

PPE II: WORKING ON A JOB REQUIRING SAFETY SHOES? HERE'S WHAT YOU NEED TO KNOW!

Work hazards are minimized through engineering controls or eliminated altogether through safer methods or non-toxic materials. But sometimes, Personal Protective Equipment (PPE) must be worn as well. PPE can serve as an effective safety barrier as long as it is selected to protect the worker against the specific hazards (See "Job Hazard Analysis," *AIC News*, Vol. 39, No. 6, Nov. 2014, pp.13-16). PPE has to be properly donned and maintained because if it fails, you are exposed to the full force of the hazard. Remember: PPE only protects the worker wearing it, not other bystanders in the area. Even in museum work, industrial hazards exist and industrial controls must be enforced.

FOOT PROTECTION

Protective footwear is required when working in and visiting areas where there is a danger of foot injuries, due to falling or rolling heavy objects, objects piercing the sole, or electrical hazards. You and/or your employer are responsible for purchasing and wearing this PPE, as the foot size is person-specific (i.e., person in charge of a site cannot reasonably be expected to stock these as they would an adjustable-size hard hat).

- Steel toe shoes/boots have a steel protective covering over the toe box that protects the wearer from injury that results from impact and/or compression by heavy objects.
- Composite toe is essentially the same as a steel toe; it is a non-metallic and non-magnetic safety toe cap that is lighter in weight than a steel toe cap. The composite toe meets the same ANSI/ASTM safety requirements as a steel toe.

In either case, it is generally accepted as best practice for the protective toe-box to be fully integrated into the construction of the shoe or boot and NOT be a separately attached "addon" or strap-on type toe or metatarsal guards (which are not approved by most national standards, including the U.S.).

- A steel shank is a narrow piece of metal inserted at the arch for foot support only.
- A steel midsole is piece of metal that covers a maximum area of the foot sole to provide puncture protection at the bottom of the shoe or boot.
- Chemical-protective boots can also be purchased but, just like selecting gloves, you must be sure that the boot material has been tested to protect against the chemicals you will be working with.
- Some full-body protective suits incorporate foot protection to be worn over a safety shoe.

STANDARDS TO LOOK FOR ON FOOTWEAR

Protective footwear should meet the professional consensus standards incorporated into your country's regulations (U.S. OSHA references ASTM 2013 and ANSI 1999).

Examples include:

- ASTM F-2413-2005, "Standard Specification for Performance Requirements for Protective Footwear" (<http://webstore.ansi.org/FindStandards.aspx?SearchString=f2413&SearchOption>

[=0&PageNum=0&SearchTermsArray=nu ll%7cf2413%7cnull\)](#)

- ANSI Z41-1999 "American National Standard for Personal Protection—Protective Footwear" (available only through National Safety Council: <http://shop.nsc.org/ANSI-Standards-S122.aspx?var=mnd>)
- [European Standard] ISO 20345-2011, Personal Protective Equipment – safety footwear (http://www.iso.org/iso/home/store/catalogue_ics/catalogue_detail_ics.htm?csnumber=51036)
- CAN/CSA Z195-02 Guideline on Selection, Care, and Use of Protective Footwear (<http://www.scc.ca/en/standardsdb/standards/7661>)

Testing and approval requirements for footwear usually start with basic toe protection, but can include a wide range of features based on exactly what type of work hazards one needs to protect against (another reminder to conduct a complete job hazard analysis).

CONSIDERATIONS FOR SELECTION

- What is the maximum weight of material that could fall on a foot?
- What is the heaviest piece of equipment that could roll over or crush a foot?
- In view of the above, should full metatarsal protection be required?
- Is this a fire-rated area, where static electricity from steel-toed shoes or non-conductive sole material will cause a spark?
- Does the work pose an electrical hazard?
- Is there a need to protect the soles from puncture, as in working on irregular surfaces or construction sites with nails or metal sharps on the ground?
- Are these slippery work conditions, requiring slip-resistant soles?
- Is there a high risk of significant chemical spills and does the boot material need to be chemically-resistant?
- Does the shoe supplier offer gender-specific shoe sizes and makes?

MARKINGS

Specific approval codes are typically required to be stamped, labeled, or stitched to be legible within at least one shoe of each pair. Be sure of what hazardous work conditions you may need protection from before you shop for safety footwear! That information is

essential for the shoe vendor to recommend the right construction, and the following markings will be the guide.

Line 1 will identify the standard it complies with, followed by the toe protection (PT) standard year.

Example: ANSI Z41 PT 99 or ASTM F2413-05

Line 2 will usually identify: Gender "M" = male, "F" = female / Impact resistance "I" @ 75, 50 or 30 foot-pounds / Compression Resistance "C" @ 75, 50 or 30 which correlates to 2500 lbs., 1750 lbs. and 1000 lbs. respectively – the amount of force it can withstand before it crumples.

Example: F I/75 C/75
Additional coding tells you other hazards the shoe is constructed to protect against, such as:

"MT" or "Mt" = metatarsal resistance ratings @ 75, 50 or 30 foot-pounds

"EH" = electrical hazard protection. Has soles and heels which are non-conductive electrical shock resistance

"PR" = puncture resistant plate between the inner and outer sole. Minimum puncture resistance of 270 lbs.

"CS" = chainsaw resistant footwear

"CD" = conductive properties. Range of electrical resistance must be between 0 – 500,000 ohms and refers to the shoes ability to drive static electricity away from the body to the ground

"SD" = static dissipative footwear

"DI" = Dielectric Insulation. Extra insulation for accidental contact with energized electrical conductors, circuits and devices.

INSPECTION AND USE

Workers need to try on each shoe or boot in a pair and ensure that the toes do not fully touch the front or top of the steel box. The user must remember that steel or fiberglass-tipped shoes or boots will not "give" after wear; extra room at the toe will be necessary to accommodate foot expansion during a shift. Finally, footwear needs to be inspected daily to remove nails, stones and other puncture debris and then to assess whether puncture or impact damage has compromised any of the protective features. Footwear should be replaced if there is any doubt about the integrity of its construction, particularly after an accident.

Credit: Partial reprint from Ch 5 of Health and Safety for Museum Professionals (2011), Hawks et al, Society for the Preservation of Natural History Collections, New York.