of the roadway where Net Barrier is located.
- 1.2.9 Uninterrupted Power Supply (UPS) shall backup barrier operations without interruption or delay during a power outage. The backup power must also operate traffic signals, warning lights, PLC, alarms, and controls. The net barrier must operate a minimum of 5 times using backup power during a power outage, which includes the lights, signals, alarms, and controls. Backup power shall be tested during commissioning.
- 1.2.10 The active net barrier must deploy within 2 seconds to function as a final denial barrier. It must deploy and retract using automated control systems. Programmable Logic Controller (PLC) shall be used to sequence the lights, signals, alarms and deployment of the barrier. Sequencing shall be adjustable in field using PLC.
- 1.2.11 Barrier net shall be able to cycle at least 15 times in an hour.
- 1.2.12 Barrier net shall not be exposed to elements when in the retracted position. The barrier net shall remain stored in below pavement housing across roadway when retracted. The below pavement housing shall have an automated continuous steel lid with hinge that allows lid to open and close immediately upon deployment and retraction of the barrier net. The lid, below pavement housing, and pivot hinge shall all be galvanized or stainless steel. The lid shall be  $\frac{3}{4}$ " in thickness. The below pavement structure and lid shall support at least a 32,000-pound axle load or a 16,000-pound wheel load.
- 1.2.13 The steel lid for the below pavement housing shall be maximum 12 inches wide, and keep out debris and trash, while protecting the net. Below pavement housing that extends across the roadway shall be fabricated to follow the existing slope or crown in the roadway. The 12" wide steel lid shall be flush with roadway surface and minimize noise and when motorist drive across it.
- 1.2.14 Energy absorption systems shall decelerate vehicle upon impact and allow net to "give" for reduced risk stopping. Energy absorption systems reduce vehicle impact energy and provide a softer stop or reduced risk impact. The energy absorption systems must immediately and automatically reset after a typical vehicle impact occurs, without requiring manpower or equipment to reset the barrier.
- 1.2.15 Minimum of 50 net barriers must have been successfully installed at DoD and other Government facilities. The energy absorption and reduced risk stopping

capability must have been demonstrated at a DoD facility, where unauthorized vehicle was arrested by net without harming driver or passengers.

- 1.2.16 Electrical drawings shall be provided and indicate power supply requirements, amps, voltages, conduits, low voltage wiring, and uninterrupted backup power supply. Wiring drawings and details of electrical connections shall also be provided. This includes wire sizes, pairs, terminations, NEMA 4 panels, conduit sizes, breakers, and other electrical information.
- 1.2.17 Net barrier components and actuators may be electrical/mechanical/hydraulic. All components and actuators shall be above ground in an enclosure, and easily accessible. Only biodegradable fluid shall be used with and secondary containment provided.

### **1.3 SUBMITTALS**

- 1.3.1. Drawings  
Initial submittals with detailed drawings and specifications shall be provided for approval. Vehicle barrier system components, equipment, control panels, site layout, power requirements, subpanels, safety devices, and other components. Wiring diagrams shall be provided. Control panels and operational sequencing of devices shall be provided. Sign sizes and dimensions shall be provided. Alarms, signals, and lights shall be demonstrated in drawings. Bill of materials shall be included. Installation requirements shall be provided. This includes foundation requirements, drainage conduit sizes, and electrical. Initial submittal drawings will address site specific requirements. Changes to initial submittals after receiving comments shall be clouded. Submittal drawings shall be sealed by a registered professional engineer. Drawings containing wiring schematics shall be provided. Conduits and sizes shall be shown, and how systems integrate and connect.
- 1.3.2. O&M Manuals  
At least 2 weeks prior to turnover, Operations & Maintenance (O&M) manuals shall be submitted. The O&M manual shall cover operation of the vehicle barrier and periodic maintenance required. Maintenance manuals shall include routine maintenance procedures, checklists, and troubleshooting guide. Cut sheets on products and system components shall be provided. Upon acceptance, CD of O&M manual shall also be provided.
- 1.3.3. Testing and Commissioning  
At least 2 weeks prior to turnover, acceptance testing & commissioning document shall be provided. It will list each field test to perform in a formal order, so that each alarm, traffic light, safety device, deployment & retraction button, safety loop are tested in field and recorded prior to turnover. Testing and Commissioning documents are site specific to the barrier installed.
- 1.3.4. Spare Parts  
At least 2 weeks prior to turnover and demonstration, list of optional spare parts and supplies shall be provided with unit prices.

## **PART 2 PRODUCTS**

### **2.1 VEHICLE ARRESTOR**

The barrier system consists of two steel prefabricated end supports with energy absorption units, and a covered below pavement housing that protects the proprietary net stored below pavement. The Vehicle Arrestor is crash test certified to stop a 15,000 lb. vehicle traveling at 50 mph. (ASTM F2656-07 M50/P2 rated); and is approved on the Department of Defense (DoD) Anti-Ram Vehicle Barrier List. The Vehicle Arrestor has been crash tested in inbound and outbound directions, and stops traffic in either direction, allowing the net to extend across roadways with inbound and outbound lanes. Net span can range from 19'-6" to 80'-0" in accordance with ASTM F2656-07 crash test certifications.

