Protective Design-Mandatory Center of Expertise Update

SAME Omaha Post Industry Day
7 May 2013

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Hardened Structures Section
(Vacant)

32 Full Time Permanent
(Loans from Omaha District as needed)
Mission Programs

Civil Works

Military

Interagency & International Services (IIS)
PDC Mission

- Army’s Center of Expertise for security engineering and hardened structures design
- Responsible for:
  - Criteria development
  - Technology transfer
  - Technical support
- Support to DoD, Dept. of Army, federal, state and local government agencies, foreign governments
Mission Areas

- Security Engineering
  - Physical security design
  - Antiterrorism design
  - Sensitive Compartmented Information Facilities
  - Installation access control points

- Hardened Structures
  - Conventional weapons effects resistant design
  - Chemical/biological/radiological resistant design
  - Nuclear weapons effects design
  - Explosives safety design
Technology Transfer - Criteria

- Unified Facilities Criteria (UFC)
- Unified Facilities Guide Specifications (UFGS)
- PDC Technical Reports
- National Standards
  - ASCE
  - ASTM
  - E 54 Committee on Homeland Security Applications
  - F 12 Committee on Security Systems and Equipment
  - F 14 Committee on Fences
  - UL
  - PCI
- Custom documents for specific customers
The DoD Security Engineering Manual Series

**UFC 4-020-01**

- Only minimum standards required? (Yes/No)
  - No: Conv. Const. standoff available? (Yes/No)
    - No: Learn more about security engineering.
    - Yes: Continue with planning.

**UFC 4-010-01 and 4-010-02**
DoD Minimum Antiterrorism Standards for Buildings

**Support Manuals**
(multiple UFC in security engineering series)

**UFC 4-020-02**
Security Engineering Design Manual

- Incorporate Design Requirements into Planning Documents

**DoD Minimum Antiterrorism Standards for Buildings**

- Incorporate Design Requirements into Planning Documents
Content of UFC 4-010-01

- Chapter 1: Introduction
- Chapter 2: Philosophy, Design strategies, and Assumptions
- Appendix A: Glossary
- Appendix B: DoD Minimum Antiterrorism Standards for New and Existing Buildings
- Appendix C: Recommended Additional Antiterrorism Measures for New and Existing Buildings
- Appendix D: DoD Antiterrorism Standards for Expeditionary Structures
Inhabited Building

- For buildings sheltering DoD personnel
- Routinely occupied by 11 or more
- And population density of greater than one person per 430 gross square feet (40 gross square meters)
- Low occupancy areas may be treated separately from inhabited areas. Examples are hangars, warehouses, etc.
Primary Gathering Building

- Inhabited buildings
- Routinely occupied by 50 or more DoD personnel
- Buildings will not be divided into inhabited and primary gathering but low occupancy areas may be treated separately from inhabited or primary gathering.
Billeting

- Any building or portion of a building in which 11 or more unaccompanied DoD personnel are routinely housed regardless of population density
  - Barracks/Dorms
  - Temporary Lodging Facilities
  - Military family housing permanently converted to unaccompanied housing
  - Fisher Houses
Intent is

► Minimize possibility of mass casualties
► Provide appropriate, implementable, and enforceable measures to establish a level of protection against terrorist attack for all inhabited buildings where no known threat of terrorist activity exists
► Bring existing buildings into compliance with these standards over time

- Not Assets other than personnel
- Not Mission Assets
- Not to high levels of protection
Applicability

- All new inhabited buildings

- Existing buildings:
  - When renovation costs >50% of replacement value (Plant Replacement Value)
  - Change in occupancy
  - Window replacement
  - Additions to existing buildings
Chapter 1 - Applicability

1-8.4 Leased Buildings (continued)

- 1-8.4.2 New Buildings that are built to lease to DoD shall comply with the standards for new construction
- 1-8.4.3 Existing buildings if DoD occupies at least 25% of usable building area (ANSI/BOMA Z65.1)
  - For new leases or renewals, the standards for existing buildings apply
  - Major renovations of leased buildings do not trigger standards unless lease changes because of it.

