

TerranearPMC Safety Share

Week of April 8, 2013 – Flame Resistance and Fire Retardants

It is not unusual for a safety and health plan to require fire resistant clothing, when, in fact a fire retardant garment is the correct terminology. Flame resistant, fire retardant, fire resistant, etc. what's the difference! These terms do mean different things and while the nuances may seem to be small and insignificant, understanding these terms is important. A material is classified as "fire retardant" when it is treated with a specific substance to keep fire from spreading, while "flame-resistant" fabrics are considered to be resistant to fire, while also stunting its spread. In addition, "flame-resistant" clothing will not keep burning once the source of the fire is gone.

To put it in other terms, flame resistance or FR is a characteristic of a fabric to resist ignition and to self extinguish if ignited, while fire retardant is considered to be a chemical substance used to impart flame resistance. Some common fire retardant substances are Polybenzimidazole (PBI), Nomex™, and Kevlar™.

There are numerous videos available that illustrate the difference between typical cotton and polyester materials burning and then compared to a flame resistant cloth. The contrast is an eye opener. For those employees that work in an environment where there is the likelihood a spark-producing activities, and therefore have the potential to ignite clothing, it is more than just appropriate to understand how fire retardants and flame resistant clothing work and can protect them. These garments represent more than just meeting compliance to an OSHA standard or work plan; they can save a life.

Fire retardant substances are placed on fabrics or areas to make sure it is flame resistant. Most fabric that is used on furniture has a special finish or a fire retardant substance placed on the fibers before the fabric is used. This helps to make sure that if a fire starts in the home, the flames won't spread as fast. It is a built in safety feature so that people are able to get out of the home or area quickly. This type of fabric also meets fire codes and have had tests done on the fabric itself, to tell how fast a flame might spread.

Most FR clothing has been designed to protect workers from two specific types of hazards: flash fire and electric arc flash. A flash fire is a rapidly spreading fire caused by igniting an atmosphere derived from hydrocarbon vapors (from either an ignitable liquid) or finely divided combustible particles (such as coal dust or grain) in a concentration exceeding the chemical's lower explosive limit. Temperatures can reach 1,000 degrees F to 1,900 degrees F. An electric arc flash is the passage of substantial electrical current through ionized air, created by an electric fault. Typically lasting less than one second, an arc flash explosion generates extremely high radiant heat and releases acoustical energy, as well as a pressure wave, and molten debris. Temperatures can reach 35,000 degrees F.

Flash fire is a primary hazard in industries where combustible materials are either used or produced, such as in petrochemical and metallurgy plants. Arc flash is an obvious concern at electrical utilities; however, any work environment with recognized electrical hazards needs to guard against arc flash injury with the proper FR garments. Exposed electrical equipment at 50

volts and above is the threshold that requires the use of electrical safety practices as described in the National Fire Protection Association (NFPA) standard 70E, *Electrical Safety in the Workplace*.

Industry uses many standards to help define the ability of garments to protect persons from fire. In addition to NFPA 70E, two of the more prevalent standards are the American Society for Testing and Materials (ASTM) Standard F1930 and NFPA 2112. These standards are designed to ensure proper PPE is worn during all types of conditions where workers are exposed to a variety of burn hazards, including hot work operations, such as torch cutting and welding.

ASTM F1930 is a test method that is designed to measure and compare the thermal protection provided by different materials, garments, and clothing ensembles. This test method provides a measurement of how well a garment can protect the wearer from flames. Heat sensors are placed at specific positions on a manikin. These sensors can detect heat within the immediate area and therefore help to characterize how well the garment can protect a person from being burned. Using simulated flash fire environment with a controlled heat flux, flame distribution, and duration, heat is transmitted to each sensor location on the surface of the instrumented manikin. This information is then used to show the corresponding predicted degree of burn injury to human tissue. The sum of these values can then be converted to a percentage to show the total area of predicted burn injury.

NFPA 2112, entitled *Standard on Flame-resistant Garments for Protection of Industrial Personnel Against Flash Fire*, provides the minimum requirements for the design, construction, evaluation, and certification of flame-resistant garments for use by industrial personnel, with the intent of not contributing to the burn injury of the wearer. Garment materials must exhibit less than 50% predicted total area burn injury including both second-degree and third-degree burn injury when a specified coverall design made of the test material is positioned on a manikin over specified cotton undergarments (T-shirt and briefs) is exposed to a 3 second flash fire with a controlled heat flux of 2.0 cal/cm²second. In addition, NFPA 2112 requires third party testing and certification; therefore eliminating bias during the certification process.

NFPA 2112 dictates that a label must be on each article of clothing that has met compliance with this standard. The label must state the model name, number or design, manufacturer's name, address, country, serial number, size, fiber content and "do not remove" statement and have the words, "Flame resistant garment meets the requirements of the NFPA standard 2112." The label must be legible at 12 inches after 100 launderings or dry cleanings. The label must also include the international symbol for "read instructions before use", while the manufacturer must provide information for warnings, instructions for use and sizing charts as needed. Cleaning and care instructions must also be included. Sound a little tedious and complicated? No problem...that is, if you get your Safety and Health professional involved!

We are born into a box of time and space. We use words and communication to break out of it and to reach out to others.

Roger Ebert 