#### **2.1.1. Barrier Functions**

The vehicle barrier is deployed within 2 seconds as a final denial barrier. It is retracted using automated systems. The below pavement housing and steel lid shall be capable of supporting a 32,000-pound axle load or a 16,000-pound wheel load. The retractable cable-net barrier shall be capable of 15 complete up/down cycles per hour, and 5 complete cycles after a power loss using uninterrupted backup power. The cable net barrier shall be capable of raising the cable net from the lowered position to the raised position within 2 seconds, with span distance up to 80 feet. The barrier net system shall have a below-pavement housing with a protective lid to keep out debris, trash, snow, ice, and protect the cable net from saltwater environments. Provide below pavement housing with dampers to minimize sound from crossing the lid. The below pavement housing and steel lid must follow the crown in the road to minimize disruption when driving over top. The cable net must be reusable after a typical impact. After an impact, the energy absorption system shall immediately and automatically reset with the barrier remaining in the up position, so the barrier is ready for a second vehicle impact from either traffic position. The cable net must be able to retract into the below-pavement housing without having to replace system components or parts immediately after a typical impact, such as a 5,000 lb. SUV at 35 mph.

### **2.2 SYSTEM FEATURES**

#### **2.2.1 Reduced Risk**

The net barrier must by design lessen the impact and reduce the risk of injury to vehicle occupants. Each end support shall have energy absorption units incorporated with a net that "gives" and decelerates the vehicle upon impact.

#### **2.2.2 Reusable & Re-settable**

The energy absorption systems immediately and automatically reset, without requiring labor or equipment, and barrier is ready for a second threat. The barrier net must remain locked in place and remain connected in the same manner before, during, and after a vehicle impact.

#### **2.2.3 Bi-Directional Vehicle Arresting**

The barrier system must be crash tested in both traffic directions and certified with ASTM F2656-07 M50/P2 by third party, independent Government approved lab in both traffic directions. Net barrier must be crash tested and certified

from inbound impact and outbound impact. Barrier shall not be deemed “bi-directional” if it has not been crash-tested with ASTM F2656-07 M50/P2 vehicle impact from inbound and outbound directions. The energy absorption systems, structural end supports, and foundation shall function in the same manner, if impacted from either the inbound or outbound directions (must be mirror image or symmetrical design if deemed “bi-directional”)

#### 2.2.4 Barrier Net Composition

The barrier net cable shall not be affected by heat or temperature change, snow, ice, rain, saltwater or de-icing salt. The cable members shall be pliable where it easily bends and does not “kink” if impacted by a vehicle. After an impact, the cable net shall be re-usable. Net shall be fabricated in modular manner, so that only 1 cable can be replaced in field versus the entire barrier net.

#### 2.2.5 Uninterrupted Backup Power Source

Battery backup systems must provide at least 5 uninterrupted cycles to deploy and retract the vehicle barrier if a power outage occurs. Traffic lights, signals, warning lights, and safety loops must also be backed up by batteries during a power outage. Backup batteries must be maintenance free.

#### 2.2.6 EFO Operation

The barrier system shall deploy within 2 seconds of activation. The system shall be programmable and provide sequencing of traffic lights, signals, and alarms that give guard adequate reaction time.

#### 2.2.7 Signs, Signals, Safety Loops

Signage, traffic signals, warning lights, audible alarms, safety loops and other devices shall be incorporated into the active vehicle barrier system to conform to site specific requirements.

#### 2.2.8 Heating and Drainage

Barrier system shall operate in all weather conditions. System shall be equipped with thermostatically controlled heating inside power side enclosure to ensure normal operation in cold weather. Below pavement housing system shall be supplied with gravity drains, and heater to melt snow and ice, in climates that require it.

#### 2.2.9 End Support Covers

End supports shall have enclosure with locking access doors. All system components shall be accessible through these access doors. Enclosures shall have pitched roof and made of non-rusting aluminum or stainless steel.

#### 2.2.10 Power and controls

A power subpanel shall be provided at barrier, with maximum requirement of four (4) 20-amp breakers, single phase, 110VAC. A control subpanel populated with electronics shall be provided by manufacturer on the barrier. Conduit sizes, wire sizes, wiring diagrams, electrical power, control panels and logic, and other data shall be provided in submittal drawings.

## 2.3 FINISH

The end support covers shall be constructed of sturdy aluminum panels and frames, and primed and painted. The covers shall be weather resistant and not rust. Covers shall have locking access doors.

## **2.4 ELECTRICAL**

All field wiring for loop detectors, communication lines, and power circuits shall have surge protection. System components, motors, and electronics shall be wired in compliance with local codes and requirements.

