DEPARTMENT OF DEFENSE

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DoD Anti-Ram Vehicle Barrier List for Entry Control Facilities and Access Control Points

List Date: March 2026

This list is intended to be used to meet the requirement for Access Control Points (ACPS) and Entry Control Facilities (ECFs) as identified in UFC 4-022-01 ECFs/ACPs and in the Army Standard for ACPs and should not be considered a complete list of all tested Active and Passive Vehicle Barriers. This list should not be used as criteria or in contact documents for other projects except for DoD ACPs/ECFs. More Information can be found in Appendix C.

The Department of Defense physical security concept is to create a layered or tiered defensive system that may include both active and passive perimeter barriers to delay, defeat or otherwise mitigate potential intruders. The Department employs several testing standards and testing procedures for both active vehicle barriers and passive vehicle barriers designated as “vehicle security barriers”, “vehicle-impact rated barriers”, or “anti-ram vehicle barriers”. The testing standards include ASTM International F2656 and Department of State (DOS) SD STD-02.01, Specification for Vehicle Crash test of Perimeter Barriers and Gates.

The ASTM F2656 test standard rates barriers based on vehicle type, impact velocity and penetration. Barriers that were tested to ASTM F2656- 07 and assigned a penetration rating of P4 are not included in the DOD Anti-Ram Vehicle Barriers List. The P4 penetration rating has been removed from ASTM F2656 in subsequent versions.

Barriers tested to DOS STD 02.01, ASTM F2656-07, ASTM F2656-15, ASTM F2656-18 and ASTM F2656-18a have penetration ratings based on measurement from the trailing edge of the barrier. Barriers tested to ASTM F2656-19 and all subsequent versions will have penetration ratings based on measurement from the leading edge of the impacted barrier element.

The following list of barriers includes active barriers for allowance or denial of vehicle access, and passive or fixed barriers to prevent circumvention of active vehicle barriers or for other perimeter applications. This list will be updated simi-annually in March and September . A compliant report must be received one month prior to the list being published to be included on the next list.

Note: To be considered to be on the DoD Anti-ram Vehicle Barrier List the barrier must be installed in the "as tested" configuration. Any modification from the "as tested" configuration will be considered a new barrier and must be tested and submitted for acceptance on to the DoD Anti-Ram Vehicle Barrier List prior to be used on a project where this criteria is required.

Note: If the requirements of the test standard (ASTM, DOS) are not met and/or are not included in the test report, the tested product will not be added to this list and the report will be rejected for revision and resubmittal. The most common reason for rejection of submittals is a lack of comprehensive information about the test article (engineering drawings, dimensions, specifications, and material properties).

Note: This DOD Anti-Ram Vehicle Barrier List supersedes all previous versions. Please refer to the date above to ensure you have the most up to date list. Neither this list nor any previous list represents an overall endorsement of any product or design or addresses its operational suitability or maintainability. The list merely verifies that a particular vehicle barrier has been certified in accordance with the performance standards in ASTM F2656 or previously tested to the DOS SD-STD-02.01 standard and that the appropriate test reports have been submitted to, and validated by, the Protective Design Center. This list does not attempt to discern whether the barriers listed meet other contractual requirements. All listed barriers have been impact tested. Each vehicle barrier system has its own distinct characteristics that must be considered and weighed against the needs and conditions of the individual installation. Some barrier characteristics are associated with vulnerabilities. These vulnerabilities may not be readily apparent to the end users. See appendix A for a list of demonstrated characteristics. Careful consideration should be given to clearances and geometric characteristics when utilizing barrier systems of varying widths. For examples of ratings see appendix B. The PDC is available to discuss barrier characteristics, and other barrier issues or questions at PDC.Web@usace.army.mil.

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ACTIVE BOLLARD **SEE NOTE 6 IN APPENDIX A**

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
K4	L2	SP Defender	ATG Access, Inc.	3-bollard array
K4	L2	DSC 800 Bollard Type Barricade	Delta Scientific Corporation	3-bollard array May not be able to meet required operating time
M30	P1	Ground Retractable Bollard – Model RB-400	Barrier1 Systems, Inc.	Single Bollard
M30	P1	J355 HA-M30 (KH) Bollard	FAAC International, Inc.	Single bollard
M30	P1	Movable Bollard M30	Perimeter Protection Germany GmbH	Single bollard
M30	P1	Movable Bollard, “AUIA – 348”	TiSO Production	Single bollard
M30	P1	RSS4003R	RSSI	3-bollard array
M30	P1	Model 303 Single High Impact Operable Bollard	B&B Roadway and Security Solutions	Single bollard. 3.28’ clear spacing would result from two adjacent as tested bollards. 4’ centerline spacing would result from two adjacent as tested bollards. 48” wide foundation.
K8	L3	XT-1208-RB, Xact Series Retractable Bollards - (fka-Eagle Series Bollards, K8)	Harden Architectural Security Products, LLC	3-bollard array, hydraulic bollards
K8	L2	DSC 701 Crash Certified Bollard Type Barricade	Delta Scientific Corporation	3-bollard array May not be able to meet required operating time
K8	L1	ARMR B-30 Bollard Assembly	B&B ARMR	3-bollard array, hydraulic bollards
M40	P1	Hydraulic Bollard, HBD 275 H90	Ozak Access Technologies Inc.	Single 10.63” bollard. 4.04’ clear spacing would result from two adjacent as tested bollards. 4.92’ centerline spacing would result from two adjacent as tested bollards. 59.1” wide foundation.

ACTIVE BOLLARD **SEE NOTE 6 IN APPENDIX A**

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
K12	L3	SP Titan	ATG Access, Inc	3-bollard array
K12	L2	Movable Bollard K12	Perimeter Protection Germany GmbH	Single Hydraulic bollard
K12	L2	NBI Hydraulic Bollard Barrier	Nasatka Barrier, Inc.	3-bollard array
K12	L2	XT-1208-RB, Xact Series Retractable Bollards - (fka-Eagle Series Bollards, K12)	Harden Architectural Security Products, LLC	3-bollard array, hydraulic bollards
K12	L1	B40 Retractable Bollard	B&B ARMR	3-bollard array, hydraulic bollards
M50	P1	SP1000 Rising Bollard	ATG Access, Inc	single hydraulic bollard
M50	P1	DSC720 1M	Delta Scientific Corporation	3-bollard array, pneumatic bollards
M50	P1	HT1 Raptor	Heald Ltd	Single bollard
M50	P1	HRB-Protector Crash Tested Rising Bollard	Optima Engineering	Single bollard
M50	P1	AUIA-342	TiSO Blockers	Single bollard
M50	P2	TITAN MKII Hydraulic Bollard	ATG Access, Inc	3-bollard array, hydraulic bollards
M50	P2	BLG-05 Foundations Protection System	EL-GO TEAM Parking and Security Systems	Single Pneumatic/Hydraulic/Electric Bollard
M50	P2	Movable Bollard M50	Perimeter Protection Germany GmbH	Single Hydraulic bollard
M50	P2	PASS PM 275/M50-1200A	Pilomat SrI	Single Hydraulic bollard

ACTIVE BOLLARD **SEE NOTE 6 IN APPENDIX A**

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
M50	P2	G-1752 Active Bollard	Gibraltar Perimeter Security	Single 12” bollard. 4.67’ clear spacing would result from two adjacent as tested bollards. 5.73’ centerline spacing would result from two adjacent as tested bollards. 68.75” wide foundation.
M50	P2	RollC Retractable Bollard	Rollc Company	Single 12.8” bollard. 6.81’ clear spacing would result from two adjacent as tested bollards. 7.87’ centerline spacing would result from two adjacent as tested bollards. 94.5” wide foundation.
M50	P3	SW1700 (EM)	Global GRAB Technologies (fka: FutureNet Security Solutions, Smith & Wesson Secuirty Solutions, Universal Safety Response)	3-bollard array, electromechanical
M50	P3	Hydraulic Tandem Bollard HBD 275 H 90	Ozak Access Technologies Inc.	2-bollard array with 10.63” diameter bollards. 2.62’ clear spacing would result from two adjacent as tested bollards within the 2-bollard array. 3.51’ centerline spacing would result from two adjacent as tested bollards within the 2-bollard array. 4.04’ clear spacing would result between two adjacent as tested 2-bollard arrays. 101.18” wide foundation.
M50	P3	Pilona Automatica Alta seguridad HM50/12	Benito Urban, SLU	Single bollard array with 10.75” (273 mm) diameter bollard. 5.67’ (1.73 m) clear spacing would result between two adjacent as tested 1-bollard arrays. 6.56' (2.0 m) wide foundation.

