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# Standard Specification for Performance Requirements for Soft Toe Protective Footwear (Non-Safety / Non-Protective Toe)<sup>1</sup>

This standard is issued under the fixed designation F2892; 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.

## INTRODUCTION

Current ASTM standards **F2412** and **F2413** provide test methods and performance requirements for footwear requiring a protective safety toe cap. In industry there are many jobs that do not require toe protection from impact or compression. This committee has developed non-safety toe cap (soft toe) requirements to allow manufacturers to demonstrate the performance level of non-safety toe cap (soft toe) protective footwear.

## 1. Scope

1.1 The principal purpose of this specification is the certification of protective footwear. Certification must be performed by independent third party laboratories in order for footwear to bear the ASTM marking.

1.2 The specification contains performance requirements for footwear to protect workers' feet from the following hazards by providing: (1) conductive properties (Cd) which reduce hazards that may result from static electricity buildup; and reduce the possibility of ignition of explosives and volatile chemicals; (2) electric hazard protection (EH), to protect the wearer from accidental contact by stepping on live electric wires; (3) static dissipative properties (SD) to reduce hazards due to excessively low footwear electrical resistance that may exist where SD footwear is required; (4) puncture resistance (PR) footwear devices.

1.3 This specification covers minimum requirements for the performance of footwear to provide protection against a variety of workplace hazards other than the toe area that can potentially result in injury.

1.4 This specification is not intended to serve as a detailed manufacturing or purchasing specification, but can be referenced in purchase contracts to ensure that minimum performance requirements are met.

1.5 Controlled laboratory tests used to determine compliance with the performance requirements of this specification shall not be deemed as establishing performance levels for all situations to which individuals may be exposed.

1.6 Any changes to the original components of safety footwear such as replacing or adding after market footbeds/inserts could cause failure to any or all parts of this specification rendering the ASTM Soft Toe Protective Footwear label invalid.

1.7 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.8 *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.*

1.9 *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>

**B117 Practice for Operating Salt Spray (Fog) Apparatus**

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee F13 on Pedestrian/Walkway Safety and Footwear and is the direct responsibility of Subcommittee F13.30 on Footwear.

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<sup>2</sup> 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.

F1646 Terminology Relating to Walkway Safety and Footwear

F2412 Test Methods for Foot Protection

F2413 Specification for Performance Requirements for Protective (Safety) Toe Cap Footwear

2.2 Federal Standards:<sup>3</sup>

29 CFR 1910.132 Personal Protective Equipment—General Requirements

29 CFR 1910.136 Personal Protective Equipment—Occupational Foot Protection

2.3 Canadian Standards Association Standard<sup>4</sup>

CAN/CSA Z195 Protective Footwear

### 3. Terminology

3.1 Definitions:

3.1.1 *box toes, n*—are semi-rigid materials which can be molded to the shape of the last during shoe making. This provides the reinforcement and shape retention on the critical area of the toe of the footwear.

3.1.2 *certification (recertification), n*—testing of product as required by this standard using the most recently published methods of test and obtain a Certificate of Conformance (see Section 7).

3.1.3 *footbed (removable), n*—also known as ‘insock,’ a component typically made of a foam material with a leather or fabric cover/sockliner and often shaped or contoured covering the entire insole board which can be inserted between the foot and insole board.

3.1.4 *insole, n*—foundation of the shoe; the inner sole of the shoe which is next to the foot, under the sockliner or the insert, onto which the upper is lasted.

3.1.5 *last, n*—solid hinged form, in the general shape of a foot, around which footwear is constructed.

3.1.6 *lasting, v*—building of footwear around a specific last.

3.1.7 *lining, n*—term used to describe all components that can be used to construct the interior of the upper part of the footwear.

3.1.8 *product category, n*—description for a type of footwear designed and group of similar footwear items manufactured for a specific hazard or ~~hazards~~ hazards and that:

- Have same protective insole and supplier.
- Have the same outsole design, compound and hardness (including midsole).
- Have the same thickness (within a  $\pm 12.5$  % range) of upper, lining and insole.
- Are manufactured using the same method of construction; cemented, welted, etc.
- Are manufactured in the same factory.
- Are manufactured using the same last.

3.1.9 *protective footwear, n*—footwear that is designed, constructed, and classified to protect the wearer from a potential hazard or hazards.

3.1.10 *puncture resistant device, n*—component design to provide penetration protection to the bottom of the foot – the device shall be an integral and permanent part of the footwear.

3.1.11 *quarter, n*—entire back portion of the footwear upper.

3.1.12 *size, n*—length and breadth measurements of footwear determined by using a specific grading; the American system of footwear grading.

3.1.13 *soft toe (absence of protective toe cap), n*—which are commonly called box toe in footwear industry.

3.1.14 *soling material, n*—exterior bottom platform of the footwear; the bottom surface.

3.1.15 *upper, n*—parts of a shoe or boot that are above the bottom of the foot.

### 4. Significance and Use

4.1 This specification contains requirements to evaluate the performance of footwear for the following:

4.1.1 Conductive properties which reduce hazards that may result from static electricity buildup, and reduce the possibility of ignition of explosives and volatile chemicals, (Cd).

