Designation: ~~F2413 – 11~~ F2413 – 17

Standard Specification for Performance Requirements for Protective (Safety) Toe Cap Footwear[1]

This standard is issued under the fixed designation F2413; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

INTRODUCTION

For more than sixty years, the predecessor to this specification, ANSI Z41, established the performance criteria for a wide range of footwear to protect from hazards that affect the personal safety of workers.

The value of these standards was recognized early in the history of Occupational Safety and Health Administration (OSHA) and incorporated as a reference standard in the Code of Federal Regulations (29 CFR Part 1910.132 and 29 CFR Part 1910.136).

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

The specification contains performance requirements for footwear to protect workers' feet from the following hazards by providing: (*1*) impact resistance (I) for the toe area of footwear; (*2*) compression resistance (C) for the toe area of the footwear; (*3*) metatarsal impact protection (Mt) that reduces the chance of injury to the metatarsal bones at the top of the foot; (*4*) conductive properties (Cd) which reduce hazards that may result from static electricity buildup; and reduce the possibility of ignition of explosives and volatile chemicals; (*5*) electric hazard protection (EH), to protect the wearer when accidental contact is by stepping on live electric wires; (*6*) static dissipative properties (SD) to reduce hazards due to excessively low footwear electrical resistance that may exist where SD footwear is required; and (*7*) puncture resistance (PR) footwear devices.

1. Scope

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

1.2 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.

1.3 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.

1.4 Any changes to the original components of safety toe footwear such as replacing or adding after market footbeds/inserts could cause failure to any or all parts of this standard rendering the ASTM marking invalid.

1.5 This specification is not applicable to overshoes with safety toe caps or strap on devices with safety toes.

1.6 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.7 *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~~ safety, health, and ~~health~~environmental practices and determine the applicability of regulatory limitations prior to use.*

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[1] 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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1.8 *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]
B117 Practice for Operating Salt Spray (Fog) Apparatus
F1646 Terminology Relating to Walkway Safety and Footwear
F2412 Test Methods for Foot Protection
2.2 *Federal Standards:*[3]
29 CFR Part 1910.132 Personal Protective Equipment–General Requirements
29 CFR Part 1910.136 Personal Protective Equipment–Occupational Foot Protection
2.3 *Canadian Standards Association Standard:*[4]
CAN/CSA Z195 Protective Footwear

3. Terminology

3.1 *Definitions:*

3.1.1 ~~*insert/footbed/sockliner (all removable),*~~ *footbed (removable), n*—~~*footbed normally*~~ *also known as 'insock,'* a component typically made of a foam ~~product~~material with a leather or fabric ~~cover shaped to cover~~ cover/sockliner and often shaped or contoured covering the entire insole board which can be inserted between the foot and insole board.

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

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

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

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

~~3.1.6 *soling material, n*—exterior bottom platform of the footwear; the bottom surface.~~

3.1.6 *product category, n*—description for a type of footwear designed and manufactured for a specific hazard or hazards.

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

3.1.8 *protective toe cap, n*—component designed to provide toe protection that is an integral and permanent part of the footwear.

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

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

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

3.1.12 ~~*socklining (non-removable),*~~*soling material, n*—~~material placed over the insole, footbed, or insert that may be imprinted with a brand name or other designation.~~exterior bottom platform of the footwear; the bottom surface that is exposed to wear.

3.1.13 *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 Impact resistance for the toe area of footwear, (I),
4.1.2 Compression resistance for the toe area of footwear, (C),
4.1.3 Metatarsal protection that reduces the chance of injury to the metatarsal bones at the top of the foot, (Mt),
4.1.4 Conductive properties which reduce hazards that may result from static electricity buildup, and reduce the possibility of ignition of explosives and volatile chemicals, (Cd),
4.1.5 Electric hazard by stepping on live wire, (EH),
4.1.6 Static dissipative (SD) properties to reduce hazards due to excessively low footwear electrical resistance that may exist where SD footwear is required, and
4.1.7 Puncture resistance footwear devices, (PR).

[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 U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401.
[4] Available from Canadian Standards Association (CSA), 178 Rexdale Blvd., Toronto, ON Canada M9W1R3.

4.2 Any changes to the original components of the safety toe footwear such as replacing or adding ~~after market~~ aftermarket footbeds/inserts could cause failure to any or all parts of this standard rendering the ASTM MARKING INVALID. Protective toe footwear specimens or samples shall be retested for any of the following changes:

4.2.1 Change in material used to make protective toe cap, change in protective cap manufacturer, change in the design of the toe cap.

