



Designation: F2715 – 19 (Reapproved 2024)

# Standard Specification for Temporary Protective Equipotential Bond Mat To Be Used on De-Energized Equipment<sup>1</sup>

This standard is issued under the fixed designation F2715; 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 specification covers the manufacture and testing of the temporary protective equipotential bond mat used on or around de-energized electrical equipment.

1.2 It is common practice for users of protective equipment to prepare complete instructions and regulations to govern in detail the correct use and maintenance of such equipment.

1.3 The use and maintenance of this equipment is beyond the scope of this specification.

1.4 It is recognized that the use of temporary protective equipotential bond mats requires additional equipment for installation and use, typically temporary connecting jumper assemblies.

1.5 The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard.

1.6 *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.*

1.7 *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:*<sup>2</sup>

**B33** Specification for Tin-Coated Soft or Annealed Copper

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee F18 on Electrical Protective Equipment for Workers and is the direct responsibility of Subcommittee F18.45 on Mechanical Apparatus.

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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.

## Wire for Electrical Purposes

**D2261** Test Method for Tearing Strength of Fabrics by the Tongue (Single Rip) Procedure (Constant-Rate-of-Extension Tensile Testing Machine)

**F855** Specifications for Temporary Protective Grounds to Be Used on De-energized Electric Power Lines and Equipment

**F1267** Specification for Metal, Expanded, Steel

**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 Other Standards:

**Fed Std 191/5100** Strength and Elongation, Breaking of Woven Cloth; Grab Method<sup>3</sup>

**Fed Std 191/5874** Temperature, Low; Effect on Coated Cloth<sup>3</sup>

**Fed Std MVSS302** Flammability of Interior Materials<sup>3</sup>

**A-A-59551** Wire, Electrical, Copper Un-insulated<sup>3</sup>

## 3. Terminology

### 3.1 Definitions:

3.1.1 *bonding, n*—the mechanical interconnection of conductive parts to maintain a common electrical potential.

3.1.2 *carrier, fabric, n*—the main body of the equipotential bond mat on which the flat braid conductor is sewn.

3.1.3 *carrier, non-fabric, n*—the main body of the equipotential bond mat on which a conductive metal mesh is attached by means other than sewing.

3.1.4 *equipotential grounding system, n*—temporary grounding system placed in such locations and arranged in such a manner as to minimize the likelihood of workers being exposed to hazardous differences in electrical potential.

## 4. Significance and Use

4.1 Protective equipotential bond mats in this specification shall not be considered Temporary Protective Grounds and are

<sup>3</sup> Available from U.S. Government Publishing Office (GPO), 732 N. Capitol St., NW, Washington, DC 20401, <http://www.gpo.gov>.

not designed nor intended to carry full rated fault current. Refer to Specifications F855 for specifications for Temporary Protective Grounds.

4.2 Non-fabric carrier protective equipotential bond mat systems have more stringent electrical current tests to verify structural and interconnection integrity. Test values in this specification shall be considered a minimum; end users may request testing to higher values.

## 5. Classification

5.1 Equipotential bond mats covered under this specification shall be designated as Type I or Type II; Style 1, Style 2, Style 3 or Style 4; Grid Conductor, flexible, 1 to 6, or Grid Conductor, metallic mesh; and Fabric Carrier Material I or II.

5.1.1 *Type I*, capable of being cascaded (joined together).

5.1.2 *Type II*, without capability of being cascaded.

5.1.3 *Style 1*, fabric carrier with exposed conductor termination.

5.1.4 *Style 2*, fabric carrier with jacketed conductor termination.

5.1.5 *Style 3*, non-fabric carrier with exposed conductor terminations for the metallic mesh.

5.1.6 *Style 4*, non-fabric carrier with jacketed conductor terminations for the metallic mesh.

5.1.6.1 *Grid Conductor*, flexible, 1 to 6, in accordance with the normal flat width, or equivalent, of the flat braid conductors combination that makes up the grid conductor and perimeter conductor of the fabric carrier, as shown in Table 1.

5.1.6.2 *Grid Conductor*, metallic mesh. Expanded metal sheet, or welded wire mesh, which makes up the grid conductor, as shown in Table 2. Mesh type, size and attachment to the perimeter conductive provisions shall be such that the equipotential bond mat meets all electrical test requirements of Section 11.

5.1.7 *Fabric Carrier Material I*, slip resistant.

5.1.8 *Fabric Carrier Material II*, without slip resistance.