Will be governed by Interagency Security Committee Standards
Stationary vs. Moving Vehicle Bombs

The vast majority of vehicle bombs have been of the stationary variety.
UFC Definition – Controlled Perimeter

- Provides a physical boundary
- Sufficient to channel vehicles to access control point
- Demonstrated capability to detect explosives

UFC Baseline Threat Assumption is Stationary Vehicle Bomb

Vehicle Barriers NOT Required
Key Standoff Definitions

- Conventional construction standoff distance. The standoff distances at which conventional construction may be used for building components other than doors and windows without a specific analysis of blast effects.

- Minimum standoff distance. The smallest permissible standoff distance for new construction regardless of any analysis or hardening of the building.
### Table B-1 Standoff Distances – With Controlled Perimeter

<table>
<thead>
<tr>
<th>Category</th>
<th>Distance</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roadways</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unobstructed Space</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trash Containers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inhabited Buildings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary Gathering Buildings or Billeting Structures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Occupancy Portion of Building</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Occupancy Building</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: CCSD = Conventional Construction Standoff Distance from Table B-1
### Table B-1 Standoff Distances for New and Existing Buildings

<table>
<thead>
<tr>
<th>Distance to:</th>
<th>Building Category</th>
<th>Applicable Level of Protection</th>
<th>Load Bearing Walls (1)</th>
<th>Non-Load Bearing Walls (1)</th>
<th>Minimum Standoff Distance (2)</th>
<th>Applicable Explosive Weight (2)</th>
<th>Column Letter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controlled Perimeter or Parking and Roadways without a Controlled Perimeter</td>
<td>Billeting and High Occupancy Family Housing</td>
<td>Low</td>
<td>A</td>
<td>C</td>
<td>18 ft (5.5 m)</td>
<td>I</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Primary Gathering Building</td>
<td>Low</td>
<td>A</td>
<td>C</td>
<td>18 ft (5.5 m)</td>
<td>I</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inhabited Building</td>
<td>Very Low</td>
<td>B</td>
<td>D</td>
<td>18 ft (5.5 m)</td>
<td>I</td>
<td></td>
</tr>
<tr>
<td>Parking and Roadways within a Controlled Perimeter</td>
<td>Billeting and High Occupancy Family Housing</td>
<td>Low</td>
<td>E</td>
<td>G</td>
<td>12 ft (3.6 m)</td>
<td>II</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Primary Gathering Building</td>
<td>Low</td>
<td>E</td>
<td>G</td>
<td>12 ft (3.6 m)</td>
<td>II</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inhabited Building</td>
<td>Very Low</td>
<td>F</td>
<td>H</td>
<td>12 ft (3.6 m)</td>
<td>II</td>
<td></td>
</tr>
<tr>
<td>Trash Containers</td>
<td>Billeting and High Occupancy Family Housing</td>
<td>Low</td>
<td>E</td>
<td>G</td>
<td>12 ft (3.6 m)</td>
<td>II</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Primary Gathering Building</td>
<td>Low</td>
<td>E</td>
<td>G</td>
<td>12 ft (3.6 m)</td>
<td>II</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inhabited Building</td>
<td>Very Low</td>
<td>F</td>
<td>H</td>
<td>12 ft (3.6 m)</td>
<td>II</td>
<td></td>
</tr>
</tbody>
</table>

1. See Table B-2 for standoff distances.
2. For new construction, standoff distances less than those in this column are not allowed for new buildings regardless of analysis or hardening. For existing buildings that are constructed / retrofitted to provide the required level of protection, standoffs less than those in this column are allowed, but discouraged.

### Table B-2 Conventional Construction Standoff Distances

<table>
<thead>
<tr>
<th>Wall Type</th>
<th>Column Letter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood Studs – EIFS</td>
<td>A</td>
</tr>
<tr>
<td>Metal Studs – Brick Veneer</td>
<td>B</td>
</tr>
<tr>
<td>Metal Studs – EIFS</td>
<td>C</td>
</tr>
<tr>
<td>Metal Panels</td>
<td>D</td>
</tr>
<tr>
<td>Girts</td>
<td>E</td>
</tr>
<tr>
<td>Reinforced Concrete</td>
<td>F</td>
</tr>
<tr>
<td>Unreinforced Masonry</td>
<td>G</td>
</tr>
<tr>
<td>Reinforced Masonry</td>
<td>H</td>
</tr>
<tr>
<td>European Block</td>
<td></td>
</tr>
</tbody>
</table>

1. Metal panels and girts are not considered primary structural members.
2. Non-load bearing steel stud girts assumed to have slip-track connections. Closer distances may be obtained through non-standard detailing and analysis.
3. Only used for analysis of existing structures. Not allowed for new construction.