4.1.2 Electric hazard ~~by to~~ protect the wearer when accidentally stepping on live ~~wire~~ electric wires (EH).

4.1.3 Static dissipative (SD) properties to reduce hazards due to excessively low footwear electrical resistance that may exist ~~where SD footwear is required~~ that result from a build up of static charge where there is an underlying risk of accidental contact with live electrical circuits (SD).

4.1.4 Puncture resistance footwear devices (PR).

<sup>3</sup> Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, <http://dodssp.daps.dla.mil>.

<sup>4</sup> Available from Canadian Standards Association (CSA), 5060 Spectrum Way, Mississauga, ON L4W 5N6, Canada, <http://www.csa.ca>.

4.2 Any changes to the original components of the soft toe protective footwear such as replacing or adding after market footbeds/inserts could cause failure to any or all parts, or a combination thereof, of this standard rendering the ASTM MARKING INVALID. Soft Toe Protective footwear specimens or samples shall be retested for any of the following changes.

- 4.2.1 Change in construction method used to make footwear or change in factory in which footwear is produced.
- 4.2.2 Change in the upper or insole material thickness greater than 25 % ~~change to the soling system.~~
- 4.2.3 Change in the out sole or midsole, including its hardness.
- 4.2.4 Change in shape of last used in the manufacturing of footwear.
- 4.2.5 Change in material or supplier of protective insole.

## 5. Performance Requirements for Foot Protection

### 5.1 Conductive Protective Footwear (Cd):

NOTE 1—Conductive footwear is not intended to be worn by personnel working near open electrical circuits.

5.1.1 Conductive protective footwear shall be constructed and manufactured to provide protection for the wearer through conductance with a maximum 500 000 ohm resistance, against hazards that may result from static electricity buildup, thus reducing the possibility of ignition of an explosion in situations such as munitions manufacture.

5.1.1.1 Footwear shall dissipate static electricity from the body to reduce the possibility of ignition of volatile compounds.

5.1.1.2 Footwear shall be of a construction that facilitates a stable electrically conductive path. All external components shall be made of non metallic materials.

5.1.2 Conductive protective footwear shall be determined by evaluating three specimens in accordance with Test Methods **F2412**.

5.1.3 The specimens shall demonstrate resistance between 0 and 500 000 ohms.

5.1.4 Any specimen or sample of conductive footwear that does not meet the performance requirement constitutes a non compliance for the product category.

5.1.5 *Care and Use*—Keep the outsoles clean. Do not add aftermarket insoles/inserts as doing so may affect conductivity. Dispose of the footwear if it becomes contaminated or no longer tests conductive, or both.

### 5.2 Electric Hazard Resistant Footwear (EH):

NOTE 2—Electrical hazard protection is severely deteriorated in the following conditions: excessive wear on the soling material or exposure to wet and humid environments, or both. Work footwear can become contaminated with conductive materials. For example, soles can pick up metal shavings etc. which may reduce the effectiveness of the protection. In step potential environments, dielectric overshoes should be used.

5.2.1 Electric hazard footwear shall be constructed and manufactured so that the footwear outsole can provide a supplemental form of protection to the wearer from hazardous step potential (the difference in electrical potential between the feet) while standing on the ground.

NOTE 3—Electrical hazard protection is severely deteriorated in the following conditions: excessive wear on the soling material, contamination by conductive materials, or exposure to wet environments. In wet environments where the protective qualities of the footwear are compromised and where there is a step potential hazard, Dielectric overshoes should be used. In addition, a variety of methods such as maintaining appropriate distances, use of isolation methods, use of grounding methods for step voltage control, etc. should be considered to provide protection.

5.2.2 Electric hazard resistance shall be determined by evaluating three specimens in accordance with Test Methods **F2412**.

5.2.2.1 Protective footwear constructed or manufactured to be resistant is capable of withstanding the application of 18 000 V (root mean square (rms)) at 60 Hz for 1 min with no current flow or leakage current in excess of 1.0 mA under dry conditions tested as per lab conditions in Test Methods **F2412**.

5.2.3 Any specimen that does not meet the minimum Electrical Hazard resistant requirements for the product constitutes a non compliance for the product category.

5.2.4 Keep the shoes and outsoles free of conductive materials such as screws, nails, and metal shavings. Dry the footwear thoroughly after use. Clean outsoles with a mild soap and warm water. To avoid cracking, store footwear away from electric motors or electric fields. Inspect footwear for any visible damage prior to use, such as punctures, tears, snags and cracking. Dispose of the footwear if imbedded with conductive materials, or if wear causes the outsole thickness to diminish noticeably. These conditions will result in significant reduction or elimination of the footwear's protection if the wearer steps on an electrical circuit.

### 5.3 Static Dissipative Footwear (SD):

NOTE 4—The inconsistency of certain hygroscopic materials can result in footwear not being able to consistently meet the performance requirements of static dissipative footwear.

5.3.1 Static dissipative footwear shall be constructed, and manufactured to provide protection through conduction and resistance to the wearer against hazards which may exist due to excessively low footwear resistance in a work environment, as well as maintain a sufficiently high level of resistance to reduce the possibility of electrical shock in work areas where SD footwear is worn such as electrical assembly.

5.3.1.1 Footwear shall reduce the excess static electricity by conducting the charge (from body) to ground while simultaneously maintaining a sufficiently high level of resistance.