ACTIVE DROP-ARM BEAM **SEE NOTE 10 IN APPENDIX A**

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
K4	L3	Satyr-4 Crash Beam	Perimeter Security Partners, LLC	11.5 foot clear opening
K4	L3	Bosik Bar VBS Shallow Foundation Barrier (SP VBB) K4	ATG Access, Inc	14 foot clear opening
K4	L3	ARMR Model 730 Crash Gate	B&B ARMR	12 foot clear opening
K4	L2	IP500 Transportable Beam for Quick Deployment	Delta Scientific Corporation	12 foot clear opening, surface mounted
K4	L2	TT212EC Drop Arm Beam Barrier System	Delta Scientific Corporation	12 foot clear opening
M30	P1	M530 12-foot Drop Arm Assembly	Nasatka Barrier, Inc	12 foot clear opening
M30	P1	M530 26-foot Drop Arm Assembly	Nasatka Barrier, Inc	26 foot clear opening
M30	P1	M-30 VP-SF	Autogate, Inc	15 foot clear opening
M30	P1	Model 773 Series Drop Arm Barrier	B&B Roadway Security Systems	24 foot clear opening
M30	P1	StrongArm M30	HySecurity Gate, Inc.	12 foot clear opening
M30	P1	Sono Tube Barrier Arm	Logical Decisions, Inc.	20 foot clear opening
M30	P1	RSS-3000 Drop Beam System	RSSI Barriers	11.5 foot clear opening
M30	P1	Drop Arm Barrier	Tymetal Corporation	14 foot clear opening
M30	P1	Model DSC7090-M30	Delta Scientific Corporation	12’ (3.66m) clear opening 4.02’ (1.23m) clear spacing would result between two adjacent as tested barriers 21.04’ (6.41m) foundation width
M30	P1	M30 P1 Drop Arm	Black Security Products	22.96' clear opening

ACTIVE DROP-ARM BEAM **SEE NOTE 10 IN APPENDIX A**

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
M30	P1	12' Drop Arm	Ameristar Perimeter Security Systems	12 foot clear opening. Interpolation with 24' Drop Arm not allowed.
M30	P2	24' Drop Arm	Ameristar Perimeter Security Systems	24 foot clear opening, Interpolation with 12' Drop Arm not allowed.
M30	P2	Model 773 Drop Arm	B&B ARMR	24 foot clear opening
M30	P2	G-2300S Surface Mount Vehicle Barrier	Gibralter Perimeter Security	12 foot clear opening
M30	P2	Barrier Arm Crash Gate	Logical Decisions, Inc.	Approx 12.5 foot clear opening
M30	P3	G-2300P Portable Vehicle Barrier	Gibralter Perimeter Security	12 foot clear opening
M30	P3	G-4033P Portable Drop Arm	Gibralter Perimeter Security	12 foot clear opening
K8	L3	VPL-CB-24	Autogate, Inc	14.5 foot clear opening
K12	L3	Bosik Bar VBS Deep Foundation Barrier (SP VBB) K12	ATG Access, Inc	14.25 foot clear opening
K12	L3	VPL-CB-24	Autogate, Inc	14.5 foot clear opening
K12	L3	DSC 7000 Barrier	Delta Scientific Corporation	12 foot clear opening
K12	L3	NMSB XII Crash Beam Barrier - 12 ft	Nasatka Barrier, Inc	12 foot clear opening -
K12	L3	NMSB XII Crash Beam Barrier - 18 ft	Nasatka Barrier, Inc	18 foot clear opening
M50	P1	TCRB12 Pivot Arm/Beam	Tymetal Corporation	14 foot clear opening
M50	P1	Satyr-4 Crash Beam	Perimeter Security Partners, LLC	12.9 foot clear opening

ACTIVE DROP-ARM BEAM **SEE NOTE 10 IN APPENDIX A**

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
M50	P2	24-ft Patriot Rising Beam Barrier	Ameristar Perimeter Security Systems	24 foot clear opening
M50	P2	Horizontal Crash Beam or Horizontal Cable Barrier (HCB) Ground Retractable Active Vehicle Barrier	Barrier1 Systems, Inc	15’-10” span - interpolation with 47’-10” span barrier is acceptable
M50	P2	Horizontal Crash Beam or Horizontal Cable Barrier (HCB) Ground Retractable Active Vehicle Barrier	Barrier1 Systems, Inc	47’-10” span - interpolation with 15’-10” barrier is acceptable
M50	P2	Drop Arm Crash Beam Model FCB-1200	Barrier1 Systems, Inc	13’-9” clear opening
M50	P2	StrongArm M50	HySecurity Gate, Inc.	12 foot clear opening
M50	P2	24’ Drop Arm	Black Security Products	24.0’ (7.315 m) Clear Opening 29.58’ - (9.016 m) Foundation Width
M50	P2	Satyr-12 Crash Beam	Perimeter Security Partners, LLC	28 foot clear opening
M50	P3	Drop Arm Vehicle Barrier - KBVB	Barrier1 Systems, Inc.	14 foot clear opening, interpolation with 34 foot width acceptable
M50	P3	Active Drop Arm Swing Gate, Surface Set Mobile Crash Beam Barrier, 14’0” Span, Model #DASG-SSM	Barrier1 Systems, Inc	14 foot clear opening, interpolation with 34 foot width acceptable
M50	P3	Active Drop Arm Swing Gate, Surface Set Mobile Crash Beam Barrier, 34’0” Span, Model #DASG-SSM	Barrier1 Systems, Inc	34 foot clear opening, interpolation with 14 foot width acceptable

ACTIVE GATE **SEE NOTE 10 IN APPENDIX A**

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
K4	L2	ARMR Model 400 Sliding Gate	B&B ARMR	12 foot clear opening
M30	P1	K4 Shield Crash Gate	Autogate, Inc	15'-8" clear opening
M30	P1	AR-266 - 12 ft	Anti-Ram Barriers, Inc.	12 foot clear opening
M30	P1	TCG4 Sliding Gate Barrier	Tymetal Corporation	14 foot clear opening
M30	P1	BM530 12’ Gate Barrier	Apex Fabrication & Design, Inc.	12 foot clear opening
M30	P1	DSC8000 Bi-Fold Gate	Delta Scientific Corporation	13.73 foot clear opening
K12	L3	CG12 Gate	Bad Day Fabrication	12 foot clear opening
K12	L3	DSC 7500 Barrier	Delta Scientific Corporation	12 foot clear opening
K12	L3	K12 Cable Crash Gate	Betafence	24 foot clear opening
K12	L3	AR 466 Anti-Ram Vehicle Barrier - 40 ft	Anti-Ram Barriers, Inc.	40 foot clear opening
K12	L3	Modified Interlocking Finger Gate	Logical Decisions	V shape, 13 foot clear opening
K12	L1	ARMR Model 450 Anti-Climb High Security Vehicle Access Control Cantilever Gate System	B&B ARMR	12 foot clear opening
M50	P1	Terrablock Crash Gate	Betafence	16.4 foot clear opening, must be installed with Terrablock M50 passive barriers in configuration
M50	P1	DSC 288	Delta Scientific Corporation	20 foot clear opening
M50	P1	Tracked Gate TG M50	Perimeter Security Partners, LLC	7.2 meter clear opening

ACTIVE GATE **SEE NOTE 10 IN APPENDIX A**

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
M50	P1	SR 466 Anti-Ram Vehicle Barrier	Anti-Ram Barriers, Inc.	12.75 foot clear opening
M50	P1	AR 466 Anti-Ram Vehicle Barrier - 16.5 ft	Anti-Ram Barriers, Inc.	16.5 foot clear opening
M50	P1	K12 Cable Restraint Barrier - 24 ft	Neusch Innovations, LP	24 foot clear opening
M50	P1	Terrablock Vehicle Access Gate	Praesidiad NV	16.4 foot clear opening, must be installed with Terrablock XV passive barriers in configuration
M50	P2	G-5500 Anti-Ram Sliding Gate	Gibralter Perimeter Security	24 foot clear opening
M50	P2	G-5500 Anti-Ram Sliding Gate	Gibralter Perimeter Security	28 foot clear opening
M50	P2	K12 Cable Restraint Barrier - 50 ft	Gibralter Perimeter Security	50 foot clear opening
M50	P2	Crash Gate System Barrier	Jamieson Manufacturing Co.	24 foot clear opening
M50	P2	K12 Cable Restraint Barrier - 50 ft	NEU Security Systems	50 foot clear opening
M50	P2	32’ Articulating TCRB Crash Gate	Tymetal Corporation	32 foot clear opening
M50	P2	TCGR-12 Box Frame Cantilever Slide Gate with Crash Beam	Tymetal Corporation	16 foot clear opening - No interpolation with 26’ version
M50	P2	26’ x 7’ Box Frame Cantilever Slide Gate w/Crash Beam Model TCGR-12	Tymetal Corporation	26 foot clear opening - No interpolation with 16’ version
C730	P1	High Security Fancy Fence Gate	JP Novation Sp. z.o.o FANCY FENCE	Gate width 16.24' (4.94 m), foundation width 18.86' (5.75 m).