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1. See UFC 4-010-02, for the specific explosive weights (pounds / kg of TNT) associated with designations I and II. UFC 4-010-02 is for Official Use Only (FOUO).
<table>
<thead>
<tr>
<th>Wall Type</th>
<th>Sections</th>
<th>Span</th>
<th>Spacing</th>
<th>Support Condition</th>
<th>Support Weight</th>
<th>Reinforcement Ratio</th>
<th>Static Material Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood Studs – Brick Veneer</td>
<td>2 x4 &amp; 2x6 in (50 x 100 &amp; 50 x 150 mm)</td>
<td>8 – 10 ft</td>
<td>16 - 24 in (400 – 600 mm)</td>
<td>S-S</td>
<td>N/A</td>
<td>N/A</td>
<td>875 psi (6 MPa)</td>
</tr>
<tr>
<td>Wood Studs – EIFS</td>
<td>2 x4 &amp; 2x6 in (50 x 100 &amp; 50 x 150 mm)</td>
<td>8 – 10 ft</td>
<td>16 - 24 in (400 – 600 mm)</td>
<td>S-S</td>
<td>N/A</td>
<td>N/A</td>
<td>875 psi (6 MPa)</td>
</tr>
<tr>
<td>Steel Studs – Brick Veneer²</td>
<td>600S162-43, 600S162-54, 600S162-68</td>
<td>8 – 12 ft</td>
<td>16 - 24 in (400 – 600 mm)</td>
<td>S-S</td>
<td>N/A</td>
<td>N/A</td>
<td>50,000 psi (345 MPa)</td>
</tr>
<tr>
<td>Steel Studs – EIFS²</td>
<td>600S162-43, 600S162-54, 600S162-68</td>
<td>8 – 12 ft</td>
<td>16 - 24 in (400 – 600 mm)</td>
<td>S-S</td>
<td>N/A</td>
<td>N/A</td>
<td>50,000 psi (345 MPa)</td>
</tr>
<tr>
<td>Metal Panels</td>
<td>1.5 – 3 in (38 - 76 mm)</td>
<td>4 – 8 ft</td>
<td>N/A</td>
<td>S-S</td>
<td>N/A</td>
<td>N/A</td>
<td>33,000 psi (228 MPa)</td>
</tr>
<tr>
<td></td>
<td>22, 20, &amp; 18 ga</td>
<td></td>
<td>(1.2 - 2.4 m)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girts</td>
<td>8Z3 &amp; 10Z3, 16, 14, and 12 ga</td>
<td>20 – 25 ft</td>
<td>6 – 8 ft (1.8 – 2.4 m)</td>
<td>S-S</td>
<td>N/A</td>
<td>N/A</td>
<td>50,000 psi (345 MPa)</td>
</tr>
<tr>
<td>Reinforced Concrete</td>
<td>≥ 6 in (≥ 150 mm)</td>
<td>12 – 20 ft</td>
<td>N/A</td>
<td>S-S, One way flexure</td>
<td>N/A</td>
<td>N/A</td>
<td>3,000 psi (21 MPa)</td>
</tr>
</tbody>
</table>
Reflected Charge Weight (CW) - Standoff Combinations
Metal Studs, Connected Top and Bottom

B2

Figure C.4 - B2 Damage Curves for Metal Studs Connected Top and Bottom

(1/sq-ft) MC vs Standoff (ft)

