

ELECTRICAL SAFETY

Electrical Hazard Assessment: First Step in Meeting OSHA Standards

A hazard assessment engineering firm can help meet OSHA standards and improve safety.

by *Larry Altmayer*

OSHA has long required employers to evaluate the workplace for electrical hazards. Most employers are familiar with possible shock hazards, but in recent years, and with the publication of the 2004 edition of NFPA 70E, electrical arc flash hazards are now being assessed and quantified. Arc flash is accompanied by intense heat and arc blast pressures that can cause severe burns, concussions, falls, and associated injuries. Moreover, these events are a leading cause of death for qualified electrical workers. Assessing the workplace to identify these hazards is required by OSHA.

About 80 percent of these are the result of arc flash events. According to the National Safety Council, more than 1,000 deaths occur annually that are related to electrical shock and arc flash. Fatalities aside, about 2,000 electrical workers require treatment in burn centers each year, and burns result in more days of lost work than most other injuries.

In 2005, OSHA assessed employers more than \$34 million in fines, 44 percent of which were due to electrical hazards. Several OSHA standards spell out employer responsibilities in assessing the workplace to identify potential electrical hazards and protecting workers

that this assessment now must include arc flash hazards. Failure to comply with OSHA requirements puts workers at risk and can result in fines and exposure to multimillion-dollar lawsuits.

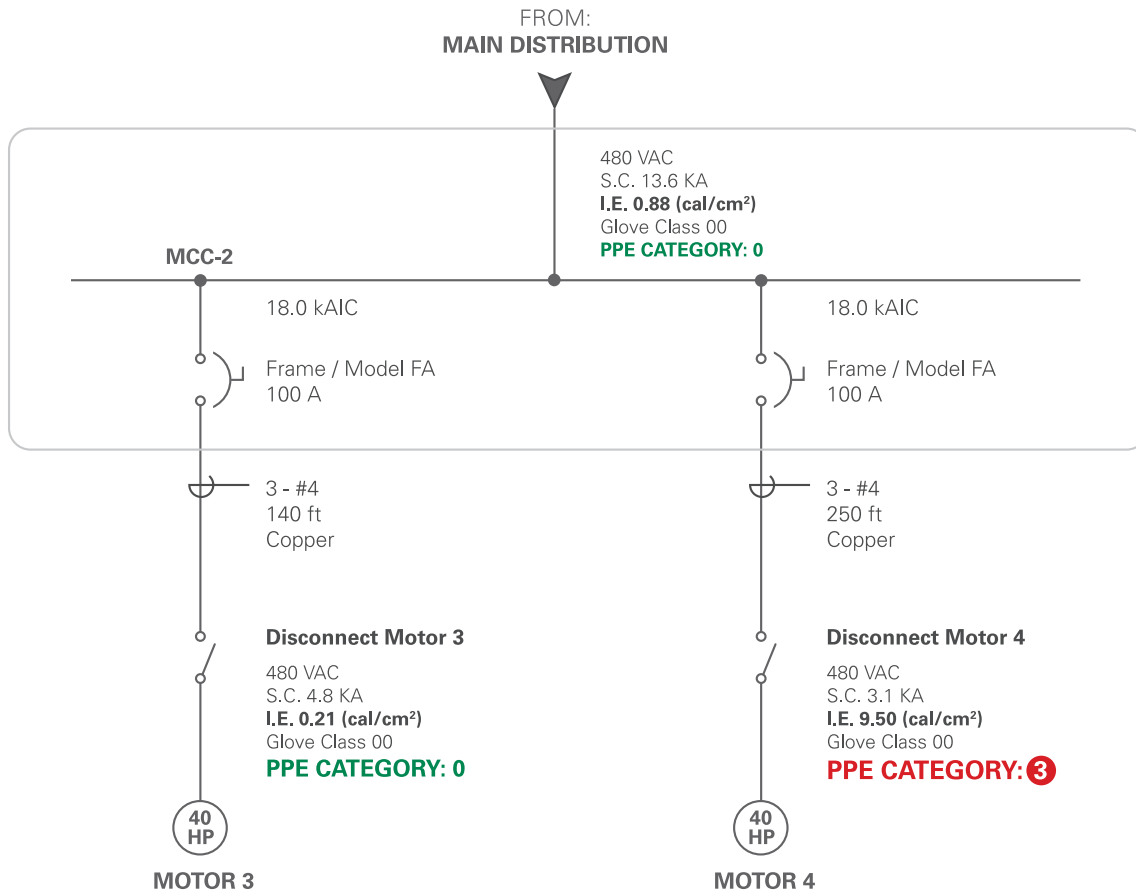
With the stakes so high, it is imperative that companies assess their electrical infrastructure and configuration, including the equipment and work practices for all actual and potential electrical hazards—especially arc flash hazards. These assessments are complex; unless you understand the special expertise required, you risk falling short of OSHA requirements. For example, the sections of 29 CFR 1910 relating to PPE selection are based on industry standards such as NFPA 70E and IEEE 1584. These standards are used to calculate heat energy associated with an arc flash event based on fault current, fault clearing time, and other factors. Furthermore, the National Electrical Code (NEC) mandates equipment to have warning labels that clearly identify electrical shock and arc flash hazards. Misconceptions abound in the application of all of these standards.