ACTIVE NET SEE NOTE 10 IN APPENDIX A

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
M40	P1	GRAB-400 - 12 ft SEE APPENDIX A	Global GRAB Technologies (fka; FutureNet Security Solutions, Smith & Wesson Security Solutions, Universal Safety Response)	12 foot clear opening - interpolation with 60 foot barrier is acceptable with a P2 penetration. **Barrier has a demonstrated characteristic.** SEE APPENDIX A
M40	P2	GRAB-400 - 60 ft SEE APPENDIX A	Global GRAB Technologies (fka; FutureNet Security Solutions, Smith & Wesson Security Solutions, Universal Safety Response)	60 foot clear opening - interpolation with 12 foot barrier is acceptable with a P2 penetration. **Barrier has a demonstrated characteristic.** SEE APPENDIX A
M50	P1	Swing Gate Access Control Barrier	Barrier1 Systems, Inc.	18’ 3” clear opening
M50	P2	30' Retractable Net Vehicle Barrier System SEE APPENDIX A	Barrier1 Systems, Inc.	30 foot clear between stanchions - interpolation with 90 foot barrier is acceptable with P3 rating. SEE APPENDIX A
M50	P3	90' Retractable Net Vehicle Barrier System SEE APPENDIX A	Barrier1 Systems, Inc.	90 foot clear between stanchions - interpolation with 30 foot barrier is acceptable with P3 rating. SEE APPENDIX A
M50	P2	Retractable Cable Net Vehicle Barrier System - 20 ft **4 Horizontal Cables**	Barrier1 Systems, Inc.	19' 9.5" clear opening between stanchions - interpolation between 19’ 9.5” and 52’ 5” is acceptable
M50	P2	Retractable Cable Net Vehicle Barrier System - 52.5 ft **4 Horizontal Cables**	Barrier1 Systems, Inc.	52' 5" clear opening between stanchions - interpolation between 52’ 5” and 19’ 9.5” is acceptable
M50	P2	Vehicle Arrestor 2.0-NET-400 Net Based Active Vehicle Barrier – 80’ SEE APPENDIX A	Barrier1 Systems, Inc.	80' clear opening between stanchions - interpolation between 29’ 3” and 80’ is acceptable. **Barrier has a demonstrated characteristic.** SEE APPENDIX A
M50	P2	Vehicle Arrestor 2.0-NET-400 Net Based Active Vehicle Barrier – 29’ 3" SEE APPENDIX A	Barrier1 Systems, Inc.	29' 3" clear opening between stanchions - interpolation between 29’ 3” and 80’ is acceptable. **Barrier has a demonstrated characteristic.** SEE APPENDIX A

ACTIVE NET SEE NOTE 10 IN APPENDIX A

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
M50	P2	GRAB-300 - 14 ft SEE APPENDIX A	Global GRAB Technologies (fka; FutureNet Security Solutions, Smith & Wesson Security Solutions, Universal Safety Response)	14 foot clear opening - interpolation with 12 foot barrier is acceptable with a P2 penetration. **Barrier has a demonstrated characteristic.** SEE APPENDIX A
M50	P2	GRAB-300 - 62 ft SEE APPENDIX A	Global GRAB Technologies (fka; FutureNet Security Solutions, Smith & Wesson Security Solutions, Universal Safety Response)	62 foot clear opening - interpolation with 12 foot barrier is acceptable with a P2 penetration. **Barrier has a demonstrated characteristic.** SEE APPENDIX A
M50	P2	Defender Net 21’	Black Security Products	21.29’ (6.49m) tested width 12.67’ (3.86m) clear spacing would result between two adjacent as tested barriers (as measured between major abutment elements) 6.34’ (1.93 m) clear space exists between edge of foundation and the major abutment elements 35.96’ (10.96m) foundation width **Interpolation with the 72' tested width is allowed**
M50	P2	Defender Net 72’	Black Security Products	72.0’ (21.95m) tested width 2.0’ (0.61m) clear spacing would result between two adjacent as tested barriers (as measured between major abutment elements) 1.0’ (0.31m) clear space exists between edge of foundation and the major abutment elements 87.0’ (26.52m) foundation width **Interpolation with the 21.29' tested width is allowed**
M50	P3	Modified Vehicle Arresting System (VAS)	Engineered Arresting Systems Corporation	24 foot tested width

ACTIVE POST AND BEAM SEE NOTE 10 IN APPENDIX A

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
K4	L3	Barrier Lift System K4	Perimeter Protection Germany GmbH	9 m (29.5 foot) clear opening
M30	P3	Portable Beam Barricade Model: DSC 1500	Delta Scientific Corporation	16 foot clear opening
K12	L3	SP Patriot	ATG Access, Inc.	12 foot clear opening
K12	L3	Barrier Lift System – 6m	Perimeter Protection Germany GmbH	6 m clear opening No interpolation with 10 m barrier
K12	L2	Barrier Lift System K12 – 10m	Perimeter Protection Germany GmbH	10 m width No interpolation with 6 m barrier
M50	P1	XT-4200-HB Post & Beam Gate	Ross Technology Co.	24 foot clear opening

ACTIVE WEDGE **SEE NOTE 10 IN APPENDIX A**

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
PU40	P3	DSC 1000 Barrier	Delta Scientific Corporation	12 foot clear opening, portable wedge
K4	L3	DSC 1200 Barrier	Delta Scientific Corporation	12 foot clear opening
K4	L2	DSC 1100 Quick Beam Deployment Barrier System	Delta Scientific Corporation	12 foot clear opening, surface mounted
K4	L2	XS-2000-PW, Xpress Series Portable Wedge Barrier - (fka- Osprey Series Portable Wedge)	Harden Architectural Security Products, LLC	12 foot clear opening, portable wedge
K4	L1	ARMR Model 850 Portable/Towable Barrier	B&B ARMR	Portable wedge
K4	L1	MP5000 Mobile Barrier	Delta Scientific Corporation	12 foot clear opening, portable wedge
M30	P1	HD200	Delta Scientific Corporation	9 foot clear opening
M30	P1	OZAK Road Blocker, HRB 30 R 90	Ozak Access Technologies Inc.	9.84’ (3.00m) tested width 4.59’ (1.40m) clear spacing would result between two adjacent as tested barriers 14.44’ (4.40m) foundation width
M30	P1	AUIA-313 Automatic Barrier	TiSO Production	9.42’ (2.87 m) tested width 4.36’ (1.33m) clear spacing would result between two adjacent as tested barriers 13.78’ (4.20 m) foundation width
M30	P2	Pyramid Barrier	Mifram Security	3 – 1 m wide pyramid shapes bolted together
M30	P3	MNSB XV Mobile Barrier	Nasatka Barrier, Inc.	12 foot clear opening, mobile wedge
K8	L1	DSC 1100 Quick Beam Deployment Barrier System	Delta Scientific Corporation	12 foot clear opening, surface mounted
M40	P1	SHS3110-8	Secure USA, Inc.	10 foot tested width

ACTIVE WEDGE **SEE NOTE 10 IN APPENDIX A**

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
M40	P3	MP5000 Mobile Barrier - 16 feet	Delta Scientific Corporation	16 foot clear opening, mobile wedge
M40	P3	MP5000 Mobile Barrier - 20 feet	Delta Scientific Corporation	20 foot clear opening, mobile wedge
M40	P3	MNSB XVI Mobile Barrier	Nasatka Barrier, Inc.	16 foot clear opening, mobile wedge
M40	P3	NMSB XVX 20 ft Clear Opening Barrier	Nasatka Barrier, Inc.	20 foot clear opening, mobile wedge
K12	L3	SP Sentinel	ATG Access, Inc.	8 foot plate
K12	L3	ARMR Shallow Mount Plate Barrier Model 820	B&B ARMR	9 foot tested width
K12	L3	DSC 2000 Barrier	Delta Scientific Corporation	3 - 2 foot wedges with 18 inch spacing
K12	L3	Model DSC501 - Phalanx Type Barricade	Delta Scientific Corporation	9 foot wide plate
K12	L3	Road Blocker DSP K12	Perimeter Protection Germany GmbH	4.6 meter tested width
K12	L3	MSB II Barrier	Nasatka Barrier, Inc.	12 foot clear opening
K12	L3	Wedge K12	Perimeter Protection Germany GmbH	4 meter tested width
K12	L3	XT-1000-W, Xact Series Wedge Barrier - (fka-Eagle Series Wedge Barrier)	Harden Architectural Security Products, LLC	9 foot wide plate
K12	L3	RSS-2000	RSSI	4 post configuration - interpolation with 6 post configuration is acceptable, 5 post configuration acceptable
K12	L3	Phoenix Wedge Barrier	Perimeter Security Partners, LLC (PSP)	8 foot plate
M50	P1	Electric Wedge Barrier	Barrier1 Systems, Inc.	10 foot tested width

