

When is Safe Not Safe Enough: Three-Piece Suite for Arc Flash Hazard Protection

by *Bill Reith*

So, you are well on your way to bringing your company into compliance with NFPA 70E. You have attended all the meetings and classes and understand the hazard. You have determined that this is indeed a hazard that exists within your company and needs to be dealt with. You have decided to adopt NFPA 70E within your company and you have even performed your arc flash hazard assessments as outlined in NFPA 70E. The next step is to choose your PPE. Specifically you are now ready to choose the proper clothing to protect your employees.

This may sound like a simple task. Once you have performed your hazard assessment and, if they have been performed correctly, you know what your maximum exposures are. So the choice of clothing should be simple. But is it really?

Whether you have employed method "A" and used software to determine your hazard or whether you have used method "B" and employed the use of the NFPA 70E Hazard Risk Category tables 130.7(C)(9)(a) and 130.7(C)(10) you still must determine what level of protection is required.

Method "A" will provide you with a maximum exposure value, given that the information provided is correct. Then it seems to be only a matter of wearing a garment with an equal to or greater than level of protection. If using method "B" it would seem to be an easy matter to determine your required level of protection as outlined by the HRC tables. It is true in both cases that the maximum level of protection is identified and that a garment with an equal to or greater than level of protection is required. What is not mentioned, and is often times confusing, are the different styles of garments available today.

It is in our nature to find the "quick fix." We want to be able to do the right thing and protect our employees in hazardous situations and, at the same time, make it as convenient as possible to do so. The obvious solution to this is to wear a garment that is easy to put on and easy to take off. NFPA 70 130.7(C)(13)(a) states, "Flash Suits. Flash suits shall permit easy and rapid removal by the wearer..." This is where confusion comes in. Is a lab coat a safe solution? NFPA 70 repeatedly refers to a coverall but never mentions a lab coat. And even when it refers to a coverall it does so only as a layering option.

Lab coats at first glance seem to be the quickest and easiest solution to a problem. Common concerns that are heard in the field are, "If they can't put it on quickly and take it off quickly they won't wear it!" and, "These guys have all kinds of equipment they need now so I don't want to add to their problems!"



These are fair and real concerns. A lab coat would seem to be the solution. But when looking at styles of clothing it is important to also look at the type of work that will be performed while wearing that clothing and the physical positions that worker will be in at any given time while performing their job.

For instance, if a worker has to kneel down to perform the work that is required, then what has become of the lab coat? The worker most likely will have pushed the coat up above the knees to allow for an easier kneeling position. Now the front closure of the garment is "bunched up" allowing for the strong possibility of an opening in the front or vertical surface of the garment. It also forces the collar of the garment to open at the front or top of the closure.

The typical style for a lab coat allows for the closure to end 4 to 6 inches from the bottom of the garment. When in a kneeling or squatting position the garment naturally opens and allows exposure to the lower extremities.

NFPA 70E 130.7(12)(a) states, "Layering. Non-melting flammable fiber garments shall be permitted to be used as under layers when used in conjunction with FR garments in a layered system for added protection. If non-melting flammable garments are used as under layers, the system arc rating shall be sufficient to prevent break open of the innermost FR layer..."

This section is telling us that while non-melting flammable fiber garments (i.e. untreated cotton, wool, rayon, silk, or blends of these materials) provide excellent insulating properties, they will ignite and continue to burn if exposed to an open flame. Because of the design of a lab coat and the "enveloping" nature of the fireball during an arc flash, there is a very high probability of exposing the under layer garments to an open flame while wearing a lab coat.

So what is the safest system available to us today? A three-piece system that incorporates a flash hood, a jacket and bib overalls provides us with maximum protection but is not required for lower levels of exposure. In HRC categories 1 and 2 a waist length coat or coverall is sufficient. A lab coat is not necessary and may in fact increase the chances for injury and is not even mentioned as an option in NFPA 70E.

A lab coat should never be considered as an option for HRC categories 3 and 4. These categories require full protection including the lower legs. Some manufacturers offer leggings to go along with a lab coat because the lab coat does not cover the entire leg. These may protect the lower portion of the leg but they do nothing for protecting against the situations that will arise due to the nature of the work to be performed.

Neither a lab coat nor a coverall offer the same protection level provided by a three-piece system. The three-piece system provides three layers of protection over the vertical surface meaning the chest area and vital organs. The bib overall provides a layer over the chest. The jacket provides another layer over the chest, and the long flap found on both the front and back of the hood adds yet another layer of protection.

When choosing your style of clothing it is important to keep in mind the reason you began this process. Your concern was to provide a safe work environment for your employees. In most cases they are much more than that.

They are friends and co-workers. You have taken the necessary steps to understand the hazard. You have spent time and money understanding your exposure levels. The right style of clothing can make all the difference.

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