Legend:
- MS1
- MS2
- MS3
- MS4
- MS5
- MS6
- MS7
- MS8
- MS9
- MS10
- MS11
- MS12
- MS13
- MS14
- MS15
- MS16
- MS17
- MS18
- MS19
- MS20
- MS21
- MS22
- MS23
- MS24
- MS25
- MS26
- MS27
- MS28
- MS29
- MS30
- MS31
- MS32
- MS33
- MS34
- MS35
- MS36
DoD Standard 1 (w/controlled perimeter)

**Standoff - Parking and Roadways**

Note: CCSD = Conventional Construction Standoff Distance from Table B-1
Existing Buildings (w/controlled perimeter)

CCSD = Conventional Construction Standoff Distance from Table B-1

MSD = Minimum Construction Standoff Distance from Table B-1

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Sitework Elements: DoD Standard 2

Unobstructed Space within Controlled Perimeter

- **Parking**
- **Roadways**
- **Standoff**
- **Inhabited Buildings**
- **Low Occupancy Buildings or Billeting**
- **Primary Gathering Buildings**

Unobstructed Space 6" (150mm high)

Extends out to standoff for parking and roadways.
Sitework Elements: DoD Standard 2

Unobstructed Space without Controlled Perimeter

Unobstructed space established based on standoff distance for Explosive Weight II

Note: CCSD = Conventional Construction Standoff Distance from Table B-1
Unobstructed Space

Landscaping should not provide concealment
DoD Standard 6
Progressive Collapse Resistance

- Structures 3 stories or more shall be designed to prevent progressive collapse
- Basements & penthouses considered stories if space is designed for human occupancy
- Follow guidance of UFC 4-023-03 Design of Building to Resist Progressive Collapse
Design Requirement - Tie Force Method

- Tie Forces
  - Building mechanically tied together, enhancing continuity, and aiding development of alternate load paths.

Note catenary action of perimeter beam over failed column.
Would proper detailing have helped?
Design Requirement - Alternate Path Method

- Alternate Path
  - Requires structure to be capable of spanning over a missing structural element (column or load-bearing wall)

Note enhanced beam-column connections in steel framing
Progressive Collapse Upgrade
Standard 9
Exterior Masonry Walls

Why we avoid unreinforced masonry walls
DoD Standard 9
Exterior Masonry Walls

- New Buildings
  - A minimum of 0.05% vertical steel reinforcement spaced no more than 48 inches
  - 0.025% horizontal steel
    - Either joint reinforcing at 16 inches
    - Or bond beam no more than 48 inches
DoD Standard 9
Exterior Masonry Walls

- Wood or metal studs used with unreinforced masonry **veneers** are allowed
Glass Fragments

Annealed Glass
Hazard Levels – ASTM F1642

- VLH: Very Low Hazard Zone
- LH: Low Hazard Zone
- HH: High Hazard Zone
- No Hazard
- Minimal Hazard
Methods of Window Design

- **“Static” Design**
  - ASTM Standard F 2248-03, *Standard Practice for Specifying an Equivalent 3-Second Duration Design Loading for Blast Resistant Glazing Fabricated with Laminated Glass*

- Dynamic design IAW PDC TR 10-02
- Testing IAW ASTM F 1642
DoD Standard 12
### UFC 4-010-01 Levels of Protection for Doors

<table>
<thead>
<tr>
<th>Level of Protection</th>
<th>Potential Glazing Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below AT standards</td>
<td>Doors and windows fail catastrophically and result in lethal hazards. (High hazard rating)</td>
</tr>
<tr>
<td>Very Low</td>
<td>Glazing will fracture, come out of the frame, and is likely to be propelled into the building, with the potential to cause serious injuries. (Low hazard rating) Doors will be severely deformed but will not become a flying debris hazard. (ASTM F2247 Category IV)</td>
</tr>
<tr>
<td>Low</td>
<td>Glazing will fracture, potentially come out of the frame, but at a reduce velocity, does not present a significant injury hazard. (Very low hazard rating) Doors will experience non-catastrophic failure, but will have permanent deformation and will be inoperable. (ASTM F2247 Category III)</td>
</tr>
<tr>
<td>Medium</td>
<td>Glazing will fracture, remain in the frame and result in a minimal hazard consisting of glass dust and slivers. (Minimal hazard rating) Doors will be operable but have permanent deformation. (ASTM F2247 Category II)</td>
</tr>
<tr>
<td>High</td>
<td>Glazing will not fracture. (No hazard rating) Doors will remain intact and show no permanent deformation. (ASTM F2247 Cat I)</td>
</tr>
</tbody>
</table>