ACTIVE WEDGE **SEE NOTE 10 IN APPENDIX A**

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
M50	P1	Model 828 Wedge Barrier	B&B ARMR	10 foot tested width
M50	P1	DS 2000S Road Blocker	Digital & Security Technology Co., LTD	8.2 foot (2.5 m) tested width
M50	P1	DSC 207S	Delta Scientific Corporation	9 foot wide plate
M50	P1	HD2055	Delta Scientific Corporation	12 foot tested width
M50	P1	HD 300	Delta Scientific Corporation	9’ 1” tested width
M50	P1	Road Block DS-3000S	Digital & Security Technology Co., LTD	12.5 foot tested width
M50	P1	A-120-C/A-260 Optimus	EL-GO TEAM Parking and Security Systems	8.1 foot tested width
M50	P1	9 ft Wedge Barrier	Global GRAB Technologies (fka: FutureNet Security Solutions, Smith & Wesson Security Solutions, Universal Safety Response)	9 foot tested width; interpolation with 16 foot width acceptable
M50	P1	16-ft Wedge System	Global GRAB Technologies (fka: FutureNet Security Solutions, Smith & Wesson Security Solutions, Universal Safety Response)	16 foot tested width; interpolation with 9 foot width acceptable
M50	P1	G-2000 M50-P1 8’0” Wedge Barrier	Gibralter Perimeter Security	8’0” clear opening; interpolation with 14’6” width acceptable
M50	P1	G-2000 M50-P1 14’6” Wedge Barrier	Gibralter Perimeter Security	14’6” clear opening; interpolation with 8’0” width acceptable
M50	P1	Road Blocker Model GBRH50 Wedge Barrier	Guardian Industries Co.	10' 1" tested width
M50	P1	Viper RBSM 1000	Heald Ltd.	9.83’ plate
M50	P1	HydraWedge SM50	HySecurity	6.5 foot tested width
M50	P1	NSMB-IIID-E - 8 ft	Nasatka Barrier, Inc.	8 foot plate
M50	P1	Model III D-E 10’ Barrier System	Nasatka Barrier, Inc.	10 foot tested width

ACTIVE WEDGE **SEE NOTE 10 IN APPENDIX A**

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
M50	P1	Model III D-E 11' Barrier System	Nasatka Barrier, Inc.	11 foot tested width
M50	P1	Model 3 D-E 12' Barrier System	Nasatka Barrier, Inc.	12 foot tested width
M50	P1	Model III D-E 14' Barrier System	Nasatka Barrier, Inc.	14 foot tested width
M50	P1	ElkostaWedge II	Perimeter Protection Germany GmbH	6.5 foot (1.98m) tested width
M50	P1	RSS-2000VI	RSSI	6 post configuration - interpolation with 4 post configuration is acceptable, 5 post configuration acceptable
M50	P1	SHF3610-12	SecureUSA, Inc.	14 foot wide plate
M50	P1	SHF3614S	SecureUSA, Inc.	10 foot wide plate
M50	P1	Road Blocker "AUIA – 333 Automatic"	TiSO Production	9.42' (2.87 m) tested width
M50	P1	NMSB III-D	Nasatka Barrier, Inc.	14.0' (4.27m) tested width 2.44' (0.74m) clear spacing would result between two adjacent as tested barriers 16.44' (5.01m) foundation width
M50	P1	G-2500 14' Wedge Barrier	Gibralter Perimeter Security	14.0' (4.27 m) tested width 2.00' (0.61 m) clear spacing would result between two adjacent as tested barriers 16.0' (4.88 m) foundation width Interpolation with G-2500 8' Wedge Barrier is acceptable
M50	P1	G2500 8' Wedge Barrier	Gibralter Perimeter Security	8.0' (2.74m) tested width 2.00' (0.61 m) clear spacing would result between two adjacent as tested barriers 10.0' (3.05m) foundation width Interpolation with G-2500 14' Wedge Barrier is acceptable

ACTIVE WEDGE **SEE NOTE 10 IN APPENDIX A**

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
M50	P1	DSC550-10’ (Electro-mechanical Barrier)	Delta Scientific Corporation	9.67' (2.94m) tested width 3.5’ (1.07 m) clear spacing would result between two adjacent as tested barriers 13.2’ (4.01 m) foundation width NO Interpolation with 16.67’ allowed
M50	P1	DSC550-10’ (Hydraulic Barrier)	Delta Scientific Corporation	9.67' (2.94m) tested width 2.83’ (0.863m) clear spacing would result between two adjacent as tested barriers 12.5’ (3.81m) foundation width Interpolation with 16.67’ foot width acceptable
M50	P1	DSC550-16’ (Hydraulic Barrier)	Delta Scientific Corporation	16.67’ (5.08m) tested width 2.83’ (0.863m) clear spacing would result between two adjacent as tested barriers 19.5’ (5.94m) foundation width Interpolation with 9.67’ foot width acceptable
M50	P1	NMSB 3B-2020	Nasatka Barrier, Inc.	14.0’ (4.27 m) tested width 2.09’ (0.637m) clear spacing would result between two adjacent as tested barriers 16.0’ (4.88 m) foundation width
M50	P1	10' 3 Post Wedge Barrier	Black Security Products	9.96’ (3.04 m) tested width 2.87’ (0.87m) clear spacing would result between two adjacent as tested barriers 12.83’ (3.91 m) foundation width
M50	P1	Shallow Foundation Wedge Barrier	Black Security Products	10' tested width 2' clear spacing would result between two adjacent as tested barriers 12.83’ (3.91 m) foundation width
M50	P1	DSSM Wedge Barrier	D & S Technology	9.84' (3 m) tested width 4.2' clear spacing would result between two adjacent as tested barriers 14.04’ (4.28 m) foundation width

ACTIVE WEDGE **SEE NOTE 10 IN APPENDIX A**

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
M50	P3	Rollc Company "RRB 5100 Road Blocker	Rollc Company	16.34' (4.98 m) tested width 2.71' (0.83m) clear spacing would result between two adjacent as tested barriers 19.05' (5.806 m) foundation width
M50	P3	MP5000 16' Barricade	Delta Scientific Corporation	16 foot clear opening, mobile wedge Chained To 6 Delta Passive Barriers
C730	P1	Road Blocker, Speedbump "AUIA – 359-04	TiSO Production	14.35' (4.068 m) tested width
H30	P1	Heavy Road Block Barrier	Digital and Security Technology Co.	11.48' (3.50 m) tested width 4.20' (1.28 m) clear spacing would result between 15.68' (4.78 m) foundation width

ACTIVE CABLE **SEE NOTE 10 IN APPENDIX A**

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
M40	P2	RSSI Cable Trap System	RSSI	4 - 1" diameter cables, 100' tested total length

PASSIVE BOLLARD **SEE NOTE 5 IN APPENDIX A**

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
SC40	P1	Reliance Foundry Removable Bollard	Reliance Foundry	Single Bollard 6.60” Diameter 1.95’ clear spacing would result from two adjacent as tested bollards 2.50’ centerline spacing would result from two adjacent as tested bollards 30” wide foundation
SC30	P1	Bollard 150/C40FX 900	Ontario Bollards	Single Bollard 6.61” Diameter 1.96’ clear spacing would result from two adjacent as tested bollards 2.51’ centerline spacing would result from two adjacent as tested bollards 30.12” wide foundation
SC40	P1	Reliance Foundry R-1040-C40	Reliance Foundry	Single Bollard 6.30” Diameter 1.97’ clear spacing would result from two adjacent as tested bollards 2.50’ centerline spacing would result from two adjacent as tested bollards 30” wide foundation
SC40	P1	Bollard 150/C40RM 900 removable	Ontario Bollards	Single Bollard 6.61” Diameter 1.96’ clear spacing would result from two adjacent as tested bollards 2.51’ centerline spacing would result from two adjacent as tested bollards 30.12” wide foundation
PU50	P2	DSC 650 Shallow Foundation Bollard Array	Delta Scientific Corporation	2-bollard array 3.61’ clear spacing (gap between bollards) 52” centerline spacing 108” wide foundation
K4	L3	Shallow Bollard System Barrier	Atlas Security Products, Inc.	5-bollard array
K4	L3	RB80 Bollard	Weathers Manufacturing, Inc.	48" OC, 3-bollard array

PASSIVE BOLLARD **SEE NOTE 5 IN APPENDIX A**

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
K4	L3	SP1000 Static Shallow Mount Barrier	ATG Access, Inc.	3-bollard array
K4	L3	Shallow Bollard System	SecureUSA, Inc.	5-bollard array
M30	P1	M30 Shallow Foundation Modular Bollard System Test#CV0077	Barrier1 Systems, Inc.	3-bollard array 3.75’ clear spacing (gap between bollards) 54” centerline spacing 168” wide foundation
M30	P1	Set and Pour Bollard	Barrier1 Systems, Inc.	Single bollard 4.33’ clear spacing would result from two adjacent as tested bollards 5.00’ centerline spacing would result from two adjacent as tested bollards 60” wide foundation
M30	P1	Shallow Foundation Modular Bollard System Test #TR2627	Barrier1 Systems, Inc.	Single modular bollard 13.28’ clear spacing would result from two adjacent as tested bollards 14.00’ centerline spacing would result from two adjacent as tested bollards 168” wide foundation
M30	P1	Removable Bollard Model RB151	BP (Systems) Engineering Pte Ltd	3-bollard array 3.70’ clear spacing (gap between bollards) 4.59’ centerline spacing 165.4” wide foundation
M30	P1	Fixed Bollard Model FB151	BP (Systems) Engineering Pte Ltd	3-bollard array 3.70’ clear spacing (gap between bollards) 4.59’ centerline spacing 165.4” wide foundation
M30	P1	M30 P1 Shallow Mount Bollard	Gibralter Perimeter Security	3-bollard array

