Worker Safety

Whitepaper: Mitigating Arc Flash Injuries Through Remote Wireless Cutting

Brought To You by Milwaukee | Apr 17, 2024

Arc Flashes – they're brighter and hotter than the sun, louder than a jet, and capable of creating arc blasts that could send metal debris flying at over 700 miles per hour. Determining the maximum energy associated with an arc flash requires complex calculations and advanced computer programs – and even then, experts still disagree on the actual explosive capabilities of an arc flash when applied to an actual jobsite setting There is one thing all experts will agree on, though – it's extremely hazardous to be anywhere near an arc flash when it occurs.

Electric arcing can produce temperatures as high as 35,000°F – nearly four times as hot as the surface of the sun. Even though this intense heat can last for just a fraction of a second, it's enough time to cause severe burns, potential hearing loss, blindness, skin damage from blasts of molten metal and copper, lung damage and blast injuries from shrapnel, and even death.

All of this is why the Occupational Safety and Health Administration (OSHA®), the Institute of Electrical and Electronics Engineers (IEEE), and the National Fire Protection Association have drawn up three major industry standards associated with arc flash:

- OSHA 29 Code of Federal Regulations Part 1910 Subpart S
- NFPA 70E
- EEE Standard 1584

NFPA 70E in particular has been influential in directing safety related practices and maintenance requirements for jobsites that have the potential of arc flash incidents.

NFPA 70E – At a Glance

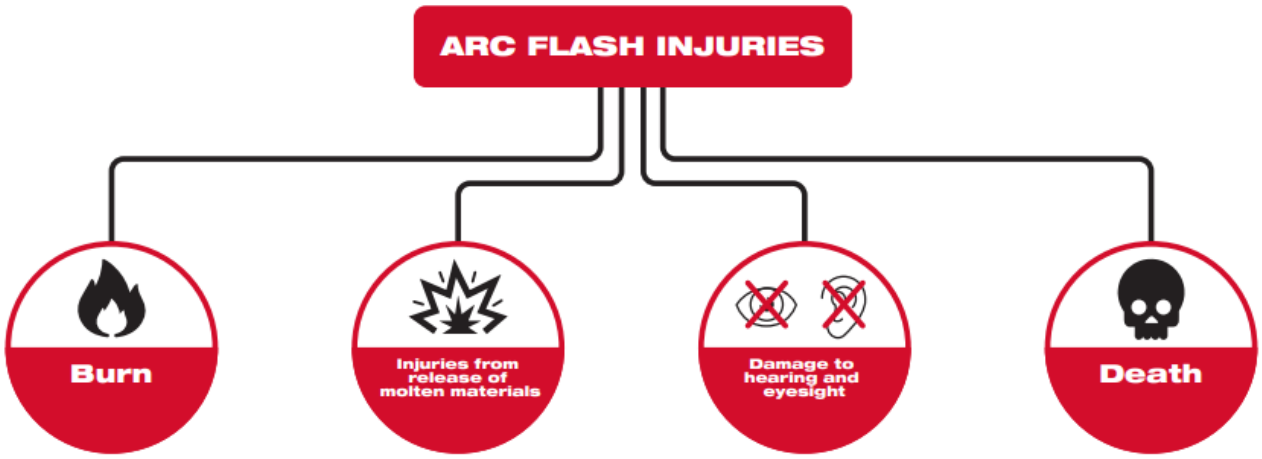
When work must be performed on electrical equipment, NFPA 70E calls for normally energized conductors and circuit parts to be put in an electrically safe work condition before work begins whenever possible. In situations where work must be performed on energized conductors, or where the condition of the circuit cannot readily be determined, there is an increased risk of injury due to electric shock and a hazard known as an arc flash. NFPA 70E provides information regarding qualifications, approach boundaries, and the PPE required to help mitigate the risks of working on energized conductors.

The 2015 edition of NFPA 70E defines the arc flash boundary (AFB) as, "When an arc flash hazard exists, an approach limit at a distance from a prospective arc source within which a person could receive a second-degree burn if an electrical arc flash were to occur."

But despite the effectiveness of these requirements, there remains the unfortunate fact that arc flash is unpredictable. In a report by the IEEE, the organization stated, "Workers and equipment may be at risk from electrical arc, even at times when codes, standards, and procedures are seemingly adequately addressed" and that "workers should 'assume the worst' and use available personal protective equipment." Simply put – the unpredictable nature of arc flash accidents is why it is so important to know about them and stay away from dangerous situations.

The Impact on Your Crew & Company

According to OSHA standards, an arc flash incident only needs to be reported if (A) A fatality occurs or (B) Three or more employees require hospitalization. With that in mind, it's not a stretch to assume that current data does not capture the full landscape of arc flash risks and incidents occurring each day. This inconsistent reporting practice has led to a wealth of conflicting data on the frequency of arc flash accidents, with figures ranging from 5 – 10 per day to 30,000 per year. These reports also estimate that those incidents result in an average annual total of 7,000 burn injuries, 2,000 hospitalizations, and 400 fatalities per year. In fact, according to the Bureau of Labor Statistics about 80% of these incidents involve "qualified workers," showing that even trained experts can get hurt – another reminder of the unpredictable nature of arc flash.



The direct monetary costs to your injured crew member and the indirect monetary costs for your

company? They're numerous.

Direct Monetary Costs – Includes medical treatment and rehabilitation, workers compensation, cost of accident investigation, and downtime/loss of production.

1.5 DAYS of hospitalization for EVERY PERCENT of the body that is burned

19 DAYS is the average hospitalization resulting from an arc flash event

8–12 is the average amount of months needed for a worker to return, if injured by an arc flash

$61K is the average an employee can receive for workers compensation

Indirect Monetary Costs – Such as legal costs and judgments related to litigation, potential fines, increased insurance premiums, repair costs, and the cost of replacement workers.

$10.5M is the average litigation cost to defendants for a general industry incident

$10K OR JAIL can become the penalty for an employee death resulting in failure to comply with OSHA regulations

The Safest Solution – Cutting Conductors from a Distance

With all this data considered, the goal for any arc flash mitigation technique is to reduce contact with conductor being cut as much as reasonably possible. PPE and proper training are critical for protection but, as detailed earlier, an arc flash accident can still occur despite the preparation and expertise of those involved. Historically, the methods to make a cut on a potentially live conductor have tried to create space between the worker and the cut, but ultimately these methods don't safely distance workers enough. The most common method – utilizing a hydraulic pump – in theory protects workers from any potential conductive path. However, if debris got into the hydraulic pump's hose it's possible that the conductive path could still be intact. In addition, most hydraulic pumps still require that users physically press the button to operate them, thus maintaining the physical connection between the worker and the live line.

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