Arc Flash Prevention and Protection

In the construction and contracting industry, arc flashes can be quite common if safety precautions are not exercised; an arc flash can occur anywhere there is electrical equipment or conductors. In fact, there are between five and 10 OSHA-reportable arc flash events every day in the country, averaging one fatality every 28 hours.

What is an Arc Flash?
The best way to think of an arc flash is as a short circuit through the air. An electric arc arises from energy being released through the air when high voltage exists across a gap between conductors. Any electrical service of more than 450 volts has the capacity for an arc flash, and they are especially dangerous because they are highly unpredictable. Arc flashes can not only give off thermal radiation and light that will scorch unprotected skin, but they also could produce pressure and sound waves causing traumatic hearing loss or blunt force trauma from flying electrical components. Next to the laser, the National Institute for Occupational Safety and Health (NIOSH) reports that the electric arc is the hottest event on earth, with recorded temperatures as high as 35,000°F.

Arc flashes are often misunderstood because the worker will hardly ever come in contact with an energized electrical conductor when they occur. Also, arcing can occur with a direct current like mine DC trolley systems or batteries. Therefore, the burns are not caused by electric shock, but rather by electromagnetic radiation that can vary from infrared to ultraviolet and cause anything from mild skin reddening to third-degree burns, including the complete destruction of skin, muscle and any other surrounding tissue.

Many things that can cause an arc flash, including the following:

- Inadvertently bridging electrical contacts with a conducting object
- Dropping a tool or otherwise causing a spark
- Coming near an extremely high-amp source with a conducting object, causing the electricity to arc
- Breaks or gaps in insulation
- The buildup of dust or corrosion
- Equipment failure because of either normal wear and tear or improper upkeep

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The Bureau of Labor calls arc flash incidents “disproportionately fatal,” and the hazards of electric arc flashes are present at many worksites. Also, the population of workers who could be exposed to arc flash...
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dangers is quickly on the rise. Injuries resulting from burns tend to cause more days off work, translating to more dollars for your company, than other types of work-related incidents. All of these reasons are incentive for you to introduce a risk management program for arc flashes.

The good news: in a study conducted recently by NIOSH, 94 percent of arc flash victims or witnesses said the incident could have been prevented. The best thing you can do as an employer is educate yourself, educate your employees and place a high value on establishing a safe working environment so your workers will do the same.

What Does OSHA Require?

There are two main entities that monitor business practices for the prevention of arc flashes in the workplace. The OSHA and the National Fire Protection Association (NFPA) have material governing industry standards in 29 CFR Part 1910, Subpart S, and 70E, respectively.

OSHA mandates that employers must follow “safe work practices” to prevent electric shock or other injuries resulting from either direct or indirect electrical contacts, which would include arc flashes. Employers must adhere to the following OSHA regulations to prevent arc flashing:

- All services to electrical equipment must be done in a de-energized state. That is, lockout and tagout laws apply to all electrical work. Only two circumstances are OSHA-acceptable exceptions where working on live electrical parts would be permissible:
  1. When the work cannot be done on a de-energized system (only permissible if physically impossible, not acceptable if it is feasible but significantly more difficult on a de-energized system)
  2. When de-energizing equipment would create additional hazards (inconvenience does NOT qualify as an additional hazard)

- When performing work on an energized or live circuit, tools and equipment must be insulated.

- Personal protective equipment (PPE) must be worn for both eyes and face whenever the risk of arcing is present, and the use of protective shields or barriers are required where dangerous electric heating is present.

- PPE being used must fully protect employees from potential shock, pressure blast and arc flash burn hazards based on the incident energy exposure and the specific task being performed.

What Does NFPA Require?

In addition to these regulations, OSHA also recommends that employers follow the NFPA 70E standards, which outlines more specific safety measures that can be used to comply with OSHA’s general guidelines. Think of NFPA 70E as the “how-to” standard for complying with OSHA’s broad, vague requirement of “safe work practices.” It gives step-by-step instructions on how to ensure a system is de-energized, how to label equipment properly, how to conduct a flash-hazard analysis and what kind of flame-resistant clothing should be used in a given situation.

To clarify, NFPA 70E is not an OSHA requirement, and it is not the law. However OSHA does recommend that it be used to comply or supplement the law. In fact, Electrical Construction and Maintenance Magazine says OSHA’s field inspectors also carry with them a copy of NFPA 70E and use it to enforce arc flash safety procedures. OSHA’s General Duty Clause enables them to issue citations when unsafe working conditions are identified for which a regulation does not exist. That said, compliance with NFPA 70E could serve as evidence that a hazard prevention program is in place and save your company thousands of dollars in fines.
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Who to Target with Arc Flash Safety Messages

The NIOSH study’s results indicated that as an employer, modeling safe job performance and enforcing safety precautions is crucial to do for all employees, regardless of experience. Because of their unpredictable nature and variety of causes, arc flash incidents could happen to anyone, no matter how qualified. In fact, let your employees know that according to the NIOSH study, the average arc flash victim is 37 years old with 16 years of electrical experience. This goes against the typical assumption that accidents only happen to young, inexperienced workers. It is also important to emphasize to your employees that arc flashes themselves are avoidable by being less careless and taking the necessary safety precautions.