PASSIVE BOLLARD **SEE NOTE 5 IN APPENDIX A**

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
M30	P1	Shaw Stainless & Alloy Shallow Bollard	Shaw Stainless & Alloy	3-bollard array 8.625” Diameter Bollards 3.78’ (1.15 m) clear spacing would result from two adjacent as tested bollards within the 3-bollard array 4.5’ (1.37 m) centerline spacing would result from two adjacent as tested bollards within the 3-bollard array 8.28’ (2.52 m) clear spacing would result between two adjacent as tested 3-bollard arrays 224” wide foundation Must be installed with 4’ sidewalk behind the foundation.
M30	P1	DSC630	Delta Scientific Corporation	Single Bollard 8” Diameter 3.45’ clear spacing would result from two adjacent as tested bollards 4.17’ centerline spacing would result from two adjacent as tested bollards 50” wide foundation
M30	P1	DSC633	Delta Scientific Corporation	Single Bollard 8.625” Diameter 3.45’ clear spacing would result from two adjacent as tested bollards 4.17’ centerline spacing would result from two adjacent as tested bollards 50.0” wide foundation
M30	P1	SFB-M30 Single Bollard	Nasatka Barrier, Inc.	Single bollard 8” Diameter 11.28’ clear spacing would result from two adjacent as tested bollards 12.00’ centerline spacing would result from two adjacent as tested bollards 144” wide foundation

PASSIVE BOLLARD **SEE NOTE 5 IN APPENDIX A**

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
M30	P1	Single Bulwark Shallow Mount Bollard	Ameristar Perimeter Security Systems	Single Bollard 8.625” Diameter 11.28’ clear spacing would result from two adjacent as tested bollards 12.0’ centerline spacing would result from two adjacent as tested bollards 144” wide foundation
M30	P2	8" SM Removable K4 Shallow Mount Bollard	Calpipe Security Bollards	3-bollard array 3.28’ clear spacing would result from two adjacent as tested bollards within the 3-bollard array 4.00’ centerline spacing would result from two adjacent as tested bollards within the 3-bollard array 3.28’ clear spacing would result between two adjacent as tested 3-bollard arrays 144” wide foundation
M30	P2	3 Bollard Array Bulwark Shallow Mount Bollards	Ameristar Perimeter Security Systems	3-bollard array 8.625” Diameter Bollards 4.0’ clear spacing would result from two adjacent as tested bollards within the 3-bollard array 4.72’ centerline spacing would result from two adjacent as tested bollards within the 3-bollard array 1.84’ clear spacing would result between two adjacent as tested 3-bollard arrays 144” wide foundation
M40	P1	M40 Shallow Foundation Modular Bollard System Test#CV0068	Barrier1 Systems, Inc.	3-bollard array 4.25’ clear spacing would result from two adjacent as tested bollards within the 3-bollard array 4.50’ centerline spacing would result from two adjacent as tested bollards within the 3-bollard array 3.75’ clear spacing would result between two adjacent as tested 3-bollard arrays 168” wide foundation

PASSIVE BOLLARD **SEE NOTE 5 IN APPENDIX A**

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
M40	P1	G-1441 Ultra-Shallow Bollard	Gibralter Perimeter Security	Single Bollard 12” Diameter 13.27’ clear spacing would result from two adjacent as tested bollards 14.33’ centerline spacing would result from two adjacent as tested bollards 172” wide foundation
M40	P2	G-1442 Ultra-Shallow Bollard	Gibralter Perimeter Security	Single Bollard 10” Diameter 13.44’ clear spacing would result from two adjacent as tested bollards 14.33’ centerline spacing would result from two adjacent as tested bollards 172” wide foundation
K12	L3	DSC 600 Shallow Frame Bollard Array	Delta Scientific Corporation	2-bollard array 3.44’ clear spacing would result from two adjacent as tested bollards within the 2-bollard array 4.33’ centerline spacing would result from two adjacent as tested bollards within the 2-bollard array 3.77’ clear spacing would result between two adjacent as tested 2-bollard arrays 108” wide foundation
K12	L3	Model 6 Bollards - 4-bank shallow mount	Nasatka Barrier, Inc.	4-bollard array 2.10’ clear spacing would result from two adjacent as tested bollards within the 4-bollard array 3.00’ centerline spacing would result from two adjacent as tested bollards within the 4-bollard array 4.60’ clear spacing would result between two adjacent as tested 4-bollard arrays 174” wide foundation
K12	L3	Shallow Mount Bollards	Sandia National Laboratories	3-bollard array 3.10’ clear spacing would result from two adjacent as tested bollards within the 3-bollard array 4.00’ centerline spacing would result from two adjacent as tested bollards within the 3-bollard array 15.10’ clear spacing would result between two adjacent as tested 3-bollard arrays 288” wide foundation

PASSIVE BOLLARD **SEE NOTE 5 IN APPENDIX A**

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
M50	P1	M50 Shallow Foundation Single Bollard ASPI-SB-120	Atlas Security Products, Inc.	Single bollard
M50	P1	G-1350 – 3 Bollard Layout	Gibralter Perimeter Security	3-bollard array 4.50’ clear spacing would result from two adjacent as tested bollards within the 3-bollard array 5.40’ centerline spacing would result from two adjacent as tested bollards within the 3-bollard array 5.31’ clear spacing would result between two adjacent as tested 3-bollard arrays 204” wide foundation
M50	P1	M50 Shallow Foundation Bollard	Gibralter Perimeter Security	3-bollard array 4.50’ clear spacing would result from two adjacent as tested bollards within the 3-bollard array 5.40’ centerline spacing would result from two adjacent as tested bollards within the 3-bollard array 8.96’ clear spacing would result between two adjacent as tested 3-bollard arrays 248” wide foundation
M50	P1	Fixed Bollard M50	Perimeter Protection Germany GmbH	3-bollard array 3.70’ clear spacing would result from two adjacent as tested bollards within the 3-bollard array 4.90’ centerline spacing would result from two adjacent as tested bollards within the 3-bollard array 3.80’ clear spacing would result between two adjacent as tested 3-bollard arrays 177.6” wide foundation
M50	P1	Shallow Mount Bollard Single Stand Alone Model SMB-1200- SA	Barrier1 Systems, Inc.	Single bollard 10” Diameter 14.27’ clear spacing would result from two adjacent as tested bollards 15.17’ centerline spacing would result from two adjacent as tested bollards 182” wide foundation

PASSIVE BOLLARD **SEE NOTE 5 IN APPENDIX A**

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
M50	P1	14’ Bent Pipe Barrier	NON Proprietary Contact PDC For Engineering Details	Single Bent Pipe 10” Diameter No interpolation with 34’ 0.00’ clear spacing would result from two adjacent as tested bollards within the 1-bollard array 0.00’ centerline spacing would result from two adjacent as tested bollards within the 1-bollard array 2.10’ clear spacing would result between two adjacent as tested 1-bollard arrays 204” wide foundation (1)
M50	P1	34’ Bent Pipe Barrier	NON Proprietary Contact PDC For Engineering Details	Single Bent Pipe 10” Diameter No interpolation with 14’ 0.00’ clear spacing would result from two adjacent as tested bollards within the 1-bollard array 0.00’ centerline spacing would result from two adjacent as tested bollards within the 1-bollard array 2.10’ clear spacing would result between two adjacent as tested 1-bollard arrays 120” wide foundation (2)
M50	P2	Single Bollard Vehicle Barrier System TR2450	Barrier1 Systems, Inc.	Single bollard 7.10’ clear spacing would result from two adjacent as tested bollards 8.00’ centerline spacing would result from two adjacent as tested bollards 96” wide foundation
M50	P2	Set and Pour Fixed Bollard	Barrier1 Systems, Inc	Single bollard 5.10’ clear spacing would result from two adjacent as tested bollards 6.00’ centerline spacing would result from two adjacent as tested bollards 72” wide foundation
M50	P2	Defender Fix HM5012F	Benito Urban, SLU	Single bollard, 10.75" (273 mm) diameter 3.70’ (1.127 m) clear spacing would result from two adjacent as tested bollards 4.59’ (1.4 m) centerline spacing would result from two adjacent as tested bollards 55.1” (1400 mm) wide foundation

