

Arc Flash, NFPA, and OSHA

What's Real, What's Not, and What YOU Need to Do to Ensure Compliance

Anywhere that electricians or other service technicians are performing energized work, the potential exists for an arc flash incident.



The purpose of an arc flash analysis is to provide “qualified persons,” who will be performing work on or near energized electrical equipment, with the information they need to protect themselves against the possibility of being injured by the release of energy as a result of an arcing fault. It is no secret that electricity can be dangerous. Those of us who work with electricity day in and day out know this to be true. We have all either been exposed to the dangers ourselves or know someone who has. The National Institute for Occupational Health and Safety figures state that between 1992 and 2001 there were over 17,000 arc flash injuries in the United States.

Arc flash is a real problem. Not only is it real, but it is a danger that extends beyond power plants and industrial sites to office buildings, hospitals, schools and retail spaces. Anywhere that electricians or other service technicians are performing energized work, the potential exists for an arc flash incident. Not only does the potential exist, but the danger is just as high in a 2,000 square foot office as it is in a 500,000 square foot textile plant.

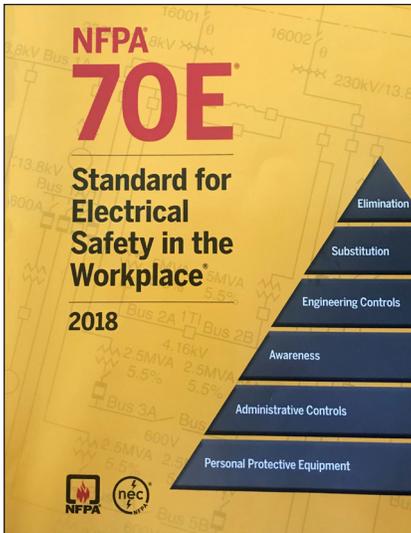
The requirement for performance of an arc flash hazard analysis is documented in several existing industry standards. The most notable being NFPA-70E, The Handbook for Electrical Safety in the Workplace. This standard is on a three year revision cycle, with the latest revision having an effective date of August 21, 2017.

In Article 130.5 of the 70E, it reads *“A arc flash assessment shall be performed: 1) To identify arc flash hazards 2) To estimate the likelihood of occurrence of injury or damage to health and the potential severity of injury or damage to health 3) To determine if additional protective measures are required, including the use of PPE.”*

The requirement is repeated in the 29CFR1910.132(d) (1) where it states *“The employer shall assess the workplace to determine if hazards are present, or are likely to be present, which necessitate the use of personal protective equipment (PPE). If such hazards are present, or likely to be present, the employer shall select, and have each affected employee use, the types of PPE that will protect the affected employee from the hazards identified in the hazard assessment.”*

This requirement in OSHA is what dictates the use of safety glasses in environments where there is danger of eye injury, the use of safety shoes in places where heavy objects are lifted, and applies to arc flash PPE for “qualified persons” performing energized electrical work.

The IEEE Standard 1584 is the manual for performing arc flash analysis and it provides formulae and guidelines for determining the level of hazard involved with differing



types of electrical equipment. There is a provision in this standard for not performing analysis on certain sizes and types of systems, but the majority of equipment in most non-industrial facilities requires analysis to assign risk levels from which PPE levels are derived. Even in systems that are of the size and type that don't require analysis, they still are required to be labeled to warn of the risk of arc flash.

This requirement is found in the National Electric Code (NEC) in article 110.16. It states that *"Switchboards, panel-boards, industrial control panels, meter socket enclosures and motor control centers that are in other than dwelling occupancies and are likely to require examination, adjustment, servicing or maintenance while energized shall (emphasis mine) be field marked to warn qualified persons of potential electric arc flash hazards."* This edict leaves out "dwelling occupancies" or homes, therefore stating that your office building, hospital, or school building still requires labeling, even if the system size and type meets the non-analysis criteria.

There is also some misunderstanding regarding the relationship between OSHA and the NFPA. The NFPA is the National Fire Protection Association. They are a consensus based organization that exists for the prevention of fires and fire related injuries. They publish the NEC under document number NFPA-70. They also publish numerous standards on fire code related subject matter, including sprinkler systems or extinguishing agents.

OSHA is the Occupational Safety and Health Administration. They are a governmental regulatory body; the safety police. If there is a lost time accident in your facility, it's OSHA who shows up. If the accident involved electricity, they will reference NFPA-70E. In 1975, OSHA requested a new electrical safety standard. The publication of that standard was awarded to NFPA. They issued the standard in sections at first, but in 1993 it was released in its entirety. The 1995 revision was the first consensus standard to address the danger of arc flash, and to have provisions for protective apparel.

The most recent revision had some changes from the previous one, but most of them are in smaller areas and the requirements for PPE and analysis still stand. Many groups believe that having an analysis and warning labels on their electrical panels constitute complete NFPA-70E compliance. These measures are a great place to start, but they are the tip of the proverbial iceberg. A comprehensive electrical safety plan is also essential. Your safety program has to be tailored to your particular needs, in terms of the size and type of your electrical apparatus and the energies associated with it. All personnel who may perform energized electrical work must be identified and trained in electrical safety, to include hazard recognition, and the injuries associated with the size and type of equipment to which they will be exposed.

The key to compliance may be found in developing a relationship with a qualified electrical engineering consulting firm. With 70E and arc flash having so much recent exposure, there's a plethora of outfits that purport to perform arc flash analysis that are actually just trying to capitalize on the growing trend. A qualified firm will have electrical system testing and/or design experience going back a number of years, not months. Your electrical contractor might not be the best bet either, since the



calculations required for accurate figures are the sort of thing suited for engineers, not electricians. Beware of outfits that claim to be able to show up at your facility a single time and be able to perform a complete analysis. The analysis is a nine step process. These steps are outlined below.

- Collect system and installation data
- Determine system modes of operation
- Determine bolted fault currents
- Determine arc fault currents
- Find protective device characteristics and duration of arcs
- Document systems voltages and classes of equipment
- Select working distances
- Determine incident energy for all equipment
- Determine flash protection boundary for all equipment

Most of the more experienced firms can offer a complete compliance solution, from analysis all the way to your safety program and required training. This is a serious business, liability must be avoided when possible, and reduced when avoidance cannot occur.

Electrical safety today, and in the future, includes compliance with the NFPA-70E. Get onboard!

Note: this article was written based on the 2018 NFPA 70E. This document is typically revised every three years.

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