



# Understanding Arc Flash Hazards

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*This document provides a basic understanding of the term “arc flash,” as it relates to electrical safety in the workplace. Understanding of NFPA 70E, Standard for Electrical Safety in the Workplace, and applicable OSHA standards for your jurisdiction are necessary for a more thorough understanding of electrical safety. Consult with an electrical safety professional if necessary.*

## Introduction

NFPA 70E, Standard for Electrical Safety in the Workplace, defines an arc flash hazard as, “a source of possible injury or damage to health associated with the release of energy caused by an electric arc.” An electric arc can cause severe burn injuries from the radiant energy of the arc. In addition, thermal burns from the ejected hot gases and molten particles are common. The arc flash is typically followed by an arc blast. The arc blast results from the expansion of the air and conductive metal material from the heat of the arc. Copper expands 67,000 times in volume as it is vaporizes from a solid to a gas state. This rapid expansion produces a blast that can cause additional injuries due to falls from ladders, or concussive injuries to the body.

## Cause of arc flash

An arc flash can occur anytime the integrity of the conductor insulation is compromised, and results in a phase-to-phase, or phase-to-ground fault. Once this happens, an electric arc is established. As the arc vaporizes the conductor material, a conductive plasma cloud surrounds the arc. This plasma cloud typically causes further shorting and grounding of the adjacent conductors that were not involved in the initial arc.

NFPA 70E, Article 100, suggests that arc flashes are more likely when electrical equipment has exposed parts or when a person is interacting with equipment that is enclosed. Many times, an arc flash occurs when a worker thinks the circuit is de-energized, and then begins working on the equipment. A screwdriver or a wrench that shorts or grounds energized electrical parts can initiate the arc flash and arc blast.



## **Arc flash hazard is not the same as shock hazard**

Electric shock injury is another general category of electrical injury. Shock injuries result when electric current conducts through parts of the human body causing “conduction burns.” An arc flash injury can occur to persons performing the work or to persons observing the work of others. The injury can occur just by being near the arc flash event. Remember, with arc flash injuries, it is not necessary for electric current to flow through the body.

## **NFPA 70E and OSHA Teamwork**

Federal and or state OSHA laws require that employers, “Shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or likely to cause death or serious physical harm to his employees.”

OSHA does not state how this requirement is accomplished. OSHA does rely heavily on consensus standards, such as NFPA 70E, for the ways to achieve this requirement as it relates to electrical safety, hazards and hazard mitigation in the workplace.

NFPA 70E defines a very thorough approach to overall electrical workplace safety. It includes safety-related work practices, safety-related maintenance requirements and safety requirements for special equipment used in the workplace.

NFPA 70E, Article 130, specifically addresses, “work involving electrical hazards.” This article defines when an electrically safe work condition must be established and what is needed when an electrically safe work condition cannot be established. Articles 130.4 and 130.5 address required shock and arc flash assessments respectively. After

proper risk assessments, electrical equipment can be labeled with available energy ratings and conditional, safe working distances. This information can be used by qualified electrical personnel to select appropriate personal protective equipment (PPE) when it is required.