

Arc Flash Overview

Protection for Workers

The “Why” of Arc Flash Training

Often when we think about an arc flash, our mind immediately thinks about the electrical industry. However, all workplaces that use electricity are vulnerable. Just because you have never been exposed to an arc flash does not mean that that it will never happen. A National Institute for Occupational Safety and Health (NIOSH) study, over an eight-year period, reports that there were 44,363 electrical related injuries. Of that number 17,101 injuries were caused by electric arc flash burns.

Determine the Hazard

Does a danger exist in your workplace? The National Electrical Code, also known as NFPA 70E, states in Article 130.3: “A flash hazard analysis shall be done in order to protect personnel from the possibility of being injured by an arc flash. The analysis shall determine the flash protection boundary and the personal protective equipment that people within the flash protection boundary shall use.”

Gather the information needed to perform the calculations for flash

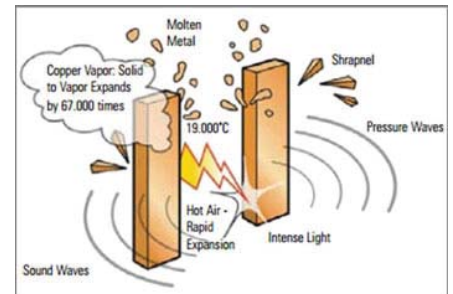
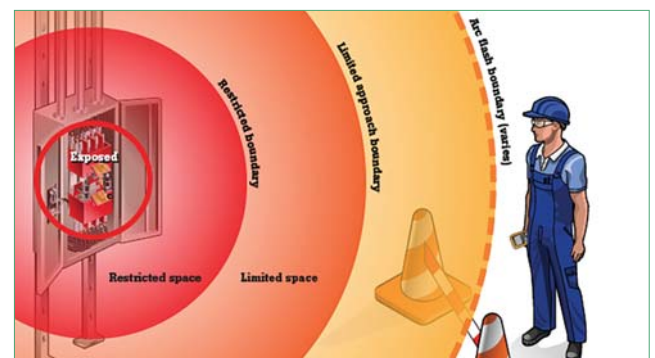
protection boundary (FPB). This can be calculated using equations given in NFPA 70E or by using one of the many software programs, both freeware and commercial, which are available.

Gather Information

Several pieces of information are required to perform the calculations, including:

- Available short-circuit current at the point of contact
- Nominal voltage
- Maximum total clearing time of the protective devices
- Working distance
- Type of ground system being used
- Type of protective device (including model numbers and settings)

If incident energy decreases by the inverse square of the distance moving away from an arc source, it will increase by the square of the distance as the distance decreases. It only takes a small change in the distance to make a large change in the incident energy. The standard working distance for work on systems operating at less than 600V is typically 18 in., while 2.4kV to 15kV power systems typically have a 36 in. working distance.



An arc flash (also called a flashover) is the light and heat produced as part of an arc fault, a type of electrical explosion or discharge that results from a low-impedance connection through air to ground or another voltage phase in an electrical system.

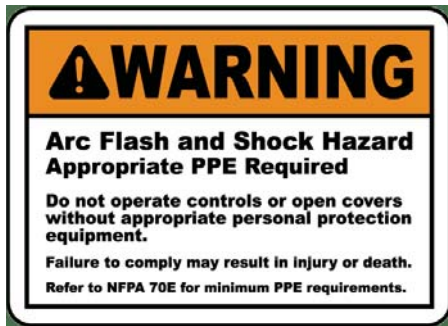
An Arc Flash Study

The Arc Flash Study will determine the incident energy at working distance and the Personal Protective Equipment (PPE) that is required should a flash occur. This determines how close a worker can be to the electrical work. In some instances a six inch difference could reduce the incident energy by 30 percent.



Proper PPE

Proper PPE selection is critical to protecting the worker from injury. After performing the incident energy calculations, the cal/cm² derived must be compared with the PPE being considered. The incident energy received by the worker must be reduced to no more than 1.2 cal/cm² to the trunk of the body. As an example, holding your finger over a match for one second produces approximately 1.0 cal/cm² of incident energy. On people, 1.2 cal/cm² is considered to be the amount of heat required to just produce the onset of a second-degree burn to unprotected skin.



Be alert and follow warning signs on panels or equipment. They are there for your safety.

Equipment Labels

NFPA 70 Article 110.16: "Flash protection, switchboards, panelboards, industrial control panels and motor control centers that are in other-than-dwelling occupancies and are likely to require examination, adjustment, servicing or maintenance while energized shall be field-marked to warn qualified persons of potential electric arc flash hazards. The marking shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing or maintenance of the equipment." Your employees, as well as contracted workers, cannot always be counted on to know the "hows" and "whys" of arc flash protection. Many workers just don't understand or lack the training and knowledge needed to properly

choose the right PPE. Labeling on the equipment ensures that those who work on power system equipment will be aware of the shock and arc flash hazard involved and what flash protective equipment is required.

Training

Training should include everyone on your work team. Unqualified workers must be trained on the hazards of electricity and how to avoid them and qualified workers must meet the above requirements and other specific requirements given in 29 CFR 1910.332 and 29 CFR 1910.269.

Conclusion

Everyone has the responsibility to be aware of the possible dangers when opening a panel on the electrical grid or a machine's electrical core. The warnings are extremely valuable and heed should be taken. Only qualified, trained persons should work on this type of equipment and must use the appropriate PPE for the possibility of arc flash.

Example

Where the available short-circuit current is 10,000 amps or less, the flash protection boundaries (FPB) may only be a few inches. Some examples of low-energy FPB (using 9,600 amps of available short-circuit current and protected by a molded-case circuit breaker):

480V - 3 phase 7.1 inches

277V - 1 phase 4.1 inches

208V - 3 phase 4.7 inches

120V - 1 phase 2.7 inches

In these instances, proper PPE would include voltage-rated gloves and protectors, safety glasses or goggles, 12-oz/yd² cotton or flame-resistant clothing and safety shoes.

The key in these examples is that the available short-circuit current is less than 10,000 amps. If a circuit is fed by an AWG 12 or less wire and is supplied by a general-purpose circuit breaker or fuse (10,000 A interrupting rating), it would match the above figures.

SAFETY TRAINING SIGN-IN

Company Name: _____ Date: _____

Subject: Arc Flash

The following employees participated in this training.

1. _____
2. _____
3. _____
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6. _____
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