Because of such complexities, most companies seek an engineering services firm to perform a comprehensive electrical hazard

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The U.S. Department of Labor estimates that there are, on average, 9,600 serious electrical shock and burn injuries each year.

from them with appropriate work practices and personal protective equipment. However, many company managers still don't realize



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assessment of their facilities. Of course, this entails the responsibility to make sure the selected firm is qualified to perform the work. The following sections outline important tips on what to look for in selecting an electrical hazard assessment firm.

Technical Qualifications

1. Select an engineering services firm that is familiar with your type of facility, processes, safety requirements, and industry-specific requirements. What is appropriate in one facility or industry may not be appropriate in yours.

2. The firm must understand the intricacies of all electrical safety standards and their requirements—OSHA's and others. The firm must be able to articulate the pros and cons of the different methods required to do the assessment. These standards would include 29 CFR Part 1910 Electrical Subpart S, NFPA 70, NFPA 70E, IEEE 1584, ANSI, ASTM, and various state and local standards (e.g., Cal/OSHA).

3. Ask prospective firms to tell you the common pitfalls of doing an electrical hazard assessment and how to avoid them. If they can't articulate the common pitfalls, then they probably don't have the depth of experience you need.

4. Make sure the firm fully understands OSHA requirements for documentation and recordkeeping. As far as OSHA is concerned, if it

wasn't documented, then it didn't happen. Failure to keep proper records can lead to violations and fines.

5. The firm must have the expertise to provide an assessment that meets the full requirements of OSHA and NFPA 70E. This includes an analysis of all electrical equipment down to 50 V. The firm must know the differences between IEEE 1584 and NFPA 70E calculations for short circuit currents and why it is often wise to calculate using both methods to account for worst-case possibilities and avoid having to redo a study in the future. Many firms do only 240 V and above analysis or an "open book" analysis using NFPA 70E tables only, disregarding the table usage requirements and qualifications. Furthermore, the firm should know the limitations of each standard; for example, IEEE 1584 cannot be used when available fault current exceeds 106 kA or when voltages exceed 15 kV.

6. The firm must be able to create electrical one-line drawings and then build a computer model using commercial software for short circuit current flow and coordination. To do so effectively, the firm must have not only the technical library with which to model short circuit characteristics of existing equipment, but also the knowledge and ability to evaluate available short circuit currents for equipment not included in such a library.

7. The firm should be experienced with widely used electrical data

management and analysis software packages on which your company may have standardized.

8. The firm should understand the impact of the electric utility feeding the plant. Arc flash calculations start with available short circuit current, which can increase or decrease depending on actions by the utility. Ideally, the firm should do its calculations with multiple assumed values of available short circuit current so that future actions by the utility will not be a factor. At the same time, the firm should be prepared to provide services to keep the facility in compliance as inevitable changes are made to the electrical system.

