

# Five misconceptions about arc flash compliance

By Kenneth Cybart, Littelfuse, Inc. -- Plant Engineering, 5/15/2007 1:00:00 AM CDT

There are some misconceptions in the application of OSHA regulations, NFPA Standards and IEEE guidelines relating to arc flash hazards and associated safety practices. If plant managers don't properly apply these standards, they may compromise worker safety and risk OSHA violations.



*In order to know the appropriate level of personal protective equipment, it is necessary to analyze the hazard at each panel or piece of equipment. Each analysis starts by knowing the available fault current at that location.*

Misconceptions exist because OSHA adheres to consensus standards and allows use of industry guidelines that may vary from state to state. Consensus standards such as NFPA 70E allow multiple methods to calculate the hazard risk. This confusion means that some arc flash hazard assessments fall short of what OSHA actually expects from employers. Avoid this trap by keeping the following points in mind.

**Misconception #1: OSHA does not enforce NFPA 70E for arc flash and electrical safety compliance.**

The reality: OSHA 1910.132 and OSHA 1920.335 require employers to assess the workplace and identify electrical hazards, select and provide personal protective equipment, inform workers about the hazards and train workers how to identify, avoid and protect themselves from the hazards.

Having a broad mandate for safety, OSHA is a general rule-making body, and it relies on the expertise of various industry groups to define specific safety standards. In the case of electrical safety, OSHA uses the latest edition of NFPA 70E as a guideline, and adheres to NFPA 70E for 'enforcing' OSHA electrical safety rules. OSHA is the 'shall' of electrical safety and NFPA 70E is the 'how.' If you follow NFPA 70E, you will be OSHA-compliant.

**Misconception #2: When equipment is determined to be a Hazard Risk Category 0, it is assumed that all other equipment fed downstream is also a Hazard Risk Category 0.**

The reality: Arc flash hazards must be identified at each electrical panel or piece of equipment that may be worked on while energized, indicating the category of arc flash hazard. The severity of a potential arc flash hazard is determined by the available fault current and the clearing time of the circuit protection devices. Depending on the type of circuit protection used and whether it is current limiting in lower available short-circuit current situations, the hazard risk may actually increase.

Figure 1 shows a typical one-line drawing. Below the main switchgear, a circuit breaker is labeled Hazard Risk Category 0. Workers cannot assume that equipment fed from this bus is also Category 0. Because impedance reduces available fault current, a fuse or circuit breaker may open more slowly in equipment located downstream. This will significantly increase the amount of potential incident energy.

The figure shows two motors fed from this bus, each protected with the same circuit breaker. The first motor is located 140 feet from the main switchgear, and the second motor is located 250 feet away. Motor 1 is labeled Category 0, but Motor 2 is a more dangerous Category 3

**Misconception #3: Per "IEEE 1584 Guide for Performing Arc-Flash Hazard Calculations," there is no need to assess equipment rated 240 V or less for arc flash hazards.**

The reality: OSHA and NFPA standards require that all equipment operating at 50 V and higher be assessed for potential shock and arc flash hazards. IEEE 1584 states that it is not necessary to calculate incident energy on equipment under 240 V fed from a transformer less than 125 kVA,

because the available fault current is not high enough to sustain an arc flash. This statement refers only to incident energy calculations, and it does not release employers from assessing all equipment down to 50 V. Substantial arc flashes can occur on equipment operating at 208 V and less if supplied by large transformers. It should also be noted that IEEE and NFPA are currently planning an investigation of low-current, long-duration arcs.

As stated in OSHA 1910 and NFPA 70E Article 110, all equipment operating at 50 volts and higher must be assessed for electrical shock, which establishes protection boundaries and PPE; and arc flash hazards, which establishes incident energy level, Hazard Risk Category, PPE and flash protection boundary. In addition, Article 110.16 of the National Electrical Code requires all equipment that may be worked on while energized to be identified and marked with an arc flash warning label.

**Misconception #4: There is no need to assess equipment for arc flash Hazards beyond the motor control center.**

The reality: Per OSHA and NFPA standards, every panel, switchboard or industrial control panel that is fed from an MCC must be assessed for arc flash and shock hazards. This is particularly important because of the contribution to the available fault current that motor loads can produce.

There is a misconception that since an MCC is the final access point of power for motor loads, there is no need to assess any other loads fed from the MCC. This perception can create a hazardous situation. It is not uncommon for an MCC to feed a 277/480 V power panel or a 480/120-240 V transformer that feeds an additional panel with life threatening hazards. Because of examples like these, companies must assess every panel, switchboard or industrial control panel that is fed from an MCC. Some motors fed from the MCC may also have a disconnect switch near the motor that must be assessed for arc flash hazards. Of course, such equipment must also be labeled with arc flash and shock information to meet NEC requirements.



*Safety gloves and equipment are essential elements of an arc flash program.*

*Worker knowledge is equally important.*

**Misconception #5: An arc flash hazard assessment is enough for OSHA compliance.**

The reality: Plant managers should not think that once the arc flash hazard assessment is completed they have done all they need to do to comply with OSHA standards. OSHA 1910.332 requires employers to identify all actual and potential electrical hazards, and train and qualify

their employees in safe work practices and standard operating procedures to reduce the hazards and increase worker safety. Workers should be trained on arc flash safety at least yearly, and this training must be documented.

Also, arc flash assessments must be integrated into the plant's ongoing preventive maintenance and documentation programs. Equipment that is properly assessed and labeled may be moved at some point in the future and require a re-assessment. Plant one-line drawings must be updated when systems are changed, and if the electric utility changes the service coming into the building.

Arc flash hazards are a serious life safety issue and are internationally recognized electrical hazards. Performing an arc flash hazard assessment of your plant is not optional; it is required by OSHA and NFPA 70E as part of a complete electrical hazard assessment. Arc flash hazard assessments and worker training must be an essential part of a comprehensive electrical safety program. Knowing what OSHA requires and how NFPA 70E can meet the requirements will help keep workers safe, productive and minimize the cost of an electrical accident.

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