



Designation: F2814 – 09

# Standard Guide for Design and Construction of Ornamental Steel Picket Fence Systems for Security Purposes<sup>1</sup>

This standard is issued under the fixed designation F2814; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This guide provides the material and installation standards for selection in the design of an ornamental steel picket fence system for security applications. The proper material selection and system installation and layout can substantially increase the difficulty to penetrate; thereby, increasing the intrusion delay time.

1.2 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

- A121 Specification for Metallic-Coated Carbon Steel Barbed Wire
- A392 Specification for Zinc-Coated Steel Chain-Link Fence Fabric
- A491 Specification for Aluminum-Coated Steel Chain-Link Fence Fabric
- F668 Specification for Polyvinyl Chloride (PVC), Polyolefin and Other Polymer-Coated Steel Chain Link Fence Fabric
- F1184 Specification for Industrial and Commercial Horizontal Slide Gates
- F1345 Specification for Zinc-5 % Aluminum-Mischmetal Alloy-Coated Steel Chain-Link Fence Fabric
- F1379 Terminology Relating to Barbed Tape
- F1665 Specification for Poly(Vinyl Chloride) (PVC) and Other Conforming Organic Polymer-Coated Steel Barbed Wire Used With Chain-Link Fence
- F1910 Specification for Long Barbed Tape Obstacles
- F1911 Practice for Installation of Barbed Tape

- F2200 Specification for Automated Vehicular Gate Construction
- F2408 Specification for Ornamental Fences Employing Galvanized Steel Tubular Pickets
- F2453/F2453M Specification for Welded Wire Mesh Fence Fabric (Metallic-Coated or Polymer Coated) for Meshes of 6 in.<sup>2</sup> [3871 mm<sup>2</sup>] or Less, in Panels or Rolls, with Uniform Meshes
- F2548 Specification for Expanded Metal Fence Systems for Security Purposes
- F2589 Specification for Ornamental Fences Employing Steel Tubular Pickets
- F2656 Test Method for Vehicle Crash Testing of Perimeter Barriers

### 2.2 U.S. Department of State<sup>3</sup>

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

### 2.3 U.S. Department of Defense<sup>4</sup>

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

## 3. Terminology

3.1 Terms defined in Specifications F2408 and F2589 shall also apply to ornamental steel picket fence systems under the jurisdiction of this guide.

3.2 Terms defined in Terminology F1379 shall apply to the use of barbed tape obstacles referenced in this guide.

### 3.3 Definitions of Terms Specific to This Standard:

3.3.1 *fence security accessory*—an accessory product added at the extremities of an ornamental steel picket security fence system to broaden its coverage range and increase the time and difficulty necessary to breach the system (for example, barbed wire, barbed tape, spiked railing supplements, etc.).

3.3.2 *supplemental security fence fill*—a secondary fence filler material (for example, expanded metal, welded wire

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

<sup>3</sup> Available from the U.S. Department of State, Bureau of Diplomatic Security, Office of Physical Security Programs, Physical Security Division, SA-14, Washington D.C. 20529-1403.

<sup>4</sup> Available electronically from United Facilities Criteria (UFC) Index [http://65.204.17.188/report/doc\\_ufc.html](http://65.204.17.188/report/doc_ufc.html)

mesh, chain-link mini-mesh fabric, etc.) attached to or integrated with the vertical pickets of the ornamental steel picket fence system.

#### 4. Significance and Use

4.1 Ornamental steel picket fence systems can be designed to provide greater levels of security by selecting styles and configurations that increase the difficulty to penetrate and in turn increase delay time. Some examples include: increasing the height of the fence, using ornamental picket styles that curve outward to form a parapet on the attack side of the fence, and decreasing the spacing between vertical pickets.

4.2 Security hardening of ornamental steel picket fence systems can be achieved by adding fence security accessories (that is, barbed wire to the top; barbed tape to the top, side or bottom of the fence; or spiked railing supplements along the top rail) or by attaching supplemental security fence fill materials (that is, expanded metal, barbed tape mesh, welded wire mesh, or chain-link mini-mesh fabric). Slats or screening panels can be inserted to restrict visibility when required.