PASSIVE BOLLARD **SEE NOTE 5 IN APPENDIX A**

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
M50	P2	K12 Shallow Mount Bollard	Calpipe Security Bollards	3-bollard array 10” Diameter Bollards 4.10’ clear spacing would result from two adjacent as tested bollards within the 3-bollard array 5.00’ centerline spacing would result from two adjacent as tested bollards within the 3-bollard array 4.10’ clear spacing would result between two adjacent as tested 3-bollard arrays 180” wide foundation
M50	P2	M50 Deep-Mount Bollard	1-800-Bollards	3-bollard array with 8' reenforced sidewalk behind it. 10.75” Diameter Bollards 4.10’ clear spacing would result from two adjacent as tested bollards within the 3-bollard array 5.00’ centerline spacing would result from two adjacent as tested bollards within the 3-bollard array 9.10’ clear spacing would result between two adjacent as tested 3-bollard arrays 240” wide foundation
M50	P3	TB150 Ten Bollard Chained Array	Delta Scientific Corporation	10 bollard array, Overall length 40.75’ 1.75’ Clear spacing 4.25’ Centerline spacing No foundation
M50	P2	Shallow Mount Bollard PDT1400SMF	Calpipe Security Bollards	3-bollard array 10.25” Diameter Bollards 4.15’ clear spacing would result from two adjacent as tested bollards within the 3-bollard array 5.00’ centerline spacing would result from two adjacent as tested bollards within the 3-bollard array 5.15’ clear spacing would result between two adjacent as tested 3-bollard arrays 192” wide foundation

PASSIVE BOLLARD **SEE NOTE 5 IN APPENDIX A**

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
M50	P2	DSC635	Delta Scientific Corporation	Single Bollard 10.75” Diameter 5.6’ clear spacing would result from two adjacent as tested bollards 6.5’ centerline spacing would result from two adjacent as tested bollards 78” wide foundation
M50	P2	RSSM50B	RSSI Barriers, LLC	3-bollard array 10” Diameter Bollards 3.10’ clear spacing would result from two adjacent as tested bollards within the 3-bollard array 4.0’ centerline spacing would result from two adjacent as tested bollards within the 3-bollard array 7.10’ clear spacing would result between two adjacent as tested 3-bollard arrays 192” wide foundation
M30	P2	Shallow Mount Bollard	1-800-Bollards	Single Bollard 8.625” Diameter 9.28’ clear spacing would result from two adjacent as tested bollards 10.0’ centerline spacing would result from two adjacent as tested bollards 120” wide foundation
M50	P2	BBRSS 315 3 Bollard Array	B&B Roadway and Security Solutions	3-bollard array 12.75” Diameter Bollards 4.0’ clear spacing would result from two adjacent as tested bollards within the 3-bollard array 5.06’ centerline spacing would result from two adjacent as tested bollards within the 3-bollard array 6.94’ clear spacing would result between two adjacent as tested 3-bollard arrays 217.5” wide foundation

PASSIVE BOLLARD **SEE NOTE 5 IN APPENDIX A**

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
M50	P2	Shaw Stainless & Alloy Shallow Bollard	Shaw Stainless & Alloy	3-bollard array 10.75" Diameter Bollards 4' (1.22 m) clear spacing would result from two adjacent as tested bollards within the 3-bollard array 4.92' (1.50 m) centerline spacing would result from two adjacent as tested bollards within the 3-bollard 8.94' (2.72 m) clear spacing would result between two adjacent as tested 3-bollard arrays 236" wide foundation Must be installed with 4' sidewalk behind the foundation
M50	P2	Fixed 3 Bollard Array	Nasatka Barrier, Inc.	3-bollard array 4.52' (1.38 m) clear spacing would result from two adjacent as tested bollards within the 3-bollard array 5.42' (1.65 m) centerline spacing would result from two adjacent as tested bollards within the 3-bollard array 4.10' (1.25 m) clear spacing would result between two adjacent as tested 3-bollard arrays 190" wide foundation
M50	P3	FB-K12 Fixed Bollard System	Weathers Manufacturing, Inc.	
M50	P3	M50 Shallow Foundation Bollard - 40	Gibralter Perimeter Security	3-bollard array 4.49' clear spacing would result from two adjacent as tested bollards within the 3-bollard array 5.40' centerline spacing would result from two adjacent as tested bollards within the 3-bollard array 8.96' clear spacing would result between two adjacent as tested 3-bollard arrays 248" wide foundation
M50	P3	HBD High Security Fixed Bollard Model HBD 275 S 100	Ozak Access Technologies Inc.	Single bollard 10" diameter 4.04' clear spacing would result from two adjacent as tested bollards 4.92' centerline spacing would result from two adjacent as tested bollards 59" wide foundation

PASSIVE BOLLARD **SEE NOTE 5 IN APPENDIX A**

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
C750	P1	Fixed Triple Bollard, "FHCM50"	Fire and Hazard Control Equipment Co. LTD	3 - 14" (355 mm) diameter bollard array 3.33’ (1.015 m) clear spacing would result from two adjacent as tested bollards within the 3-bollard array 4.50’ (1.37 m) centerline spacing would result from two adjacent as tested bollards within the 3-bollard 4.28’ (1.305 m) clear spacing would result between two adjacent as tested 3-bollard arrays 173.23” (4.40 m) wide foundation
C750	P2	Fixed bollard, RB343-68-GH-15-0.1/0.1-032/100-140	TiSO Production	Single bollard

PASSIVE CABLE

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
M30	P1	M30 High Performance Post, Rail, and Structural Stand System - 73 ft (1" cable)	Ameristar Perimeter Security Systems	3 - 1" diameter cables, 72' tested length (post to post)
M30	P1	BSP M30 Cable Barrier	Black Security Products	90’ tested length, 30’ intermediate post spacing, 10’ line post spacing.
M30	P2	192’ Post and Cable Fence Barrier	Atlas Security Products, Inc.	192’ tested length, 10’ line post spacing
M40	P2	M40/P2 High Performance Post, Rail, and Structural Stand System - 73 ft (1.25" cable)	Ameristar Perimeter Security Systems	3 - 1.25" diameter cables, 72' tested length (post to post)
M40	P2	Cable Trap System	RSSI	4 - 1” diameter cables, 96’ tested length (end post to end post)
M50	P1	Typhon 30' M50-P1 PVB	Perimeter Security Partners, LLC	30 foot tested length center line of end post to centerline of end post; 3 – 1 3/8” cables
M50	P1	Ameristar High Performance Post, Rail, and Structural Strand System (1.5” cables)	Ameristar Perimeter Security Systems	40 foot tested length end post to end post; 3 – 1.5” cables
M50	P1	M50/P1 Cable Barrier System	Ameristar Perimeter Security Systems	3 - 1.5" diameter cables, 40' tested length (post to post)
M50	P1	M50 Wire Rope, Post, and Channel Rail Anti-Ram Fence	Ameristar Perimeter Security Systems	16’ post spacing, 2 cables
M50	P1	Barrier Fence System, Model ASPI-CF-M50/P1	Atlas Security Products, Inc.	3 – 1.25” diameter cables, 64’ system tested length
M50	P1	M50 P1 28ft. Cable Crash Fence	Betafence	3 strand cable barrier, 168’ Tested Length, 28’ Crash Line Post Spacing
M50	P1	Bristorm Zero Wire Rope Barrier	Hill & Smith Ltd.	50 foot tested length

PASSIVE CABLE

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
M50	P2	High Performance Post, Rail, and Structural Stand System (1.5" cable)	Ameristar Perimeter Security Systems	3 - 1.5" diameter cables, 56' tested length (post to post)
M50	P2	Cable Barrier Surface Set – Short Span Model CBSS-1200	Barrier1 Systems, Inc.	18.1’ clear cable span, 8 blocks
M50	P2	M50 Post and Cable System – 50 ft	Global GRAB Technologies (fka: FutureNet Security Solutions, Smith & Wesson Security Solutions, Universal Safety Response)	tested length - 50 foot, center of end post to center of end post, interpolation with 200ft barrier is acceptable
M50	P2	M50 Post and Cable System – 200 ft	Global GRAB Technologies (fka: FutureNet Security Solutions, Smith & Wesson Security Solutions, Universal Safety Response)	tested length - 200 foot, center of end post to center of end post, interpolation with 50ft barrier is acceptable
M50	P2	M50 P2 Cable Crash Fence	Betafence	3 strand cable barrier, 600’ between terminal posts, 200’ between line posts
M50	P2	BSP M50 Cable Barrier	Black Security Products	90’ tested length, 30’ intermediate post spacing, 10’ line post spacing.
M50	P2	Typhon Cable Barrier 40’ Span	Perimeter Security Partners, LLC	40.0’ tested length, 10.0’ line post spacing. Interpolation with 200.0’ barrier is acceptable
M50	P2	Typhon Cable Barrier 200’ Span	Perimeter Security Partners, LLC	200.0’ tested length, 10.0’ line post spacing. Interpolation with 40.0’ barrier is acceptable
M50	P2	100’ M50P2 Cable Barrier	Black Security Products	100' tested length, 20’ line post spacing, 10' intermediate post spacing. Two strands of 6x36 1 3/8" wire rope.
M50	P2	600’ 2 Strand Cable Fence	Black Security Products	600’ tested length, 200’ line post spacing, 13’4” intermediate post spacing.
M50	P3	High Performance Post, Rail, and Structural Stand System - 41 ft (1.25" cable)	Ameristar Perimeter Security Systems	3 - 1.25" diameter cables, 40' tested length (post to post)
M50	P3	Cable Barrier Surface Set Model CBSS-1200 Three Strand Cable Barrier – Long Span	Barrier1 Systems, Inc.	67’ 8” clear cable span, 8 blocks