Ref: UFC 4-010-01, Table 2-1
Alternate Door Designs

Substantial wall

Hallway

Entry

Foyer

Building Interior

Offset Opening

Foyer
DoD Standards 15 & 19: Architectural Features & Equipment Bracing

► Brace overhead utilities & fixtures
► For features weighing more than 14 kg (31 lbs.)
► Exclude distributed systems
The Interagency Security Committee Standards
What is ISC?

- Established by Executive Order 12977, Interagency Security Committee, 19 October 1995.
- Includes all Executive Branch departments and plus CIA, OMB, and a few individuals
- Responsible for policies for security of and protection of Federal facilities
- ISC standards applicable to all buildings and facilities in the US occupied by Federal employees for non-military activities
Facility Security Level

- Evaluated by Facility Security Committee (all building tenants)
- Five equally weighted security factors
- Suggests evaluation of intangibles
- Allows for adjustments
Design Basis Threat

Essentially a “catalog” of “undesirable events” (threats) and threat scenarios that the Facility Security Committee can use to develop the site specific Design Basis Threat.
Physical Security Criteria

- Baseline Levels of Protection based on Facility Security Level
- FSC customizes based on facility specific conditions
- Customization based on risk analysis
  - Threat
  - Consequences
  - Vulnerabilities
Facility Security Committee

- All tenants
- Should include law enforcement or security (tenant of FPS)
- Chair is senior representative of primary tenant
- All tenants vote
- Vote weighted by
  - Number of occupants for each tenant
  - Rentable or assigned space per occupant
Sensitive Compartmented Information Facilities (SCIF), area, room, or building, where sources and methods, including Sensitive Compartmented Information (SCI), is stored, used, processed, or discussed.

Compartmented Area (CA) a room, a set of rooms, or an area that provides controlled separation between the compartments within a SCIF.

Typically found in:
- Operation Centers
- Command Headquarters
- Communication Centers
Sensitive Compartmented Information Facilities (SCIF)

- **POLICY:**
  - Director of Central Intelligence Directive (DCID) No. 6/9 Physical Security Standards for Sensitive Compartmented Information Facilities
  - Intelligence Community Directive (ICD) 705 Sensitive Compartment Information Facilities
  - Intelligence Community Standard Number 705-1 (ICS 705-1) Physical and Technical Security Standards for Sensitive Compartmented Information Facilities
  - Technical Specifications for Construction and Management of Sensitive Compartmented Information Facilities

8 May 2013
Sensitive Compartmented Information Facilities (SCIF)

- All SCIF construction or renovations must meet the requirements of ICD 705, and the associated documents.
- It is imperative that Design Agents and designers of SCIFs understand the requirements contained in ICD 705 and the associated documents.
- ICD requirements effect:
  - Planning
  - RFP Development
  - Design
  - Construction
Construction Security Plan (CSP)

- Each SCIF construction project shall have
  Construction Security Plan (CSP)
  - Developed by the Accrediting Official (AO)
  - Addresses the application of security to SCIF planning, design, and construction.
  - Format and content is based on extent of SCIF construction and security concerns

- Construction Plans shall be protected in accordance with CSP

- If classification guides dictate, design documents may require classification.
Physical Security for SCIF

- **SCIF Perimeter**
  - The perimeter of the SCIF includes all perimeter walls, windows, and doors as well as the entire ceiling and floor.
  - SCIF Perimeter shall provide:
    - Resistance to forced entry
    - Resistance to covert entry
    - Visual evidence of surreptitious penetration
    - Radio Frequency (RF) Shielding when required
    - Sound Attenuation
  - The SSM/SSO must be able to easily detect surreptitious entry to included audio or video probes

