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Why You Can't Rely On the 70E Tables to Select PPE

Employers must protect their employees from the dangerous thermal effects of an arcing fault. Employers accomplish this by determining what Personal Protective Equipment (PPE) is required for a given electrical exposure. This PPE may involve fire resistant clothing, hard hats, face shield, full body flash suit, etc. There are two methods commonly used to determine the appropriate level of PPE required. You can use Table 130.7 (C)(9)(A) from NFPA 70E 2004, or you can perform an arc flash hazard analysis, which includes calculating the incident energy using commercially available software based on the IEEE 1584 standard. This more in-depth arc flash hazard analysis is far superior to the tables alone. In very few cases will the tables alone result in the proper level of protection for your employees.

The tables are task-based and divided into eight equipment- and voltage-specific sections. In each section several tasks are listed that might be performed on that piece of equipment. An example of this would be in the section labeled, 600V Class Motor Control Centers (MCCs). One of the ten tasks listed for that piece of equipment is: Work on energized parts, including voltage testing - The table says when doing that task on that piece of equipment it is a Hazard Risk Category 2*. A worker could satisfy this category by wearing a non-melting t-shirt made of untreated natural fibers, an 8 Cal/cm² long sleeve fire resistant shirt, 8 Cal/cm² pants, hard hat, safety glasses, face shield, hearing protection, leather gloves, and leather work shoes. The asterisk means the addition of a double layer switching hood is also required. Voltage rated gloves and tools must also be used.

The tables are limited to only eight specific pieces of equipment. Although the equipment listed covers most situations, it may not cover yours. If your equipment, voltage, or task is not listed 70E requires an arc flash analysis. Another limitation is that they only cover situations up to Category 4. Some equipment is higher than Category 4 in what is known as the dangerous level. This level means the arc flash will be so severe you cannot work on the panel live.

But the tables' most glaring shortcoming is that it is based on a predetermined available short circuit current and clearing time. This current is the maximum amount that would flow during a short circuit at that point. The clearing time is the length of time it would take the circuit protective device to open and clear the fault. The problem with assuming a certain level of current is that your facility may have a higher current or a lower current and both can result in an increased thermal hazard. More current can mean a higher temperature and larger flash, a lower current can result in a smaller flash but a longer clearing time lengthening the duration of the arc flash. Both of these scenarios increase the extent of the burn injury to the employee. The clearing times for the circuit protective devices that are also assumed by the tables may not be your clearing times at that current level. This will introduce huge inaccuracies in the PPE selected -- either not enough protection, or too much. Through years of doing hundreds of studies we have numerous examples in which the table has prescribed PPE for a Category 1, while we calculate the actual hazard level at a Category 4. More often, we find situations in which the tables have ordered too much PPE for the actual calculated hazard level. This makes a huge difference to your electrician and his or her ability to work.

Think of a doctor who tells every patient who comes to him complaining of chronic headaches that their symptoms are caused only by stress, and they should take a vacation. While he may be correct in a handful of cases, he also could be misdiagnosing potentially life-threatening problems with such a blanket prescription. Likewise, the tables are a great tool in a limited number of situations, but if you want to more accurately protect your employees you must have an arc flash hazard analysis performed at your facility.

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