PASSIVE PORTABLE

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
SC30	P2	Meridian Archer 1200 Portable Barrier	Meridian Rapid Defense	System composed of 4-24” modules connected by wire rope. Tested for impact at the center of the 4 module system.
PU30	P3	FMB Barrier	Mifram Security	7.142 m tested width
M30	P2	G-6532 M30 P2 20ft Modular Vehicle Barrier	Gibralter Perimeter Security	Tested length 20’
M30	P2	Modular Portable Protection Device	Black Security Products	System consisted of 3 42’ spans with ballast between each span and at each end of the system. Tested only for impact on center 42’ span. Listing applies to the center 42’ span.
PU30	P2	Portable Security Barrier	Munio Technologies LLC	Barrier width 22’. Metal assemblies spaced at 16” on center.
M30	P2	Cable Block Barrier Model CBB- 400	Barrier1 Systems, Inc.	Five 72” Block System. Tested for impact at center of system. Listing applies for impact at center of 4 - 72” blocks portion of the 5 block system which are separated by synthetic rope connection of 12”.
M30	P3	TB 100 Five Bollard Array	Delta Scientific Corporation	Five Bollard Array
M30	P3	K2600 Mobile/Portable VSB	Rologard Global Company	2 Complete Assemblies Necessary for Rating Tested Spacing between assemblies 9.84’ Tested Length for each assembly 86”
M40	P2	Sentry II Security Barrier	TrafFix Devices Incorporated	31 Water Filled, cable linked modules arranged in 3 rows. Tested for impact at the center of the 31-module system

PASSIVE POST AND BEAM

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
FS30	P1	Non-Proprietary FS30 P1 Barrier	ARTRANS-TEA (formally SDDC-TEA)	Tested length 177’ guard rail
M30	P1	G-Force M30 Post and Beam	Gibralter Perimeter Security	Tested length 140’ 9” end post to end post
M30	P1	G-Force M30 Post and Beam	Gibralter Perimeter Security	Tested length 28’9” Centerline terminal post to centerline terminal post.
M30	P1	Non-Proprietary M30 P1 Barrier	ARTRANS-TEA (formally SDDC-TEA)	Tested length 177’ SPECIALIZED guard rail
M40	P2	G-Force M40 Post and Beam	Gibralter Perimeter Security	Tested length 492’ end post to end post
M50	P1	G-Force M50 Post and Beam	Gibralter Perimeter Security	Tested length 140’ 9" end post to end post
M50	P1	G-Force Post and Beam	Gibralter Perimeter Security	Tested length 140’ 9" end post to end post
M50	P1	G-Force Combination Fence 90 Meter Run	Gibralter Perimeter Security	Tested length 90 m, 3 m post spacing
M50	P1	ARFS 466	Anti-Ram Barriers, Inc.	Tested length 30.9 m, 10.3 m post spacing

PASSIVE FENCE

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
K8	L1	Perimeter Security Fence with One-Inch Cable and Diagonal	Ameristar Perimeter Security Systems	
K8	L2	Impasse Perimeter Security Fence	Ameristar Perimeter Security Systems	2 - 1" diameter cables, 162 foot tested length
K8	L2	Perimeter Security Fence with 1 in Cable and Bollard Anchorage	Ameristar Perimeter Security Systems	2 -1” diameter cables; 32.67’ between posts
K8	L2	Perimeter Security Fence with One-Inch Cable and Bollard Anchorage	Ameristar Perimeter Security Systems	2 - 1" diameter cables, 162 foot tested length
K12	L3	Impasse Security Fencing	Ameristar Perimeter Security Systems	2 – 1” diameter cables; 32.67 ft between posts
K12	L3	Cable Crash Fence	Betafence	60 foot span, terminal post to terminal post
M50	P1	RSS-F501D Tube Beam Fence	Ross Security Systems LLC	Tube beam sections, 30 ft post spacing
M50	P2	M50 P2 Gibraltar Cable Crash Fence	Gibralter Perimeter Security	200 foot span main post to main post
M50	P2	Perimeter Security Stalwart Shield	Ameristar Perimeter Security Systems	3 – 1.25” diameter cables. 40’10” tested length.

PASSIVE INERTIAL

Rating	Penetration	Barrier Model/Description	Manufacturer/Designer	Remarks
K12	L3	Expeditionary Earth Filled Barrier	DefenCell	Earth filled barrier
K12	L3	RDFW Mk. 4	Geocell Systems Inc.	Earth filled barrier
K12	L3	HESCO SL 3636 (fka-C-3315 Flood Barrier)	HESCO Bastion Ltd.	Earth filled barrier
M50	P1	Terrablock M50	apexfence	Sand filled barrier with fence
M50	P1	Terrablock XV	Praesidiad NV	Sand filled barrier with fence

APPENDIX A

Important Vehicle Barrier Characteristics:

1. Tested configuration of Barriers:

With the exception of when interpolation is allowed between two tested lengths of barriers, only the tested configuration of the barrier meets the requirement of being on the DoD Anti-ram Vehicle Barrier List. Any modification from the "as tested" configuration is considered a different barrier and is NOT to be considered to meet the requirements of being on the DoD Anti-ram Vehicle Barrier List. These modifications include but are not limited to: length, and spacing of structural elements. It is up to the Project Team to make sure that the barriers are being installed in the "as tested" configuration. This can be accomplished by sending the barrier install submittal(s) to the PDC for review or getting a copy of the test report from the manufacturer to be used in reviewing the submittal(s).

2. Interpolation and Variable width Barriers:

Only interpolation between two tested lengths of barriers as defined in Section 8.2.5 of ASTM F2656/F2656 - 23 is currently allowed. Barriers that have been reviewed for interpolation are identified by notes in the far right column of the barrier identification. Barriers without notes in the far right column are considered stand alone barriers and interpolation is not allowed and only the separate tested length(s) meet the requirement of being on the DoD Anti-ram Vehicle Barrier List.

3. GRAB Net type barriers:

Demonstrated Characteristics: Some types of these barriers result in a undesirable characteristic when impacted by a certain type of vehicle.

Resolution:

ARMY PROJECTS: Products do not currently meet requirements contained in the Army Standards for Access Control Points/Army Standard Design for Access Control Points and are NOT to be used on Army Projects. Contract PDC for additional information.

AIR FORCE PROJECTS: Products recommended not to be installed in Air Force projects. Contract AFCEC or the PDC for additional information.

4. Barrier 1 Net Type Barriers with net trap

Demonstrated Characteristics: Some issues with roadway pavement expansion causing the lid of the trap area to not close correctly after a barrier deployment.

Resolution: Expansion joints might have to be installed near the barrier on certain types of roadways.

5. Barrier 1 Vehicle Arrestor 2.0-NET-400

Demonstrated Characteristics: Some types of these barriers result in a undesirable characteristic when impacted by a certain type of vehicle.

Resolution:

ARMY PROJECTS: Products do not currently meet requirements contained in the Army Standards for Access Control Points/Army Standard Design for Access Control Points and are NOT to be used on Army Projects. Contract PDC for additional information.

AIR FORCE PROJECTS: Products recommended not to be installed in Air Force projects. Contract AFCEC or the PDC for additional information.

4. Barrier 1 Retractable Net Vehicle Barrier Systems

Demonstrated Characteristics: Some types of these barriers result in a undesirable characteristic when impacted by a certain type of vehicle.

Resolution:

ARMY PROJECTS: Products do not currently meet requirements contained in the Army Standards for Access Control Points/Army Standard Design for Access Control Points and are NOT to be used on Army Projects. Contract PDC for additional information.

AIR FORCE PROJECTS: Products recommended not to be installed in Air Force projects. Contract AFCEC or the PDC for additional information.

5. Bollard Spacing

Demonstrated Characteristic: Some manufacturers are testing single bollards with foundations having significant width. Use of these products in the as tested configuration may not be feasible. To retain their rating, DOS tested and ASTM tested products are to be fielded in the as tested configuration. Single bollards with wide foundations cannot be fielded in the as tested configuration without resulting gaps large enough for vehicles to circumvent the system.

Resolution: Utilize products that can be fielded in the as tested configuration. Many bollards are tested in sets and some have compliant spacing.

6. Bollard Type Active Barriers

Demonstrated Characteristic: Small angular particles have moved into the sleeve of the bollard and prevented either deployment or retraction of the bollard(s).