9. The work does not end with the electrical hazard assessment. The firm must be prepared to create recommendations and concrete action plans to lower hazards and correct deficiencies. Typically, these recommendations would include changes to fuse types, breaker settings, equipment repairs, adjustments to correct improper interrupting capacity of protective devices, suggestions to improve overcurrent coordination problems, and any other recommendations that could reduce or eliminate hazards or the need for PPE and fire-retardant clothing.

Resources and Expertise

Select an engineering services firm that has adequate personnel and resources to handle the entire assessment project for the size of your facility and scope of work needed, including employee training and implementation of corrections. The firm should have both electricians and engineers on staff. These resources should be in close proximity to your facilities to avoid excessive travel costs.

Because your company is liable when anyone works in your plant, the assessment firm must show that it can gather data safely. This includes a written protection plan for gathering data while all systems are energized and documented proof of its own workers' safety training in equipment and tool usage. These plans and work practices must adhere to NFPA 70E guidelines and OSHA rules.

It is a good idea to ask the firm to provide copies of typical documents (customer names removed) associated with recent hazard assessments as proof of experience. These should include detailed study results and recommendations.

NEC recognizes arc flash hazards and recently issued warning label requirements that are supported by OSHA. Your assessment firm should be capable of producing equipment hazard labels in house and in volume. To avoid the possibility of label installation errors and increased liability, the firm should be willing to install those labels.

Employee Training

Choose an engineering services firm that can follow up an electrical hazard assessment with employee safety training and continuing audits, using dedicated, experienced trainers on staff. Topics covered during training should include:

- standards that govern electrical work and their requirements, including NFPA 70E and others
- electrical safety work practices, including lockout/tagout procedures per 29 CFR 1910.147
- applicability of other OSHA rules and penalties for non-

compliance

- the difference between “qualified” and “unqualified” workers and work limitations for unqualified workers
- comprehensive examples of acceptable and unacceptable work practices, including those in wet or damp locations
- use of key interlocking systems
- identification of type and level of hazards, including electrical shock and arc flash
- identifying energized components and conductors
- determining nominal circuit and equipment voltages
- the use of voltage sensors and meters
- interpreting hazard warning labels
- safe approach distances to exposed electrical conductors
- rules for authorized “hot work” and use of Live Work Permits and Job Briefings
- the consequences of poor electrical safety practices to people and equipment
- PPE requirements, including selection, proper use, and maintenance
- required and recommended maintenance and safety inspections, and
- grounds and grounding.

All of this training should include appropriate job aides. Furthermore, it should be integrated with the employer's standard operating procedures and policies of enforcement.

General Business Considerations

Look to partner with an engineering services firm that has been in business long enough to have established a good reputation. The firm you select should be prepared to commit to a fixed cost proposal and fixed timeline.

Ask the prospective assessment firm to provide customer references that attest to successful completion of the entire scope of work. This should include data collection, one-line drawings, detailed short-circuit current coordination studies, electrical hazard analysis, and NFPA 70E training. Verify this with calls to those references.

The firm should guarantee that its assessments will be reviewed and signed by a Professional Engineer and that this P.E. is licensed in the state where your facility is located. This is required by law in most states and is a moral imperative because of the life safety issues involved.

As a minimum, the assessment firm should carry general liability insurance and professional liability insurance (errors & omissions) and should be able to provide immediate proof of same. A delay in providing such proof may well indicate that the firm is obtaining the insurance just for you and may have been lacking it on previous projects. It is also a good practice to examine the firm's track record with regard to insurance claims during the past five years. ■

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WHEN IT
COMES TO
ELECTRICAL
SAFETY...

..... DON'T TAKE ANY CHANCES

POWR-GARD Services Can Provide:

- **Short Circuit and Coordination Studies**
- **Arc-Flash Hazard Assessment**
- **NEC 110.16 Warning Label Service**
- **On Site Electrical Safety Training**

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