TerranearPMC Safety Share

Week of September 26, 2011 – Safety Glasses

Safety glasses: It seems like they have been around forever. Indeed, many of us can remember those awkward-looking things from high school or college chemistry lab that could make even Sean Connery as Secret Agent 007 look like at a complete geek. Yes, safety glasses have been around for quite some time; even before the inception of the Occupational Safety and Health Administration (OSHA) back in 1970. However, even though data, statistics and real-life incident testimonials verified that their ability to protect workers could not be disputed, getting people to actually wear them was very difficult. The effort from the occupational safety community was, to say the least, tiring. It wasn't until the Safety Glass Industry started to develop cool and sophisticated styles (so now even geeks could walk around looking like 007!) that workers were ready and willing to wear these protective devices without the enforcement efforts used in earlier times.

The actual OSHA regulations, 29 CFR 1910.133 (for General Industry) and 29 CFR 1926.102 (for the Construction Industry), both titled, *Eye and Face Protection*, mandate that eye protective devices must meet stringent performance requirements developed by the American National Standards Institute (ANSI); specifically standard Z-87. The latest version is Z87.1-2010 which supersedes Z87.1-2003 (which followed Z87.1-1989 and Z87.1-1968).

ANSI is a nonprofit organization that serves as administrator of the United States private sector voluntary standardization system. Its primary objective is to promote and facilitate voluntary consensus standards and conformity assessment systems. ANSI does not have authority to enforce such standards, but their standards are used by OSHA as the primary criteria to ensure that safety devices, such as eyewear, provide adequate protection for workers.

The ANSI Z87.1 standard sets forth requirements for the design, construction, testing, and use of eye protection devices, including standards for impact and penetration resistance. All safety glasses, goggles, and face shields used by employees under OSHA jurisdiction must meet the ANSI Z87.1 standard. The eyewear standard includes the following minimum requirements:

- Provide adequate protection against the hazards for which they are designed
- Be reasonably comfortable
- Fit securely, without interfering with movement or vision
- Be capable of being disinfected if necessary, and be easy to clean
- Be durable
- Fit over, or incorporate, prescription eyewear

The current edition of the standard is Z87.1-2010 and has divided eye and face protection into two categories: Impact rated and non-impact rated. (the previous standard, 87.1-2003, had *basic* and *high impact*) and are designated on the device as Z87+ and Z87, respectively. Other markings include:

- Splash and droplet protectors: D3-splash and Droplet
- Dust protection: D4
- Fine Dust protection: D5
- Welding lenses: W with a shade number
- UV protectors: U followed by a scale number (based on % of average transmittance of wavelengths of 200-315 nanometers).
- IR protectors: R followed by a scale number
- Visible light filters (grey lens for sun shade): L followed by a scale number

(Note: the markings described above are optional)

Regardless of whether a pair of safety glasses is designated as *Impact* or *Non-Impact*, lenses in all protectors must, at a minimum, meet a basic impact requirement of having a 50-gram, 1-inch diameter steel ball dropped at a height of 50-inches (127 centimeters). No pieces can break free from the inside of the protector, the lens cannot fracture, and the lens must remain in the frame or product housing. This test is a good measure of the product's strength, simulating a blow such as from a tool that slips from the work surface or when the lens collides with stationary objects.

Impact-rated safety glasses, however, must be capable of resisting an impact from a 6.35-mm (1/4-inch) diameter steel ball traveling at a velocity of 45.7 meters/second (150 feet/second – note that 60 mph equals 88 feet/second, so this ball is traveling at approximately 102 mph!). Models can achieve "high" impact levels indicating elevated performance.

For safety glass frames (regardless of impact or non-impact capabilities), they must be capable of resisting an impact from a pointed projectile weighing 500 grams (17.6 ounces) dropped from a height of 127 centimeters (50 inches). This is similar to the requirement criterion for standard safety glass lenses.

Face shields are also protective equipment for which ANSI Z87.1-2010 has included in their testing acceptance standard. As such, face shields shall have a minimum thickness of 1.0 mm (0.039 inches) at its thinnest point while maintaining the same impact resistance specified for safety glasses. The actual lens and frame must comply with the High Impact requirement:

Other tests performed on eye and face protection include their integrity when subjected to corrosive and flammable atmospheres: Metal parts are boiled in a 10% aqueous solution of sodium chloride for 15 minutes and then immersed in the same solution at room temperature, removed and allowed to dry for 24 hours. The metal parts are then rinsed in lukewarm water and allowed to dry. The function of the spectacles shall not be impaired by the corrosion. Flammability tests are designed to ensure that safety glasses, face shields, goggles, etc, do not contain materials that when subjected to specific flame characteristics, will not propagate the flame at a designated rate (although the glasses may burn, however not at a fast rate).

These are the safety features designed into safety glasses, goggles and face shields to ensure our well-being. The big step for us is to make the right selection and to wear them!

Nothing in life is to be feared. It is only to be understood.

Marie Curie