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Standard Guide for Design and Construction of Expanded Metal Security Fences and Barriers[1]

This standard is issued under the fixed designation F2780; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide provides assistance for the site security designer to select the proper components required to design a site specific expanded metal physical security perimeter barrier.

1.2 This standard does not purport to address all of the physical protection security concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish the appropriate design for the level of physical protection required and determine the applicability of regulatory requirements or limitations prior to use.

1.3 It is recommended that Specification F2548 ~~to~~ be used in conjunction with this guide.

1.4 *Units*—The values stated in inch-pound units are to be regarded as standard.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

A121 Specification for Metallic-Coated Carbon Steel Barbed Wire

A123/A123M Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

A307 Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength

F626 Specification for Fence Fittings

F1043 Specification for Strength and Protective Coatings on Steel Industrial Fence Framework

F1083 Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures

F1910 Specification for Long Barbed Tape Obstacles

~~F2200 Specification for Automated Vehicular Gate Construction~~

F2548 Specification for Expanded Metal Fence Systems for Security Purposes

F2656 Test Method for Crash Testing of Vehicle Security Barriers

2.2 *US Dept. of ~~Defense:~~Defense Documents:*[3]

UFC 4-010-01 United Facilities Criteria, DoD Minimum Antiterrorism Standards for Buildings

UFC 4-020-01 United Facilities Criteria, DoD Security Engineering Facilities Planning Manual

2.3 *US Dept. of ~~State:~~State Document:*[4]

SD-STD-02.01 Revision A, March 2003 Test Method for Vehicle Crash Gate Testing of Perimeter Barriers and Gates

2.4 *~~General Services Administration:~~GSA Document:*[5]

The Site Security Design Guide, U.S. General Services Administration (GSA)

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[1] This guide is under the jurisdiction of ASTM Committee F14 on Fences and is the direct responsibility of Subcommittee F14.50 on High Security Fences and Perimeter Barriers.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from Whole Building Design Guide (WBDG), https://www.wbdg.org.

[4] Available from Cybersecurity & Infrastructure Security Agency (CISA), https://www.cisa.gov.

[5] Available from General Services Administration (GSA), https://www.gsa.gov.

2.5 ~~*American Society of Civil Engineers (ASCE):*~~*ASCE Standard:*[6]

ASCE/SEI ~~7-05~~7-16 Minimum Design Loads for Buildings and Other Structures (Manufacturer ~~shall demonstrate framework design for wind load criteria for the selection of line posts and line post spacing)~~Shall Demonstrate Framework Design for Wind Load Criteria for the Selection of Line Posts and Line Post Spacing)

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *access ~~control~~—control, n—*for the purposes of these standards, any combination of barriers, gates, electronic security equipment, or guards, or a combination thereof, that can deny entry to unauthorized personnel or vehicles.

3.1.2 *active ~~barrier~~—barrier, n—*~~a~~barrier a barrier that requires manual or motorized action to ~~operate. Action~~operate; action barriers may be command or sensor activated to prevent or impede unauthorized passage.

3.1.3 *anti-ram vehicle ~~barrier~~—barrier, n—*a device or barrier that prevents vehicle access to provide pedestrian protection ~~and/or building security. Anti-Ram vehicle barriers may be either active or passive barriers. A rated anti-ram barrier is a Department of State-approved perimeter barrier that does not exceed the defined penetration level for a 15,000-lb gross weight vehicle traveling perpendicular to the barrier at nominal speeds of 50, 40, or 30 mph. Reference Test Method~~ or building security, or both.~~F2656 for performance criteria.~~

3.1.3.1 *Discussion—*

Anti-Ram vehicle barriers may be either active or passive barriers. A rated anti-ram barrier is a Department of State-approved perimeter barrier that does not exceed the defined penetration level for a 15 000 lb gross weight vehicle traveling perpendicular to the barrier at nominal speeds of 50, 40, or 30 mph. Reference Test Method F2656 for performance criteria.

3.1.4 *~~asset~~—asset, n—*tangible or intangible items, personnel, or outdoor ~~gatherings,~~gatherings (in whole or in ~~part),~~part) which may be subject to manmade or natural hazards.

3.1.5 *~~barrier~~—barrier, n—*an object used to separate or impede the movement of a vehicle or pedestrian.

3.1.6 *design basis ~~tactics~~—tactics, n—*identify the specific acts and methods that the building and site's countermeasures must protect against and form the basis for the site security design. (U.S. General Services Administration)

3.1.7 *design ~~criteria~~—criteria, n—*defines the design direction that emerges, based on inputs from the risk assessment, consideration of the design basis tactics, and the required level of protection. (U.S. General Services Administration)

3.1.8 *level of ~~protection~~—protection, n—*the degree to which an asset (for example, a person, a piece of equipment, or an object, etc.) is protected against injury or damage from an attack.

3.1.9 *passive vehicle ~~barrier~~—barrier, n—*stationary barriers creating perimeter or edge protection, such as fixed bollards, concrete walls, concrete jersey barriers, concrete planters, boulders, excavations and ditches, vehicle restraint cable systems, king tut blocks, bastion barriers, bin barriers, reinforced masonry walls, berms, ponds/basins, existing trees, intrusion detection devices, and reinforced streetscape elements ~~sculpture etc. Passive vehicle barriers have no moving parts. A passive vehicle barrier system consists of a permanent or portable structure positioned to slow, delay or deny access to a protected site or restricted area.~~sculpture, etc.

