



## Designation: F3204 – 16 (Reapproved 2024)

# Standard Guide for Design and Construction of Welded Wire Fence Systems for Security Purposes<sup>1</sup>

This standard is issued under the fixed designation F3204; 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 assistance for the site security engineer to select the proper components required to design a site-specific, welded-wire 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 the standard to establish the appropriate design level of physical protection required and determine the applicability of regulatory requirements or limitations.

1.3 Specification **F2453** is to be used in conjunction with this guide.

1.4 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered 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. Some specific hazards statements are given in Section 7 on Hazards.*

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.*

<sup>1</sup> This test method 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. Referenced Documents

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

**A121** Specification for Metallic-Coated Carbon Steel Barbed Wire

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

**F934** Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials

**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

**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

**F2453** 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

### 2.2 *American Society of Civil Engineers Standards:*<sup>3</sup>

**ASCE/SEI 7-10** (or latest edition) Minimum Design Loads for Buildings and Other Structures

## 3. Terminology

3.1 *Definitions*—Refer to the terminology listed in Specification **F2453**.

## 4. Classification

4.1 The welded wire mesh selected for security systems is classified in Specification **F2453** in accordance with the following coatings:

4.1.1 *Type 1*, consists of welded wire mesh manufactured from wire zinc-coated prior to being welded into fabric, known as galvanized before welding.

<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 American Society of Civil Engineers (ASCE), 1801 Alexander Bell Dr., Reston, VA 20191, <http://www.asce.org>.

4.1.2 *Type 2*, consists of welded wire mesh manufactured from uncoated wire, the fabric of which is subsequently zinc-coated after fabrication, known as galvanized after welding.

4.1.3 *Type 3*, consists of welded wire mesh manufactured from wire coated with zinc-5 % aluminum-mischmetal alloy (Zn-5Al-MM) before being welded into fabric, known as zinc 5 % aluminum-mischmetal alloy-coated steel before welding.

4.1.4 *Type 4*, consists of welded wire mesh manufactured from wire zinc-coated prior to being welded into fabric, known as galvanized before welding, and subsequently polymer color coated.

## 5. Ordering Information

5.1 When ordering or specifying welded wire mesh fence systems for security applications, the appropriate mesh type, mesh description, fence height, post size, post spacing, allowable mesh-to-framework attachment methods, and finish should all be defined to ensure that welded wire mesh panels and all associated system components will be compatible in the total system installation.

## 6. Materials and Manufacture

### 6.1 Welded Wire Mesh Panels

#### 6.1.1 Finish

6.1.1.1 If *Type 2* galvanized mesh is selected, the panels shall be completely and uniformly zinc-coated by the hot-dip process in accordance with Specification **F2453** after welding, shall be free from excessive accumulations of zinc in the apexes of mesh openings, and free from bare spots.

6.1.1.2 If *Type 4* color coated mesh is required, specify type of coating, color, and thickness of finish in accordance with Specification **F2453**. Specification **F934** is noted for color selection, though color coating shall not be limited to the listed colors.

#### 6.2 Framework

6.2.1 *Line Posts*: Fences designed to provide increased security levels are generally of greater heights, utilize smaller mesh sizes and heavier gauges, and these factors 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 required to compensate for wind loading or increased security. Determine the wind load requirements for a minimum 105 mph up to 170 mph wind according to ASCE/SEI 7-10 or consult the fence system manufacturer. After calculating the post

spacing and post dimension, select the post specification and protective coating from Specification **F1043**, Heavy Industrial Fence Framework; Group IA Round Steel Pipe (Specification **F1083** Schedule 40), Group IC Round Steel Pipe (Electric Resistance Welded Pipe), Group II Roll-Formed Steel Shapes (C-Sections), Group IV Alternate Design.

6.2.2 *Terminal Posts*: End, corner, or pull posts are to be in accordance with Specification **F1043**, Heavy Industrial Fence Framework; Group IA (Specification **F1083** schedule 40 pipe), Group IC Electric Resistance Welded Pipe). Select the terminal post size based on the line post size.

6.2.3 *Rails*: Top, intermediate and terminal post brace rails when specified shall be in accordance with Specification **F1043**, Heavy Industrial Fence Framework; Group IA, (**F1083** schedule 40 pipe) Group IC (Electric resistance welded pipe) or Group II (Roll-formed steel shapes).

6.2.4 *Polymer-coated Framework*: Specify the type of coating in accordance with Specification **F1043** and the color in accordance with Specification **F934**.

### 6.3 Barbed Wire

6.3.1 When specified, select the type and coating from one of the following:

6.3.2 If metallic coated steel barbed wire, specify Specification **A121** design number 12-4-3-14R having four-point barbs spaced 3 in. [76 mm] on center or 12-4-5-14R having four-point barbs spaced 5 in. [127 mm] on center.

6.3.3 *Aluminum Metallic-Coated*: Specify Coating A for the strand wire and aluminum alloy barbs.

6.3.4 *Zinc Metallic-Coated*: Specify Coating Type Z, Coating Class 3.

6.3.5 *Zinc-5% Aluminum-Mischmetal Alloy (Zn-5Al- MM) Metallic-Coated*: Specify Coating Type ZA, Coating Class 80.

6.3.6 Polymer-coated barbed wire shall be in accordance with Specification **F1665**; Specify coating type Class 2b, select barb spacing, Type I spacing at 5 in. [127 mm] on center or Type II spacing at 3 in. [76 mm] on center. The color shall match the system in accordance with Specification **F934**.

### 6.4 Fittings

6.4.1 The nuts and threaded portions of fasteners used to secure welded wire mesh panels to the framework must either be inaccessible from the attack side of the fence structure with the threads peened, or, if exposed, must be tamper-proof, peened, or welded to prevent removal. Fasteners and fittings shall be of sufficient size, strength and design to prevent removal of the fabric.

**TABLE 1 Recommended Mesh Size and Wire Gauge as Produced in Panels<sup>A</sup>**

| Vertical Mesh Spacing (in.) | Horizontal Mesh Spacing (in.) | Wire Diameter Gauge | Wire Diameter (in.) | Wire Diameter (mm) | Panel Width for Post Spacings 6, 7, 8, and 10 ft. (in in.) | Panel Length (Height) (ft) |
|-----------------------------|-------------------------------|---------------------|---------------------|--------------------|------------------------------------------------------------|----------------------------|
| 0.5                         | 2.0                           | 11                  | 0.120               | 3.06               | 74, 86, 98, 122                                            | 6–21                       |
| 0.5                         | 3.0                           | 10.5                | 0.128               | 3.25               | 74, 87, 99, 123                                            | 6–21                       |
| 0.5                         | 3.0                           | 9                   | 0.148               | 3.77               | 74, 87, 99, 123                                            | 6–21                       |
| 0.5                         | 3.0                           | 8.5                 | 0.155               | 3.94               | 74, 87, 99, 123                                            | 6–21                       |
| 0.5                         | 3.0                           | 6                   | 0.192               | 4.88               | 74, 87, 99, 123                                            | 6–21                       |
| 0.75                        | 3.0                           | 4                   | 0.225               | 5.72               | 74, 87, 99, 123                                            | 6–21                       |

<sup>A</sup>Panels available up to 10 ft 6 in. in width (not all meshes) and 21 ft in length. The vertical mesh spacing is the distance measured from the top to the bottom. The horizontal mesh opening is the distance measured from left to right.