



Arc Flash Electrical Safety

Approximately 2,000 people are admitted to burn centers every year with severe arc flash burns. Research has shown that most burns in electrical accidents are actually caused by an arc flash. Of the approximately 350 persons killed in the workplace by electricity in 2009, roughly 50% were related to arc flash.

An arc flash is an airborne short circuit consisting of a flash or blast that flashes from one exposed live conductor to another or to ground. Lighting is an example of a naturally occurring arc flash. An arc flash can occur in less than a sixtieth of a second. Arc flashes can be small pops of electrical discharge, or they can be massive outputs of energy on par with huge fireballs and small strikes of lightning that can kill workers and destroy equipment caught in the flash. Injuries from arc flash accidents tend to be very severe, and result from two types of hazards: arc flash and arc blast.

An **arc flash** is often referred to as a fireball which produces intense heat and light. It can heat the air to temperatures as high as 35,000 degrees Fahrenheit. Injuries associated with an arc flash include:

- Fatal burns can occur when the victim is several feet from the arc. Serious burns are not uncommon even at a distance of 10 feet. Arc flash can cause skin burns by direct heat exposure.
- Clothing can start on fire from the arc flash.
- Synthetic fabrics can melt and stick to the wearer.
- Metal is vaporized at this temperature. If the vaporized metal is inhaled, serious lung damage occurs when the vapor cools and solidifies in the respiratory system.
- Droplets of molten metal can be propelled over great distances, causing serious burns or igniting clothing.
- High-intensity flash can also cause damage to eyesight secondary to the intense light it produces.

Arc Blast: A high-energy arcing fault can produce a considerable pressure wave and sound blast. The intense heat from an arc causes the sudden expansion of air, resulting in a blast. A 10,000 A arc at 480 volts is equivalent to 800 MW or approximately 8 sticks of dynamite. Pressure on the chest can be as high as 2000 lbs/sq foot. In some cases, the pressure wave has sufficient energy to snap the heads of 3/8-inch steel bolts and to knock over construction walls. Moreover, it can send metal parts flying at speeds over 700 miles per hour. Injuries associated with an arc blast include:

- Lung collapse from the pressure on the chest.
- Shrapnel wounds from flying debris propelled at high speeds.
- Loss of memory or brain functions from concussion.
- Hearing loss from ruptured eardrums. The sound associated with blast can exceed 160 dB. The sound of jet engine is only 145 db!
- Other physical injuries from being blown off ladders or into walls or from wall collapse.

Arc flashes can be caused in a variety of ways:

- Overloaded circuits;
- Coming close to a high-amp source with a conductive object;
- Dropping a tool or otherwise creating a spark;
- Equipment failure due to use of substandard parts, improper installation, or even normal wear and tear;

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- Equipment failure because of the lack of adequate and timely preventive maintenance;
- Breaks or gaps in insulation;
- Dust, corrosion or other impurities on the surface of the conductor.

How to protect yourself - Critical things to remember about Arc Flash Electrical Safety:

- The best defense for avoiding an arc flash is to avoid any situation with electricity that could cause it.
- Watch for identified arc flash hazards in the workplace. They will be labeled with a warning label.
- Do not attempt to perform any work on electrical equipment. All work must be performed by properly trained personnel using appropriate insulated tools and personal protective equipment.
- Know and adhere to your company's lockout/tagout policy.
- When electrical work is being performed, stay away from the area or behind barriers.
- Do not approach workers involved in electrical work when they are performing the work. This can cause distractions that result in mistakes. This puts the workers and the electrical work at risk.
- If performing electrical work, prevent arc flashes by de-energizing electrical lines before approaching them and de-energizing electrical equipment before working on it.
- If you are present when an arc flash or arc blast occurs, take the following steps:
 - a. Turn off the power. This is the first and foremost requirement. Do not approach the area or touch anyone or anything until this is done.
 - b. Extinguish any flames.
 - c. Call for facility and municipal help (9-1-1).
 - d. Begin CPR and first aid efforts.



These are arc flashes...Respect them!



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