## **2.5 CONTROLS**

A control panel and control circuit shall be provided to interface between all cable-net barrier control stations and the power unit. The master control or main control panel shall be located at the control station, and the remote-control panel shall be located at various locations as noted on the plans. The control circuit shall contain all relays, timers, and other devices and a programmable logic controller (PLC) necessary for the barrier operation. Control schematics and functions shall be detailed in submittal drawings and changed as requested prior to building panels.

### **2.5.1 Main Control Panel**

The main control panel shall be supplied to control the barrier functions. This panel shall have a keyed main switch with main power on LED light. Buttons to raise and lower the barrier shall be provided with separate "up" and "down" LED barrier position indicator lights. There should also be an emergency fast operate (EFO) button. The EFO, raise, and lower buttons shall have plastic protective covers to prevent accidental deployment. The main control panel shall have a keyed switch for each remote-control panel provided, with LED indicator lights showing if each remote panel is enabled or disabled. Various indicator lights for power outage, loop detectors and other conditions shall be provided.

### **2.5.2 Remote Control Panel**

The remote-control panel shall have an LED indicator light showing if the panel is enabled by the main control panel. An EFO button with a protective cover shall be provided. The operation of lowering the barrier net is not provided at the remote-control panel, this function is only provided at the main control panel. LED lights will indicate if the net is in the "up" or "down" position.

### **2.5.3 Emergency Fast Operate (EFO)**

The barrier net can be deployed in less than 2 seconds when pressing any armed EFO button. All EFO buttons shall have flip covers to prevent accidental deployment. Multiple barrier nets can deploy using 1 EFO button.

### **2.5.4 Local Controls**

Local controls located at barrier shall allow for various ways to raise and lower barrier during maintenance.

## **2.6 MISCELLANEOUS EQUIPMENT**

### **2.6.1 Safety Equipment**

a. Suppression Loops

Two inductive loops whose outputs shall be used to prevent the barrier from raising when a vehicle is within a prescribed distance of the barrier. The output of the loops shall override all barrier raise signals until after the vehicle clears the suppression loops. This operation is programmable.

b. Traffic Signals

Red/yellow/green 12-inch traffic signals shall be supplied for each inbound and outbound lane to alert motorists of the barrier position. Sequencing of lights shall meet customer's requirements and shall be programmable using PLC with ability to change in field. Where required, overhead mast arms will be installed across the roadway where traffic signals and signs are installed. As an alternative, traffic signals and signs are installed on vertical posts on side of roadway.

c. Flashing Warning Lights

When barrier is deployed, flashing yellow warning lights about 150 feet from barrier shall immediately activate.

d. Audible Warning

Provide a warning annunciator built into the barrier end support that produces an audible sound when the EFO button has been pushed.

e. In Ground Lights

If required, in-ground warning lights shall be installed and active when the EFO button is pushed.

f. Maintenance Controllers at Barrier

Inside each barrier end support enclosure, controllers will be provided to perform maintenance and other functions. These controllers will allow barrier to be raised slowly and hold certain positions as needed, among other functions to perform maintenance and repair work.

2.6.2 Heaters and Cold Weather Package

Space heater with thermostat control shall be provided inside power side enclosure. Power side enclosure shall be insulated. The below pavement housing shall have a thermostat-controlled heater wire to melt snow or ice.

2.6.3 Signage

Barrier signage will be provided per site specifications and requirements. All signage shall be diamond grade and retro reflective. Signposts shall be approved by engineer.

2.6.4 Continuous Over speed Detection System

Where response zone is not adequate, provide early warning to guards if vehicle(s) are approaching access control point (ACP) at speed which exceeds the preset alarm activation speed. The over speed detection will announce audible and/or visual alarms.

Over speed Detection System shall:

- A. Use LiDAR technology that continuously reads all vehicles within radar detection zone.



- B. Continuously monitor speed of multiple vehicles in detection zone. Allow for easy changing the preset alarm activation speed desired.
- C. Set alarm activation at desired vehicle speed, with ability to change alarm activation speed in-field using software.
- D. Customize detection zone distance (detection distance from 100 to 400 feet).
- E. Filter for detection of directionality, where it picks up inbound vehicles only.
- F. Integrate audio and/or visual alarms.
- G. Allow for multiple over speed detection zones.
- H. Allow filtering of interferences that can cause false positives, using software capabilities built into system.
- I. Allow all weather use.
- J. Approved for use and installed at minimum of 5 DoD facilities, where the LiDAR's operational frequency has been determined not to interfere with DoD operations on bases.
- K. Approved by Federal Communication Commission where Grant of Equipment Authorization Certificate has been issued.

#### 2.6.5 Wrong Way Detection

Provides early warning to guard(s) that vehicle(s) are traveling in wrong direction using audible and/or visual alarms.

##### Wrong Way Detection shall provide:

- A. Detection at desired location(s) using magnetic detection loops installed in roadway or LiDAR.
- B. Multiple wrong-way detection locations, if necessary.
- C. High reliability of detection.
- D. Integrate audible and visual alarms.
- E. Allow all weather use.