

WHAT IS ARC FLASH?

Arc flash is an electrical explosion due to an arcing fault between a phase and ground or a phase to a phase conductor. During an arc flash the air becomes the conductor. Arc flashes can cause electrical equipment to explode, resulting in an arc-plasma fireball with temperatures that may exceed 35,000°F. These high temperatures cause rapid heating of the surrounding air and extreme pressures, resulting in an arc blast.

The arc flash/blast has the capability of producing fire, intense light, pressure waves, flying shrapnel and may vaporize copper conductors. When an arc flash happens, it does so without warning and happens within a fraction of a second. The result of this violent event is usually destruction of the equipment, fire, and severe injury or death of nearby service personnel.

WHAT CAUSES ARC FLASH?

There are a variety of reasons why an arc flash can occur, but most of the risk can be reduced or preventable. Many arc flashes occur when maintenance workers are manipulating live electrical equipment and accidentally cause a fault or short circuit. Improper tools, improper electrical equipment, corrosion of electrical equipment, improper work techniques and lack of electrical safety training are just some of the items that can lead to a devastating arc flash or arc blast.

WHAT TYPES OF INJURIES OCCUR AS A RESULT OF ARC FLASH?

The degree of injury is directly related to; the power of the arc flash, the distance the person is located during the time of the arc flash and the protective equipment worn by an individual. Injuries may

result from the intense flames of the arc flash, the explosive force of the blast, or shrapnel produced by the blast. Frequent injuries are; first/second/third degree burns, temporary or permanent loss of sight, hearing loss, concussions, collapsed lungs, broken bones and shrapnel injuries. Death can and does occur from these injuries.

It is estimated that 5 to 10 arc flash and blast explosions occur in electrical equipment every day in the United States with 2,000 people each year being admitted to burn centers for severe burns.

WHAT IS A MUNICIPAL OPERATOR'S RISK OF EXPOSURE TO AN ARC FLASH?

If an operator is working on energized electrical equipment they are at risk. Arc faults are limited to systems where the voltage is in excess of 50 volts. The best ways to reduce the risk of arc flash are;

- Only work on de-energized components
- Wear the proper Personal Protective Equipment (PPE)
- Follow all rules, regulations and codes with respect to working on energized equipment
- Reference all applicable OSHA codes and NFPA 70E





WHAT ARE THE COSTS ASSOCIATED WITH ARC FLASH ACCIDENTS?

The average cost of medical treatment for survivors of arc flash incidents is \$1.5 million. The total costs have been estimated to be \$12 - \$15 million, which includes the following:

- Medical expenses
- Lost productivity of worker
- Equipment, facility down time and equipment replacement
- Insurance complications
- Fines, fees and litigation

OSHA has fined some facilities over \$400K for not being compliant with electrical safety regulations. The largest cost is a result of 3rd party lawsuits. Employers have been found guilty of not properly identifying and warning employees about electrical hazards, not providing proper Personal Protective Equipment (PPE) and not properly training workers. Recently building and business owners have personally been found as negligent in some electrical accidents.

IF THE OPERATOR IS WEARING THE PROPER PPE, ARE THEY PROTECTED FROM AN ARC FLASH?

It is important to note that wearing the proper protective gear will reduce injury but will not prevent it. PPE is designed to protect against burns from the flash and some shrapnel. Those who experience an arc flash and are wearing the proper equipment can still be seriously injured or even killed from the force of the arc flash blast. An arc blast can knock people off elevated platforms, blow doors or shrapnel across the room and cause secondary explosions.

WAYS TO PREVENT ARC FLASH?

Unfortunately, there is no way to completely prevent arc flash from happening in electrical distribution systems. The best solution is to mitigate or reduce the risk by;

- Only work on de-energized electrical equipment. De-energizing equipment removes the arc flash hazard but there is some risk of arc flash/blast when testing to make sure that the equipment is de-energized and when re-energizing the panel
- Using new technologies to reduce risks for arc flash. This includes; using the PRIMEX[®] Arc Armor[®] control panel system, use arc limiting fuses, adjusting breaker settings, redesigning distribution systems, implementing electrical covers with infrared inspection ports, and remote racking technologies
- Raising awareness of Arc Flash risk and its consequences by training all workers on the hazards of Arc Flash (mandated to OSHA)
- Conducting an arc flash study to properly identify the hazards, boundaries and required PPE
- Creating regulations, work processes and a written electrical safety program that is understood and followed by all employees
- Allowing only qualified personnel that are wearing the proper Personal Protective Equipment (PPE) and using the correct tools to work on or around electrically energized equipment
- Implementing a preventive maintenance plan for electrical systems based on NFPA 70B. A proper preventive maintenance program may help identify or fix electrical hazards before they become hazards