

Electrical Safety – Myths and Rumors

In my travels throughout these last years I have had opportunity to present electrical safety as well as other types of technical training. I continue to be flabbergasted at some of the comments I hear from students or other supposedly “qualified” electrical workers regarding the requirements to maintain a safe work environment. Some examples of these questions and statements are given below, followed by appropriate answers.

1. OSHA has a *new* requirement to perform a hazard or risk analysis before beginning each job.

This statement refers to *CFR 29, 1910.132(d)(1)*, which says: “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: 1910.132(d)(1)(i) 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 new requirement is not new at all. Since OSHA’s inception in the early 1970s, the entire premise has been to ensure, as much as possible, a safe work environment for employees. Each employer has an obligation to determine what hazards an employee may face on the job. Once the hazard has been identified, the employer has further obligation to provide the appropriate training, PPE, or other work procedures that would allow the employee to perform the task safely.

Specific to the electrical industry are several hazards of which qualified workers should be aware in order to be considered “qualified.” Shock and arc-flash burns are the two primary hazards faced when working on or around energized electrical equipment. Therefore, the employer has an obligation to identify possible shock hazards, identify possible flash burn hazards, and provide the appropriate tools, PPE, or work procedures to mitigate these hazards. I will add that, even though the appropriate tools and PPE are available, the supposedly qualified worker



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may not know what to do with them. For example, I witnessed a 20-year veteran pull the insulating rubber gloves on over the leather gauntlets! When questioned, he responded, “I always wears them like that since the rubber part is the shock protection part and the leather inside keeps my hands from getting sticky.”

2. Insulated gloves should never be worn when using insulated live-line tools. If the insulation on the tool is bad the worker would never know it while wearing insulated gloves.

This statement also was posed by a 20-year veteran. I had to think about that a moment. Hmm, would I *want* to find out the tool is bad by not wearing gloves? Those of you that have ever watched insulation

break down when performing high-potential testing will testify that the breakdown happens quickly — faster than you could drop a bad switch stick!

3. We would like to adopt NFPA 70E as our working electrical safety policy, but it is entirely too cumbersome.

I have advocated *NFPA 70E* in its forms throughout the years and do admit in some cases the recommendations may be a bit cumbersome. However, realizing the intent of the publication should shed light on how to implement the appropriate policies. There is not, to my knowledge, a single safety document covering every possible scenario in the electrical industry, nor will there ever be since ours is such a dynamic field. In the absence of specific rules from OSHA, the intent should still be to protect the workforce from hazards. Therefore, a site-specific or activity-specific policy would be appropriate, as long as it meets the intent of protecting the workforce.

I keep a keen eye on the citations and violations of federal and many state OSHA organizations and have yet to see a citation for not following an *NFPA 70E* recommendation verbatim. *NFPA 70E* is not an enforceable document — yet. It is a guideline for developing a safe electrical work environment and has many practical applications the employer could use or modify, if necessary, to meet specific needs. If an employer were to adopt *NFPA 70E* in its entirety, I am certain it would be following all the OSHA rules.

4. If I were actually to develop a hazard analysis and energized electrical work permit before performing every task, as recommended in NFPA 70E, I would spend all day doing hazard analysis and never get the work done.

If you weren't already doing some form of hazard analysis before performing electrical work, I would say you should find a different occupation! The recommendation to perform a hazard analysis and develop a written *energized electrical work permit* plan for hazard mitigation applies to those tasks that are *not routine* in nature ("not routine" being less frequently than annually). The system will not be locked and tagged, and the system will be energized or possibly energized. If the task is performed frequently, an original hazard analysis with successful mitigation techniques should already be in place in one form or another. Thus, another analysis is not required.

Further, *NFPA 70E, 2004*, Article 130.1(A)(3) Exemptions to Work Permit says: "Work performed on or near live parts by qualified persons related to tasks such as testing, troubleshooting, voltage measuring, etc., shall be permitted to be performed without an energized work permit, provided appropriate safe work practices and personal protective equipment in accordance with Chapter 1 are provided and used."