8 May 2013
Wall A - Sound Group 3
Standard Wall

- When required by CTTA. In lieu of foil backed GWB a layer of approved Ultra Radiant -R Foil may be used between the 2 layers of 5/8” GWB.
- Metal studs shall be in a range of 20 gauge to 16 gauge, depending on height of true floor to true ceiling and weight.
- Sound Group 4 wall requires Four layers of 5/8” gypsum board and special acoustic door or vestibule.
Common Minimum Requirements for all SCIFs

SEAL AROUND DUCTS

NOTE: PICTURE TAKEN PRIOR TO PAINTING

8 May 2013
RF ATTENUATION

- RF MITIGATION SHALL BE PROVIDED AT THE DIRECTION OF THE CTTA WHEN THE SCIF UTILIZES ELECTRONIC PROCESSING AND DOES NOT PROVIDE ADEQUATE RF ATTENUATION AT THE INSPECTABLE SPACE BOUNDARY. IT IS RECOMMENDED FOR ALL APPLICATIONS WHERE RF INTERFERENCE FROM THE OUTSIDE OF THE SCIF IS A CONCERN INSIDE THE SCIF.
Common Minimum Requirements for all SCIFs

- All SCIF shall have an Intrusion detection system (IDS)
- All SCIF shall have access control system (ACS)
- All SCI shall be stored in GSA-approved security containers equipped with combination locks meeting Federal Specification FF-L 2740A.
Welcome to the Protective Design Center

If you are a U.S. citizen employed by a U.S. Government Agency or U.S. Government Contractor, you are invited to apply for access to this site.

Welcome
The purpose of the Protective Design Center website is to provide information, criteria, and programming tools to U.S. Government agencies and their contractors (U.S. citizenship required). Please honor the markings on all documents and web pages. Because of the sensitive nature of some of this site’s content, full access requires an approved user account. If you would like to apply for an account, then click the ‘Join’ link located in the upper-right corner of the screen. You may browse the site without registering, but you will only have access to public information.

Our Mission
The Protective Design Center (PDC) is the Army’s center of expertise for engineering services related to force protection and protective design. We provide engineering design and support services to the Army for both permanent and expedient applications and to DOD and other U.S. Government agencies to protect assets against criminal, terrorist, conventional, nuclear and special weapon threats.

Who We Are:
- Services
- PDC Brochure Download
DEPARTMENT OF DEFENSE
US ARMY CORPS OF ENGINEERS
PROTECTIVE DESIGN CENTER
1616 Capitol Avenue, Suite 9000
OMAHA, NEBRASKA 68102-4901

DoD Anti-Ram Vehicle Barrier List

List Date: April 2013

The Department of Defense’s physical security concept is to create a layered or “tiered” defensive system which consists of both active and passive perimeter barriers to delay intruders. The Department employs an ASTM International performance standard and testing procedure for both active entrance barriers and passive perimeter barriers designated as “vehicle-impact rated barriers,” or “anti-ram barriers.” The current standard is ASTM F2656-07, Standard Test Method for Vehicle Crash Testing of Perimeter Barriers.

The ASTM F2656-07 test standard rates barriers in twelve impact categories, with three predetermined impact velocities for each category and four potential penetration ratings for each impact rating. These penetration ratings are: P1 - <3.3 ft; P2 - 3.31 to 23.0 ft; P3 - 23.1 to 98.4 ft; and P4 - >98 ft. Of the four penetration ratings, barriers with a penetration rating of P4 will not be included in the DoD Anti-Ram Vehicle Barrier List.

The following list of barriers includes active barriers for use at entrances, and passive or fixed barriers for other perimeter applications. This list will be updated quarterly in January, April, July and October. A request must be received one month prior to the list being published to be included on the next quarterly list.