Resolution: Avoid use of bollards where sharp angular particles or aggregate are found on or adjacent to the roadway. This includes sand and gravel. Also applicable in areas where snow/ice require application of sand or gravel to roadways.

7. All active vehicle barriers that include below grade components or pits.

Demonstrated Characteristic: Sump systems have been deactivated when active vehicle barriers were shut off. Barriers filled with water and were compromised.

Resolution: Place sump systems on a separate circuit or otherwise ensure that sump systems are not deactivated.

8. All active vehicle barriers spanning more than one roadway lane.

Demonstrated Characteristic: Activation of detection devices in any lane will prevent barrier deployment and result in open corridor(s) for a potential threat vehicle to utilize.

Resolution: Utilize individual active vehicle barrier installed in each lane. If a detection device is activated it will prevent deployment of the active vehicle barrier for that lane only. The rest of the corridor will be blocked by active vehicle barriers and the lane with the activated detection device will be partially blocked by the vehicle that activated the detection device.

9. Drain openings and drain lines for active vehicle barrier pits.

Drain lines for active vehicle barrier pits (whether sump pump or gravity drained) are often of insufficient diameter. Drain lines clog with debris often and active vehicle barrier pits fill with water.

Resolution: Ensure that drain lines and inlets are a minimum of 4” in diameter. Reduce surface water and storm water drainage into the active vehicle barrier pit through use of storm drains and flumes.

10. Fixed portions of the Barrier located in the unobstructive space next to the roadway.

Some AVB including Drop-Arms, Gates, Nets, Post and Beam, Cable, and some Wedge Barriers have fixed portions of the AVB that are located at the ends of the moving portion of the barrier. The barrier layout must be designed so that the fixed portion of the barriers are not located int he unobstructive space adjacent to the roadway.

Resolution: Ensure that there is a minimum distance of 4 feet from the edge of the driving portion of the roadway to any fixed portion of the AVB that extends above the driving portion of the road surface.

APPENDIX B

Test Produres Vehicle Characteristics:

ASTM F2656:

Kinetic Energy Designation:

SC30 = 2,420# Small Passenger Car at 30mph (78,000 ft-lbs of kinetic energy)
SC40 = 2,420# Small Passenger Car at 40mph (131,000 ft-lbs of kinetic energy)
SC50 = 2,420# Small Passenger Car at 50mph (205,000 ft-lbs of kinetic energy)
SC60 = 2,420# Small Passenger Car at 60mph (295,000 ft-lbs of kinetic energy)
FS30 = 4,630# Full-size Sedan at 30mph (137,000 ft-lbs of kinetic energy)
FS40 = 4,630# Full-size Sedan at 40mph (247,000 ft-lbs of kinetic energy)
FS50 = 4,630# Full-size Sedan at 50mph (387,000 ft-lbs of kinetic energy)
FS60 = 4,630# Full-size Sedan at 60mph (557,000 ft-lbs of kinetic energy)
PU30 = 5,000# Pickup Truck at 30mph (164,000 ft-lbs of kinetic energy)
PU40 = 5,000# Pickup Truck at 40mph (273,000 ft-lbs of kinetic energy)
PU50 = 5,000# Pickup Truck at 50mph (426,000 ft-lbs of kinetic energy)
PU60 = 5,000# Pickup Truck at 60mph (613,000 ft-lbs of kinetic energy)
M30 = 15,000# Standard Test Truck at 30mph (451,000 ft-lbs of kinetic energy)
M40 = 15,000# Standard Test Truck at 40mph (802,000 ft-lbs of kinetic energy)
M50 = 15,000# Standard Test Truck at 50mph (1,250,000 ft-lbs of kinetic energy)
C7-30 = 15,873# Class 7 Cabover at 30mph (497,000 ft-lbs of kinetic energy)
C7-40 = 15,873# Class 7 Cabover at 40mph (884,000 ft-lbs of kinetic energy)
C7-50 = 15,873# Class 7 Cabover at 50mph (1,381,000 ft-lbs of kinetic energy)
H30 = 65,000# Heavy Goods Vehicle at 30mph (1,950,000 ft-lbs of kinetic energy)
H40 = 65,000# Heavy Goods Vehicle at 40mph (3,470,000 ft-lbs of kinetic energy)
H50 = 65,000# Heavy Goods Vehicle at 50mph (5,430,000 ft-lbs of kinetic energy)

Penetration Ratings:

P1 = Less than 3.3’ of penetration
P2 = 3.31’ to 23.0’ of penetration
P3 = 23.1’ to 98.4’ of penetration

DOS (SD-STD)

Kinetic Energy Designation:

K4 = 15,000# Standard Test Truck at 30mph (450,000 ft-lbs of kinetic energy)

K8 = 15,000# Standard Test Truck at 40mph (800,000 ft-lbs of kinetic energy)

K12 = 15,000# Standard Test Truck at 50mph (1,250,000 ft-lbs of kinetic energy)

Penetration Ratings (Prior to 2003):

L3 = 3' or less

L2 = 3.01’ to 20.0’ of penetration

L1 = 20.01’ to 50’ of penetration

Penetration Ratings (After 2003):

As of 2003 all barriers will have penetration of 3.3’ or less

APPENDIX C

Barriers on the DoD Anti-Ram Vehicle Barrier List

The DoD Anti-ram Vehicle Barrier List should not be considered a complete list of all Tested Vehicle Barriers.

1. Funding for the DoD Anti-ram Vehicle Barrier List

The US Department of Defense (DoD) through the US Army supplies all funding for the development and upkeep of the DoD Anti-Ram Barrier List. The list is intended to be an instrument for the selection of Active and Passive Vehicle Barriers for Entry Control Facilities (ECFs) and Access Control Points (ACPs) that are on the perimeter of DoD installations.

2. Barriers required to be on the DoD Anti-Ram Vehicle Barrier List by criteria.

UFC 4-022-01 ECFs/ACPs and/or Army Standard for ACPs require the Final Denial Active Vehicle Barriers (AVBs) and the Passive Vehicle Barriers (PVBs) that surround the ECF/ACP perimeter be on the DoD Anti-Ram Vehicle Barrier list. Any AVBs that is used to close an opening to the PVBs surrounding the EFC/ACP is considered part of the PVBs and also needs to be on the DoD Anti-ram Vehicle Barrier List.

3. Barriers NOT required to be on the DoD Anti-Ram Vehicle Barrier List by criteria.

Any Barrier NOT used in a DoD ECF/ACP Installation perimeter project, this includes Entry Control Points (ECPs) that are interior of the Installation perimeter of a DoD Facility. Barriers in a ECF/ACP that are used to protect equipment and personnel from errant vehicles are NOT required to be on the DoD Anti-ram Vehicle Barrier list and instead should meet contractual requirements of the project, this could include tested barriers or barriers with engineered ratings.

4. Barriers currently being accepted onto the DoD Anti-ram Vehicle Barrier List.

Barriers currently be accepted to the DoD Anti-Ram Vehicle Barrier List must be tested under the current version of ASTM F2656-F2656M at the time the testing is conducted. Barriers must be permanently mountable and cannot be portable or temporary barriers. AVBs must be able to be installed meeting the requirements of AASHTO roadside safety.

5. Current Barriers on the DoD Anti-Ram Vehicle Barrier List

Each barrier currently on the DoD Anti-Ram Vehicle Barrier List is being reviewed for applicability of constructability in a ECF/ACP and any barrier that is deemed not suitable will be removed from the list in the future. This will include all portable and temporary barriers as well as all AVBs that can not meet ASSHTO roadside safety when constructed in the "as tested" condition.

6. "As Tested" construction

With the exception of when interpolation is allowed between two tested lengths of barriers, when installed each barrier is to be constructed as it was tested, commonly referred to the "as tested" configuration. No modification to length, foundation, structural element spacing, etc. will be allowed. Barriers with these modification will be considered a different barrier and do NOT meet the requirements of "being on the DoD Anti-ram Vehicle Barrier List"

7. Safety Scheme Criteria

Both Army Criteria and DoD Criteria require the use of a ARTRANS-TEA (SDDC-TEA) approved safety scheme for Active Vehicle Barriers. "Pre-approved" Safety Schemes can be found in documents on the ARTRANS-TEA Web Site. Variations or modifications to these pre-approved Safety Schemes must be vetted through ARTRANS-TEA to meet the criteria.

8. Roadside Safety for barriers

Both the DoD and Army regulations requires meeting all federal roadway regulation including roadside safety. The unobstructed distance is measured from the edge of the driving portion of the roadway to any fixed object located next to the raodway and is normally determined by the roadway geometry and the number and velocity of the vehicles on the roadway. While this distance could be larger a minimum unobstructive distance of 4 feet should be used for all ECFs/ACPs. Examples of fixed objects for ECFs/ACPs includes most all Passive Vehicle Barriers and non-active portion of some Active Vehicle Barrier that extend above the road surface.