

Week of March 28, 2011 – Head Protection

The United States Occupational Safety and Health Administration (OSHA) requires the use of hard hats to protect employees from overhead hazards. According to 29 CFR 1910.135, *Head Protection*, “Each affected employee shall wear protective helmets when working in areas where there is a potential for injury to the head from falling objects.” This standard also covers conditions where electrical hazards are present; as the regulation continues, “Protective helmets designed to reduce electrical shock hazard shall be worn by each affected employee when near exposed electrical conductors which could contact the head.”

Although 20 million Americans wear hard hats while working, according to the Bureau of Labor and Statistics (BLS), there are approximately 120,000 on-the-job head injuries each year, and nearly 1,500 of them are fatal. The BLS further acknowledges that 84% of workers who suffered impact injuries to the head were not wearing head protection. The majority of workers that were injured were performing their normal jobs at their regular worksites. BLS also noted that in most instances, employers had not required their employees to wear head protection. Of those workers wearing hard hats, all but 5 percent indicated that they were required by their employers to wear them. This means that hard hats are generally worn when people are required to wear them as opposed to personal choice to protect themselves. The vast majority of those who wore hard hats all or most of the time at work believed that hard hats were practical for their jobs. According to the BLS, in almost half of the accidents involving head injuries, employees knew of no actions taken by employers to prevent such injuries from recurring.

The BLS survey noted that more than one-half of the workers were struck in the head while they were looking down and almost 30% were looking straight ahead. While a third of the unprotected workers were injured when bumping into stationary objects, such actions injured only one-eighth of Hard Hat wearers. While some have argued that the elimination or control of a hazard leading to an accident causing head injuries are difficult to anticipate and control, when we can identify such conditions, head protection must be provided to prevent injury.

Head protection within the occupational setting first appeared right after World War I, when Jed Bullard designed a helmet that could protect miners from falling objects. He based it on the doughboy, a helmet he'd worn as a soldier in World War I. The 'Hard-Boiled Hat', patented in 1919, was so called because of the steam used in the manufacturing process. It was manufactured out of steamed canvas, glue and black paint and had a suspension device so the top of the hat was suspended over the head, never contacting the head. This became the world's first, commercially-available, industrial head-protection device.

In terms of what constitutes a “protective helmet,” OSHA requires compliance based on performance guidelines developed by the American National Standards Institute (ANSI): ANSI Z89.1. Major testing criteria for hard hats involves actual impact and penetration testing for both Type I and II hard hats: Type I hard hats are designed to protect head from objects falling directly overhead, while Type II hard hats are designed to protect from all sides (Note: older ANSI standards refer to Type I and II hard hats with regards to a protective brim: Type I having a brim that goes completely around the hard hat, while Type II hard hats, have only a front bill). The Type I impact test involves dropping an 8-lb (3.6 kg) steel ball from a height of 5 ft (1.5 m) on the top of the hat as it sits on a head form; no more than 1,000 lb (4,400 N) of peak force can be transmitted to the head form, and no more than 850 lb (4,000 N) of average force can be transmitted. The Type I penetration test involves dropping a 2.2-lb (1-kg) pointed steel penetrator with a 60° angle tip on the top of the hat from a distance of 8 ft (2.4 m); it must not make contact with the head form. In addition, Type II impact and penetration tests involve dropping helmeted head forms onto steel anvils and pointed steel penetrators.

Therefore, when properly worn, a hard hat provides two types of protection. Its hard shell resists penetration by sharp objects and its suspension system lessens the consequences of a localized blow by distributing the force over a broader area. The most common type of suspension system, a network of straps connected to a headband attached to the helmet, holds the shell at least 1.25 inches (3 cm) away from the wearer's head.

The most recent revision of the ANSI Hard hat standard is ANSI Z89.1-2009 (5th revision), specifies three classes of hard hats based on their electrical insulation rating:

Class E (electrical) are tested to withstand 20,000 volts;

Class G (general) helmets are tested at 2200 volts; and

Class C (conductive) provide no electrical protection.

Users of industrial head protection devices must realize that these products do not have an indefinite useful life. While there is no specific regulation addressing when to replace a hard hat, many hard hat manufacturers recommend that when wearing a hard hat continuously in environments where there is an exposure to temperature extremes, sunlight or chemicals, hard hats/caps should be replaced automatically after two years of use. If a cap has been struck by a forcible blow of any magnitude, both the hard hat shell and suspension should be replaced immediately, even if no damage is visible.

The following is a simple field test that can be performed by an employee or supervisor to determine possible degradation of polyethylene shells:

Compress the shell inward from the sides about 1" (2.5 cm) with both hands and then release the pressure without dropping the shell. The shell should quickly return to its original shape, exhibiting elasticity. Compare the elasticity of the sample with that of a new shell. If the sample does not exhibit elasticity similar to that of a new shell, or if it cracks due to brittleness, it should be replaced immediately.

ANSI Z89.1-2009 also discusses three non-mandatory specifications which manufacturers, if they elect to do, will test and provide markings on the hard hat to indicate the following:

Reverse Donning: Helmets marked with a reverse donning arrow can be worn frontward or backward per the manufacturer's wearing instructions. Such an indicator on the hard hat signifies that the hard hat has successfully completed all mandatory protective tests whether worn frontward or backward.

Lower temperature: Helmets marked with an "LT" indicates that the hard hat meets all protective testing requirements when preconditioned at a temperature of -30° C (-22° F).

High Visibility: Helmets marked with a "HV" indicates that the hard hat meets all testing requirements when having high visibility colors. This includes tests for chromaticity and luminescence.

As we can see, hard hats are a valuable protective tool. However, as we understand the limitations of the impact and penetration tests, hard hats will not protect us in every situation. This is one reason why PPE is always the last resort to protect ourselves. By using prudent safe work practices, conducting pre-job hazard analyses (that give us the right controls- such as PPE) and exercising a strong safety consciousness, we can provide ourselves and our fellow- workers with a safe work environment.

Life may not be the party we hoped for, but while we are here we might as well dance.

- Anonymous