## 6. Manufacture and Marking

6.1 Each equipotential bond mat shall be marked clearly and permanently with the name of the manufacturer or supplier, ASTM F2715-YYYY (where YYYY is the year of the standard), serial number, type, and style.

## 7. Chemical and Physical Requirements

7.1 Equipotential bond mats samples selected in accordance with Section 10 shall conform to the physical and chemical requirements as specified in this section.

7.2 *Fabric Carrier Strength*:

TABLE 1 Bond Mat Conductor Size

| Grid Conductor | Grid, mm (in.) | Perimeter, mm (in.) |
|----------------|----------------|---------------------|
| 1              | 6.3 (¼)        | 6.3 (¼)             |
| 2              | 6.3 (¼)        | 12.6 (½)            |
| 3              | 6.3 (¼)        | 19 (¾)              |
| 4              | 12.6 (½)       | 12.6 (½)            |
| 5              | 12.6 (½)       | 19 (¾)              |
| 6              | 19 (¾)         | 19 (¾)              |

TABLE 2 Metallic Mesh Size

| Expanded Mesh Style                    | Mesh Rigidity, $D_m N \cdot m$ (lb·ft) |
|----------------------------------------|----------------------------------------|
| ¾ #9                                   | 7738 (5707)                            |
| ½ #13                                  | 1536 (1133)                            |
| Square Welded Wire Mesh Size, mm (in.) |                                        |
| 50 × 12 (2 × 0.25)                     | 18297 (13495)                          |
| 25 × 6 (1 × 0.12)                      | 8435 (6221)                            |

7.2.1 *Tensile (Grab)*—Fabric carrier material shall be capable of a tensile (grab) of 1828 N to 2037 N (411 lbf to 458 lbf) in accordance with Fed Std 191/5100.

7.2.2 *Tongue Tear*—Fabric carrier material shall be capable of tongue tear of 485 N to 516 N (109 lbf to 116 lbf) in accordance with Test Methods D2261.

7.2.3 *Cold Flexure*—Fabric carrier material shall be capable of a low cold crack of –40 °C (–40 °F) in accordance with Fed Std 191/5874-1978

7.3 Flat braid conductor shall comply with A-A-59551 and Specification B33 requirements and have the properties contained in Table 3 or greater.

7.4 Metallic mesh conductor shall comply with Specifications F1267 or F2453. The maximum opening size shall not exceed 50 mm by 50 mm (2 in. by 2 in.).

7.5 Non-fabric carriers shall have a minimum plate flexural rigidity of 5 times that of the metallic mesh that they carry. Mesh rigidity values,  $D_m$ , are given in Table 2. Non-fabric carrier isotropic plate flexural rigidity,  $D_c$ , may be calculated by:  $D_c = Et^3/12(1 - \nu^2)$ , where  $E$  is Young's Modulus,  $t$  is the effective thickness, and  $\nu$  is Poisson's ratio.

7.6 *Carrier Fire Resistance*—The flame resistance of the carrier shall be performed in accordance with Fed Std MVSS302 and shall be self extinguishing.

## 8. Dimensions and Permissible Variations

8.1 Equipotential bond mat size is the combination of grid spacing and perimeter dimensional configurations.

8.2 The maximum length and width of grid spacing for fabric carrier mats shall be 200 mm by 200 mm (8 in. by 8 in.), with a permissible variation of ±25 mm (±1 in.). Mesh sizes for non-fabric carrier mats shall be accordance with Table 2.

8.3 Fabric carrier mat thread stitch spacing shall be 6 stitches or more per 25.4 mm (6 stitches or more per 1 in.).

8.4 A minimum adequate area must be provided for footing surface of 0.37 m<sup>2</sup> (4 ft<sup>2</sup>) and a minimum of 0.6 m linear (2 ft) in any direction, with a permissible variation of ±25 mm (±1 in.).

TABLE 3 Flat Braid Minimum Specifications

| Nominal Braid Width, mm (in.) | Nominal Thickness, mm (in.) | Strand AWG | No. of Strands | No. Wires Per Strand |
|-------------------------------|-----------------------------|------------|----------------|----------------------|
| 6.35 (¼)                      | 0.76 (0.03)                 | 36         | 24             | 7                    |
| 12.7 (½)                      | 0.76 (0.03)                 | 36         | 48             | 8                    |
| 19 (¾)                        | 1.0 (0.04)                  | 36         | 48             | 18                   |