To give an example, a qualified worker should already know the hazards involved in taking current measurements in a motor control center. Would the hazards change from one bucket to another? I would say no. Therefore, the same techniques found to be successful in one application of shock and flash protection would be successful in other similar applications. There is no reason to perform multiple (written) hazard analyses and mitigation procedures for basically the same task.

5. OSHA has a new requirement to perform an arc-flash hazard assessment and mark the equipment.

No, and no. OSHA has no new mandate to perform a specific hazard assessment for arc flash. There is an *existing* requirement to perform a hazard analysis for any hazard an employee may face on the job (see 1910.132(d)(1) in #1 above). That requirement has been in the register for years. What is new is the ability to *quantify* the *existing* arc-flash hazard. Now that reasonable engineering means are available to quantify the flash hazard, there is more emphasis on ensuring the employees are protected. In the 2002 *National Electric Code (NEC)* Article 110.16 requires the marking of flash hazards on equipment wherever the possibility of energized work exists. This is not an OSHA mandate, it is an *NEC* requirement.

6. I didn't have to be sitting down to hear the news that there is an arc-flash hazard in electrical equipment. I already knew that, so why do we have to put a sign on the equipment?

This issue has been a hot topic in the field. I again refer to the *intent* of the code, not necessarily the verbatim application. In the fine print note associated with *NEC* Article 110.16, it says to refer to *NFPA 70E* for assistance and then mentions key terms: "determining the severity of the hazard," "qualified worker," "appropriate PPE." I sincerely believe the intent of Article 110.16 is to arm the qualified worker with enough information to make an intelligent choice when selecting the *appropriate* PPE:

CFR 29 also says, in 1910.335(a)(1)(i), that "Employees working in areas where there are potential electrical hazards shall be provided with, and shall use, electrical protective equipment that is appropriate for the specific parts of the body to be protected and for the work to be performed." One of the requirements to be considered qualified to perform electrical work is the ability to identify live *versus* other components in electrical equipment and to identify operating system voltages.

7. If there were a sign on a piece of equipment that said, "DANGER — VOLTAGE," would that be sufficient information for a qualified worker to select the appropriate insulated gloves or tools?

I think not. The voltage level is what quantifies the hazard so the appropriate PPE and tools can be selected. The intent of the arc-flash protection program should be the same. Simply putting a sign on a piece of equipment that says, "DANGER — FLASH HAZARD" would not be sufficient information for a qualified worker to select the appropriate fire-retardant materials or flash-protection equipment. The purpose of the training requirement to identify system voltages and live *versus* other components is twofold: ability to determine when a shock hazard exists and ability to determine level of insulating tools or gloves required. There should also be a training requirement associated with arc-flash protection. Never have I seen so many blank stares from supposedly qualified electrical workers as when I show an example of an arc-flash warning sign indicating magnitude of hazard at a working distance.


8. That sign says there are 11.4 calories at 18 inches. I ate ten times that many calories for breakfast this morning!

This is undoubtedly the most significant training challenge I have faced in recent years. How do you take a group of electricians or instrument technicians from volts, amperes, and time to calories per square centimeter (or, worse yet, Joules and millimeters) at a given working distance? Don't blame it on the aptitude of the audience either. I received much the same response from the audience at an IEEE meeting recently too!

A thorough explanation is needed of the transition from watt-seconds (which most understand) through Joules (which some understand) to calories applied to square centimeters of bare skin (which no one understands). Such an explanation usually results in positive head nods or the "I get it!" looks. Of course, showing the gory electrical burn victim movies helps to drive home the point.

I would hope that those engineers performing incident energy studies will keep in mind the target audience for the results. Providing a report in Joules per millimeter as well as recommendations for flame retardant materials with ratings of calories per square centimeter will only daze the confused. Help them out — provide some training along with the results of the incident energy study correlating study findings with minimum arc thermal performance values and maybe try to explain heat attenuation factor percentages too.

9. I have longer arms than you. Does that mean I can wear different flame retardant clothes?

No, because I sweat more than you do... 

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