4.3 Multiple fence lines can be installed to create isolation zones that enhance the ability to patrol or visually monitor the area.

4.4 Anti-ram cable systems may be added to resist vehicle penetration into a protected perimeter.

#### 5. Part 1—General

5.1 List the scope of work included; the performance requirements of the overall project security design criteria; the performance design criteria for the fence system, referenced contract documents, fence design and detail drawings, material specifications, related site work, site drawings with the specific fence layout, product and data submittals, certifications, site preparation, contractor qualifications, warranties and the fence integration with other security products.

5.1.1 Fence placement can be critical and should be well thought out and defined by the contract specifications and drawings. Placement should be coordinated with the grading plan to ensure it does not inhibit drainage flow or cause debris buildup.

5.1.2 Consideration should be given to the fence location to provide the proper offset to protect a building or provide a clear zone from trees, underbrush, buildings and structures. Quali-

fying federal building sites require specified fence set back distances from the building in compliance with the DoD Minimum Antiterrorism Standards for Buildings, UFC 4-010-01.

5.1.3 Consideration should be given during design of the fence to ensure it will properly support the application of added intrusion detection devices. An integrated system using lighting with video surveillance requires a specific fence layout, for example, the fence must be located to avoid blocking the view or reduce shadows.

5.1.4 Signage posted along the fence line should always be a consideration.

#### 6. Material Requirements

##### 6.1 Tubular Picket Ornamental Fence System:

6.1.1 Structural components of tubular picket ornamental fence systems shall meet the material and coating requirements of Specification **F2408** or **F2589**, whichever is applicable.

6.1.2 There are multiple panel and picket design configurations; those recommended for security fence applications are listed in **Table 1**.

6.1.3 Because ornamental steel picket fence systems designed for increased security levels are generally taller and heavier than fences for other applications, and, because they frequently are hardened by the addition of supplemental expanded metal, welded wire, or chain-link fill, wind resistance is amplified. Fence system designs should be selected to meet the anticipated wind loads based on the site geographical location, soil strength and weather conditions.

##### 6.2 Fence Security Accessories :

6.2.1 *Barbed Wire*—When barbed wire is specified, It is recommended that polymer coated barbed wire in accordance with Specification **F1665**, Type II spacing at 3 in. (76 mm) on center be selected. The color should match the color of the ornamental fence, if possible to match the aesthetics of the fence system. Metallic coated carbon steel barbed wire, high security grade in accordance with Specification **A121**, is also permissible.

6.2.2 *Barbed Tape Obstacles*—When barbed tape is specified, select the diameter, design and configuration in accordance with Specification **F1910**.

6.2.3 *Spiked Railing Supplements*—When spiked railing supplements are specified, material and coating shall comply with the requirements for the fence system.

**TABLE 1 Panel & Picket Design Characteristics for Security Applications**

Characteristic	Design Recommendation
Panel Height	Minimum 8 ft
Component Sizes	Minimum <b>F2408</b> or <b>F2589</b> , Industrial Class; pickets to be a minimum of 1 in. <sup>2</sup> × 14 Ga.
Rail Spacing	Minimum 80 in. clear span between rail(s) at top of fence panel and rail(s) at bottom of panel when space between pickets exceeds 2-¼ in. (No minimum if space between pickets is less than 2-¼ in. or if supplemental security fence fill is added to cover the spaces.
Post Spacing	Maximum 8 ft
Picket-To-Rail Connections	Connections must be secured by welding, by enclosed inaccessible retaining system, or by tamper-proof security fasteners.
Picket Profile	Spear-pointed tip extending minimum of 6 in. above top rail; or top rail protection provided by fence security accessories such as barbed wire, barbed tape, spiked railing supplements. Outwardly curved or angled pointed picket designs increase difficulty to climb.