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Avoid Devastating Electrical Arc Flash Accidents By Following These Safety Standards

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Five to 10 times per day in the United States, a worker is severely injured or killed in an electrical arc flash accident. Other electrical incidents also can injure workers; these typically involve accidental contact with energized parts that result in shock and electrocution. The injuries and fatalities that result from these accidents are always devastating to the workers and their families. Additionally, the financial consequences of such events can be very damaging to the company.

There are important steps that companies can take to reduce the occurrence of electrical accidents and better protect the worker and the employer from the physical, financial and statutory consequences of electrical accidents. Following are nine steps for reducing your arc flash risk. Several steps are required as part of the National Fire Protection Association (NFPA), in its regulation 70E 2004, which provides a detailed reference for facilities to meet the requirements of electrical workplace safety. Additional steps are recommended and considered best practices for improving overall safety within a facility.

Clearly, the fundamental requirement of the NFPA 70E standard is to de-energize electrical equipment before any work is performed. But it also recognizes that in some cases, de-energizing the equipment might actually create a different hazard (for example, de-energizing electrical equipment that controls hazardous location ventilation). In other cases, de-energizing electrical equipment simply isn't feasible, such as with infrared inspections. The process of de-energizing electrical equipment, or placing it in an electrically safe condition, is usually called lock out/tag out. This process has very specific steps, and must be performed only by a qualified person wearing the appropriate personal protective equipment (PPE).

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NFPA requirements

- **Establish an electrical safety program with clearly defined responsibilities.** This is a written document created by the employer that covers all areas of the company's electrical safety policies, and includes such things as lock out/tag out procedures, internal safety policies and responsibilities for electrical safety.

- **Conduct an electrical system analysis to determine the degree of arc flash hazard.** This is an electrical system engineering study that is performed by engineers familiar with the power distribution and control equipment and the calculation methods required. The arc flash analysis will determine, among other things, the incident energy potential of each piece of electrical distribution equipment in the facility. This incident energy potential will define the Hazard/Risk Category of PPE that the employee is required to wear while performing any work when energized parts are exposed.

- **Conduct safety training for all workers.** NFPA 70E defines a qualified person as "one who has skills and knowledge related to the construction and operation of the electrical equipment and systems, and has received safety training on the hazards involved." This training requirement means that the employee must have received safety training specific to the hazards of arc flash, arc blast, shock and electrocution. Electrical workers are not considered to be qualified by OSHA until they have received this specific training.

- **Ensure there is adequate personal protective clothing and equipment on hand.** Employees working in areas where there are potential electrical hazards shall be provided with electrical protective equipment that is appropriate for the specific parts of the body to be protected and for the work to be performed. This can include fire-resistant shirt, pants or coveralls, or a multilayer flash suit.

- **Ensure the proper tools are on hand for safe electrical work.** In addition to PPE, the standards require the employer to furnish other tools for safe electrical work. This includes, but is not limited to insulated voltage rated hand tools and insulated voltage sensing devices that are properly rated for the voltage application of the equipment to be tested.

- **Apply warning labels to all equipment.** Currently, NFPA states that switchboards, panel boards, industrial control panels, meter socket enclosures and motor control centers in other than dwelling occupancies – which are likely to require examination, adjustment, servicing or maintenance while energized – shall be field marked to warn persons of potential electric arc flash hazards. The marking shall be located so as to be clearly visible to persons before examination, adjustment, servicing or maintenance of the equipment. The current requirement for application of hazard warning labels on electrical equipment, National Electrical Code® (NEC®) 2005, does not require that the specific information, such as the PPE Hazard/Risk Category, incident energy, boundary distances and other data that would be provided by the arc flash hazard analysis, be included on the label. However, the specific data for each piece of equipment that is provided by the arc flash hazard analysis must be known by the employer, so that the employee can be properly protected from a potential arcing fault condition when work is being performed on energized electrical equipment, and energized parts are exposed. As a prudent safety measure, many Square D customers have decided to exceed the requirements in NEC 2005.

Additional best practices

- **Appoint an electrical safety program manager.** Identify an individual from your organization that has vast knowledge and experience within the electrical industry. This should be a well-organized, responsible individual who will take the position seriously. Having a single individual who is familiar with electrical code requirements and other safety issues will pay off.

- **Maintain all electrical distribution system components.** All electrical distribution systems contain active components such as fuses, circuit breakers and protective relays that help protect the system in the event an electrical fault occurs. These components, called over-current protective devices, have a critical role in protecting the system, but are also crucial when it comes to protecting workers from the hazards of arc flash and arc blast. Modern, properly adjusted over-current protective devices that have been well maintained are able to detect an arcing condition almost instantaneously, and clear the fault quickly. This always results in significantly reducing the amount of incident energy that is released. Many existing electrical distribution systems have old components that have not been well maintained over long periods of time. In actual field testing of these devices, it is often apparent that their ability to react to an arcing event is much slower than would be the case with a modern, well-maintained device. Unless the protective device optimally reduces the time to clear the fault, the hazard to a worker standing within the flash protection boundary can dramatically increase. In the past, attention to maintenance and condition of these devices in many facilities has not been a primary concern for most facility owners, as in many cases it was not clearly understood that poor condition or inadequate maintenance of the devices presents an elevated safety hazard for workers. With the current focus on workplace hazards and electrical safety, companies are more vigilant when it comes to the condition and maintenance of its electrical system.

- **Maintain and update electrical distribution documentation.** Electrical distribution system documentation is another important area that has not been well managed in many facilities. Documents such as the electrical one-line diagram (essential to safety when performing the lock out/tag out process), short circuit and coordination studies, and other critical documents often are not well maintained. When system components change due to revisions or facility expansions, this documentation is often not updated to reflect these changes. Lack of attention to documentation management makes the cost and work scope of providing accurate arc flash hazard analysis much greater. Since these documents are such a critical part of electrically safe work practices, lack of attention creates additional legal liability if an accident does occur.

Safety pays off

Standards set the pace for facility electrical safety, with the tangible payoff coming in the form of reduced medical incident rates, workers' compensation costs and other indirect costs resulting from electrical accidents.

Schneider Electric North American Operating Division can attest to this firsthand. The company saw its medical incident rate drop in 2005 at its 30 North American manufacturing facilities. That translated to a savings of approximately $2 million, split between workers' compensation savings and indirect costs.

But adhering to standards and best practices also can increase worker confidence, something not as easily measured. It allows a company to convey to employees that they care enough about their workforce to maintain a safe work environment, along with providing the tools, training and programs that will help reduce the chances of injury should they enter harm's way. That's a reputation for which any company would pay dearly.

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