Note: This list supersedes all previous copies. Please refer to the date above to ensure you have the most up to date list. This list does not represent an overall endorsement of any product or design or address its operational suitability or maintainability. The list merely verifies that particular vehicle barriers have been certified in accordance with the performance standards in ASTM F2656-07, or previously tested to the U.S. Department of State SD-STD-02.01 standard, and that the appropriate test reports have been submitted to, and validated by, the Protective Design Center. 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. Careful consideration should be given to clearances and geometric characteristics when utilizing barrier systems of varying widths. The PDC is available to discuss barrier characteristics, and any other barrier issues or questions. A few characteristics to consider are listed below:

- Impact speed at barrier (low speed impact): The use of some vehicle barriers presented in this list exhibit vulnerabilities when impacted at speeds other than those associated with the ASTM and DoS test impact velocities.
- Design Basis Threat (DBT) vehicle; other vehicle weights and speeds: The barriers presented in this list have been subjected to impacts under the specific conditions prescribed by the test designation. If the Installation’s DBT includes vehicles significantly different than the test vehicle, performance of the system may differ from what may be expected.
- Deployment mechanisms: The mechanisms used to deploy vehicle barriers vary (pneumatic, hydraulic, electro-mechanical, manual). The various mechanisms should be investigated and the choice should be based on the best fit for the Installation.
- Environmental condition at barrier: Environmental conditions can vary greatly from location to location. Conditions such as rain, snow, ice, sand, gravel, hot, and cold need to be considered when selecting a barrier for a specific location.
- Operations and Maintenance (O&M) requirements: Each barrier comes with its own operational and maintenance requirements. The O&M requirements vary in the amount and intensity from barrier to barrier. O&M needs to be figured into the overall life cycle cost of the barrier.
- After impact barrier gaps: Post impact gaps may be an inherent characteristic of the barrier system. The barrier system’s post-impact condition should be carefully evaluated for its capabilities in relation to defeat of the Installation’s Design Basis Threat (DBT).

Questions regarding the certification standard, barrier characteristics or this list can be sent to the Protective Design Center or email at: pdcmail@usace.army.mil
<table>
<thead>
<tr>
<th>Barrier Type</th>
<th>Model/Description</th>
<th>Manufacturer/Design/Distributor</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active Bollard</td>
<td>K4 L3 RB80 Bollard</td>
<td>American Anti-Ram Corporation</td>
<td>48&quot; OC</td>
</tr>
<tr>
<td></td>
<td>K4 L2 SP Defender</td>
<td>ATG Access, Inc.</td>
<td>3-bollard array</td>
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<tr>
<td></td>
<td>K4 L2 DSC 800 Bollard Type Barricade</td>
<td>Delta Scientific Corporation</td>
<td>3-bollard array</td>
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<tr>
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<td>M30 P1 K4 Shallow Mount Bollard</td>
<td>FAAC International, Inc.</td>
<td>Single bollard</td>
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<tr>
<td></td>
<td>M30 P1 Ellkota M30 (K4)</td>
<td>Perimeter Protection Germany GmbH</td>
<td>Single bollard</td>
</tr>
<tr>
<td></td>
<td>K8 L3 XT-1208-RB, Xact Series Retractable Bollards - (aka Eagle Series Bollards, K8)</td>
<td>Ross Security Systems LLC</td>
<td>3-bollard array, hydraulic bollards</td>
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<td>K8 L1 ARMR B-30 Bollard Assembly</td>
<td>B&amp;B ARMR</td>
<td>3-bollard array, hydraulic bollards</td>
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<tr>
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<td>M50 P1 SP1000 Rising Bollard</td>
<td>ATG Access, Inc.</td>
<td>Single hydraulic bollard</td>
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<tr>
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<td>K12 L3 Gunnebo Bollard</td>
<td>Gunnebo Competence Centre Outdoor Perimeter Security</td>
<td>Single hydraulic bollard</td>
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<td>K12 L3 SP Titan</td>
<td>ATG Access, Inc.</td>
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<td>K12 L2 NBI Hydraulic Bollard Barrier</td>
<td>Nasatka Barrier, Inc.</td>
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<td>M50 P1 HT1 Raptor</td>
<td>Heald Ltd</td>
<td>Single bollard</td>
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<td>M50 P2 RSS4003</td>
<td>RSSI</td>
<td>3-bollard array</td>
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</tbody>
</table>
Technology Transfer - Training

- Security Engineering
- Minimum DoD Antiterrorism Construction Standards for Buildings
- Blast Design
- Vulnerability Assessment Protection Option (VAPO)
- Access Control Points (ACPs)
- Blast Resistant Windows
- Specialty classes upon request
High Tech & Mobile Group