Howard Talks Tech

What is the recommended protection from a flash fire?

Injuries from fires and intense heat are some of the most gruesome and lethal for workers unfortunate enough to be involved in such accidents. Protecting against fire and heat hazards is an essential goal on many job sites. The first step is to engineer hazards out of a work site and institute safe working procedures, but accidents still occur. In order to mitigate the injuries caused by accidental flash fires, flame resistant clothing must be a part of personal protective equipment.

A **flash fire** is an unexpected, sudden intense fire caused by ignition of flammable solids (including dust), liquids, or gases. It is characterized by high-temperature, short-duration, considerable shock waves, and a rapidly moving flame front.The size of the fire ball and the duration is determined by the amount of fuel available, the efficiency of combustion, and the environmental and physical characteristics of the site. The temperatures vary but can range from **1022ºF to 1922^{0}F**. The damage occurs with a burst of flame that rarely lasts more than 6 seconds, the average is **3 seconds** but the real danger is the continued burning of combustible clothing.

Electric Arc fires are another source of intense heat. All live electrical lines carry the potential to start an arc fire. They occur when the current running through a wire jumps from a piece of equipment, through a worker, and then to the ground. The resulting arc fire can generate **temperature of 35,000^{o}F** but is generally over in **6 cycles (0.1 second)**

Cotton and other cellulosic fibers (linen, rayon) ignite easily, burn with a bright flame, smell like burning paper, and leave a white ash. Polyester and nylon fibers may be slower to ignite, but eventually will burn. As they burn, the melting residue slowly forms a hard bead-like plastic residue that holds heat and cools slowly. The melting residue is a very high temperature and can cause deep and severe skin burns. When Acrylic fibers burn; they produce flaming, melting and dripping of molten material. All manufactured fibers burn at a high temperature and can cause severe skin injury because they shrink as they burn and tend to stick to the skin. Wool and silk shrink from the flame are hard to ignite, smell like burning meat, sputter as they burn and leave a crisp, foamy residue.

Chances of survival after life threatening burn injuries diminish rapidly in accordance with one's age and percent of second and third degree burns. Studies have shown that burns to over 75% of the body can occur easily from the ignition and continued burning of conventional clothing versus workers that don FRC, which do not continue to burn. Add the percent of burn to the person's age if over 100 the chance of survival is about 10%

FR garments should be worn over non-melting fabrics or other similar FR materials. One recommended combination is wearing a 100% cotton T-shirt and underwear underneath FR clothing. Layering garments can increase the thermal protection of the clothing system by adding "air gaps" that provide excellent thermal insulation.

The outermost layer of clothing must always be flame resistant. Wearing highly-flammable garments (such as nylon parkas, for example) over FR clothing greatly compromises the overall protection of the FR clothing. Even though the underlying FR garments will not ignite, the flammable jacket can become a combustible fuel source that can severely burn the wearer through contact with the flames or heat transfer through the FR fabric.