3.1.9.1 *Discussion—*

Passive vehicle barriers have no moving parts. A passive vehicle barrier system consists of a permanent or portable structure positioned to slow, delay, or deny access to a protected site or restricted area.

3.1.10 *perimeter ~~barrier~~—barrier, n—*a fence, gate, bollard, wall, fence, planter, other structure, or natural topographic feature that provides protection against a vehicle gaining access to a compound or facility.

3.1.11 *physical ~~security~~—security, n—*the part of security concerned with physical measures designed to safeguard personnel; to prevent unauthorized access to equipment, installations, material, and documents; and to safeguard against espionage, sabotage, damage, and theft. (U.S. Army)

3.1.12 *portable ~~barrier~~—barrier, n—*a passive or active barrier designed to be removed and relocated as ~~required. Includes~~required; includes any movable object that can be moved in place to stop the movement of ~~vehicles and/or people.~~vehicles, or people, or both.

3.1.13 *risk ~~acceptance~~—acceptance, n—*the degree of risk associated with an asset or endeavor that a decision-maker perceives and will accept under a given set of circumstances and with associated costs.

[6] Available from American Society of Civil Engineers (ASCE), 1801 Alexander Bell Dr., Reston, VA 20191, http://www.asce.org.

3.1.14 ~~*standoff—*~~*standoff, n—*the area between a protected structure and the perimeter protecting the asset against potential attacks. ~~Sometimes referred to as setback. Distance from the inside edge of a barrier to the nearest surface of the building being protected.~~

3.1.14.1 *Discussion—*

Sometimes referred to as setback. Distance from the inside edge of a barrier to the nearest surface of the building being protected.

4. Summary of Guide

4.1 It is the responsibility of the design team to consider the design criteria, understand the design basis tactics, and levels of protection that shaped them, and provide effective and balanced design solutions that respond to the threat.

4.2 Concerns for security throughout the design process will identify the need for appropriate levels of protection around the site perimeter, site access, required standoff distances, parking, and other specific assets. All of these areas may require some form of physical security to equally balance the level of security with an acceptable risk.

4.3 Perimeter barriers are used to define the limits of a perimeter, standoff, activity, or area, to define ingress and egress points, to form a psychological deterrent, and to establish an acceptable level of protection. They delay unauthorized individuals to facilitate their apprehension by response forces, direct traffic along designated routes of travel for enhanced surveillance and control, and can preclude visual compromise by unauthorized individuals.

5. Design Criteria for Perimeter Fences and Barriers

5.1 *Cost Effectiveness*—Budgetary allotments for security plans should be set after the performance requirements for fences and barriers have been determined.

5.2 Determine the threat and risk acceptance. This standard guide should be used in conjunction with site-specific risk assessments as necessary to attain an appropriate level of protection from natural ~~and~~ or manmade ~~hazards.~~hazards, or both.

5.3 Determine the level of security for the fence system required based on acceptable risk. Part of this determination would be the height of the fence. Fences used for the purpose of security shall be a minimum of ~~8-ft~~8 ft high.

5.4 Determine the function for the fence or barrier based on the application icons listed in Fig. 1.

5.4.1 Expanded metal barriers may take different forms and provide perimeter security and access control to protect assets. Expanded metal fencing can be mounted on moveable K Rated concrete highway barriers creating active barriers that are also portable barriers to meet changing or evolving levels of security. Reference Fig. 2.

6. Materials and Sizes

6.1 *Expanded Metal Mesh Panels:*

6.1.1 Select the expanded mesh panel material from Table 1 and Fig. 3. The panel descriptions listed in Fig. 3 are commonly used with expanded metal fence systems used in security applications. Other patterns offering different sizes and shapes may be used as long as the mesh panel dimensions meet Specification F2548.

6.1.2 After selecting expanded metal mesh panels, choose the type of coating:

6.1.2.1 Hot dip galvanized in accordance with Specification A123/A123M.

6.2 *Fence Framework:*

6.2.1 Terminal and ~~Line Posts Determine~~line posts determine the size and strength of the fence framework. When designing a fence as a formidable structure intended to deny, deter, and delay access, the heightened level of security generally results in an increase in the height of the fence ~~and~~ or a reduction in the size of the openings of the ~~mesh.~~ mesh, or both. Both of these factors will result in added wind load resistance. Line post selection and the spacing of the posts should be designed to meet the anticipated wind loads based on the site geographical location and weather conditions. Increased post sizes or specific post spacing may be

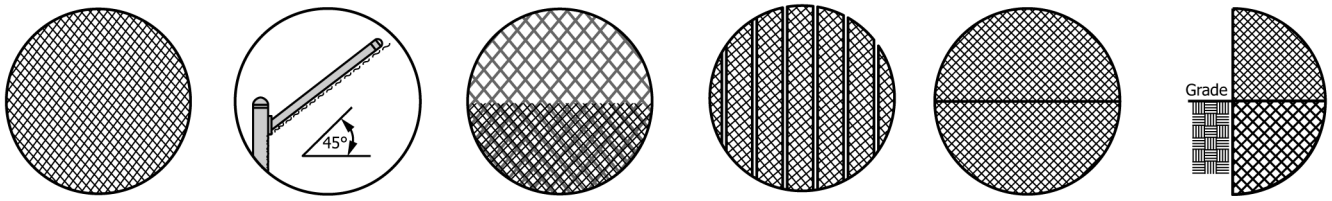

FIG. 1 Applications