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Mitigating arc flash hazards

Arc flash studies are a valuable part of implementing an NFPA 70E program. However, putting arc flash labels on electrical equipment is not the only step needed to protect electrical workers. Most arc flash studies will identify electrical equipment with incident energy at a given distance. We see many studies where "dangerous above 40 cal/cm^{2}" labels are put on electrical equipment to warn the worker of the high incident energy. While having "dangerous" labels on the electrical equipment to inform workers is a good step, they are still often asked to perform a task on the equipment. It is important workers understand what is conveyed by the label. The label does not mean no one can touch or work on the equipment; it simply gives you the incident energy at a given distance. If the distance or condition can be changed, then it may be possible to reduce the dangers for workers. It is very important for facilities to provide mitigation solutions in order to perform necessary tasks. These can range from written procedures to installing additional hardware to lower the incident energy.

Train your employees to understand what the arc flash labels mean and how to use them to make good decisions. Labels are used to communicate hazards. In the included image, the label shows "danger." The label also shows the incident energy is 43.9 cal/cm^2 at 1 foot 6 inches. If the task allows the worker to be 36 inches away (double the distance) from the potential arc, then the incident energy drops approximately 1/4 of the value, or to 11 cal/cm^2. Distance is your friend.

The labels from studies are often given as a worst-case scenario. For example, if the system is a main-tie-main, the incident energy is often given for each feeder breaker with the tie closed. However, the tie is typically open when working on the gear. Procedures in which the worker verifies the tie is open before performing tasks like racking in a breaker can ensure the incident energy is at a lower level during the task.

In areas where procedures cannot mitigate the hazard, new protective devices may have to be added. This can include circuit breakers, arc flash relays, instantaneous relays, etc. Adding hardware can be expensive, but the added safety to the worker is a must. One of the most common issues observed is a 480-volt switchgear or motor control center (MCC) being fed by a transformer without a main breaker. This high-incident energy makes it difficult to rack in feeder breakers or MCC buckets safely. The incident energy can be reduced by installing a main breaker between the transformer and MCC. Many times the cost and available footprint makes it very difficult to add a 480-volt main breaker. Instead, it may be possible to add current transformers and an over-current relay on the output of the transformer and have the relay trip the upstream medium-voltage breaker.

There are also areas of high-incident energy where the equipment may only be worked on while the facility is at light load during maintenance windows. In these areas, add a maintenance-mode switch that changes the protective relay or breaker settings for a quicker reaction to reduce the incident energy. Most modern relays have multiple setting groups, and changing a logic input to the relay can vary from one setting group to another. If this type of system is used, make sure the system is taken out of maintenance mode when the work is complete. Failure to do so can cause mis-coordination and false tripping issues.

Performing an arc flash study by itself does not ensure electrical workers are safe. A study gives useful information to quantify the incident energy at a specific distance, but training employees to understand what the information means is a requirement. In areas with high-incident energy, other measures may be required depending on the tasks performed on the switchgear.

For more information, visit www.shermco.com/sto.