4.2.2 Change in construction method used to make footwear or change in factory in which footwear is produced.

4.2.3 Change in the upper or insole material thickness greater than 25 %, change to the soling system, or a change in the hardness of the outsole.

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.

4.2.6 Change in material or supplier of the ~~metguard.~~ metatarsal guard.

5. Performance Requirements for Foot Protection

5.1 *Impact ~~Resistant Footwear (I):~~ (I) and Compression (C) Resistant Footwear:*

5.1.1 Impact and compression resistant footwear shall also meet the requirements of 5.2 for compression resistant footwear.

5.1.2 Footwear shall be constructed and manufactured so that a protective toe cap is an integral and permanent part of the footwear. ~~This type of footwear is to be worn over the foot only. Overshoes and overboots, including strap on devices with protective toe caps that are meant to be worn over footwear, do not comply with the requirements of this standard. Therefore they can not be marked with ASTM F2413 designation.~~The toecaps shall be free from corrosion, sharp edges, burrs and defects that may affect safety performance. Each protective toe cap shall bear the manufacturer's name or trademark or logo. Cap number or identification, and toe cap size and R (right) or L (left) shall be permanently stamped or marked in a conspicuous location. Protective toe caps shall have an open bottom. If a flange is present the width of the flange, when measured from the inside edge, shall be no greater than 0.394 in. (10 mm).

5.1.2.1 This type of footwear is to be worn over the foot only. Overshoes and overboots, including strap on devices with protective toe caps that are meant to be worn over footwear, do not comply with the requirements of this standard. Therefore they cannot be marked with ASTM F2413 designation.

5.1.3 The workmanship in the production and assembly of the footwear shall ensure that the footwear provides functionality to the wearer.

5.1.4 Impact 75 shall be determined by evaluating three specimens in accordance with Test Methods F2412. The requirement for impact resistance represents the minimum force required that results in the toe area of the footwear having a minimum interior height clearance of 12.7 mm (0.50 in.) in men's footwear and 11.9 mm (0.468 in.) in women's footwear.

5.1.4.1 Impact resistance of footwear shall be as follows:

(1) Impact 75 product for men's footwear shall demonstrate a minimum interior height clearance of 12.7 mm (0.50 in.) during exposure to impact energy of 101.7 J (75 ft-lbf).

(2) Impact 75 product for women's footwear shall demonstrate a minimum interior height clearance of 11.9 mm (0.468 in.) during exposure to impact energy of 101.7 J (75 ft-lbf).

5.1.4.2 *Care and Use—*~~Each protective toe cap shall bear the manufacturer's name or trademark~~ If there is evidence of physical damage to the protective toecap or evidence of significant physical damage to the toe area, or both, replace the footwear at once. (**Warning—**If an aftermarket insert or insole is added to this footwear, that device may reduce the impact or compression clearance, or both, in the toe area.~~or logo. Cap number or identification, and toe cap size and R (right) or L (left) shall be permanently stamped or marked in a conspicuous location.~~)

~~5.1.4.3 Any specimen that does not meet the minimum impact performance requirements for Impact 75 constitutes non-compliance for the product category.~~

5.2 *Compression Resistant Footwear ~~(C):~~ (C)—*

~~5.2.1 Compression resistant footwear shall also meet the requirements of 5.1 for impact resistant footwear.~~Compression 75 shall be determined by evaluating three specimens in accordance with Test Methods F2412. The requirement for compression resistance represents the minimum force required that results in the toe area of the footwear having a minimum interior height clearance of 12.7 mm (0.50 in.) in men's footwear and 11.9 mm (0.468 in.) in women's footwear.

~~5.2.2 Footwear shall be constructed and manufactured so that a protective toe cap is an integral and permanent part of the footwear. This type of footwear is to be worn over the foot only. Overshoes and overboots, including strap on devices with protective toe caps that are meant to be worn over footwear, do not comply with the requirements of this standard. Therefore they can not be marked with the ASTM F2413 designation.~~

~~5.2.3 The workmanship in the production and assembly of the footwear shall ensure that the footwear provides functionality to the wearer.~~

5.2.1 Compression ~~75 shall be determined by evaluating three specimens in accordance with Test Methods~~ resistance of footwear shall be as follows:~~F2412. The requirement for compression resistance represents the minimum force required that results in the toe area of the footwear having a minimum interior height clearance of 12.7 mm (0.50 in.) in men's footwear and 11.9 mm (0.468 in.) in women's footwear.~~