### **Other Topics**

# Some Ideas from IEEE Electrical Safety Workshop **Feb 2004 – Oakland, California**

ecently, I attended the 11th annual IEEE Safety Workshop in Oakland, California. Below are some of the highlights.

The workshop was founded in 1991 by the IEEE Industrial Application Society (IAS), Petroleum & Chemical Industry Committee, and as their Web site states "has served to accelerate the dispersion of information and knowledge impacting electrical safety." The IAS Power Systems Engineering Committee and Pulp and Paper Industry Committee are co-organizers. The IEEE Power Engineering Society is a Technical Co-Sponsor.

Hopefully, you will find some of my observations useful in your pursuit of electrical safety for you and your employees.

#### Perform a hazard analysis before starting any work

First, the term "hazard analysis" is sometimes confused with "hazard communication." Hazard communication refers to those hazards associated with chemical and materials handling. Today's hazard analysis includes **all** hazards that could be encountered in the performance of work. Being an electrical workshop, papers and discussions were primarily concerned with the hazards of shock and arc flash.

OSHA and the NFPA 70E state that the person(s) performing work must be qualified. The OSHA definition of qualified is "one familiar with the construction and operation of the equipment and the hazards involved." The new definition in NFPA 70E-2004 is "one who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training on the hazards involved." There is an increasingly strong commitment of all involved to achieve zero accidents, no incidents, and no near misses; therefore, it is apparent that the person performing the hazard analysis must be very skillful, knowledgeable, and highly trained.

It has long been recognized that experienced, skillful, knowledgeable personnel tend to have less accidents. The issue is not to have fewer accidents, but **zero accidents**. The path to this goal is training. The commitment can only come from management because of two key elements, time and money. A safety program without a budget is not a safety program.



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Most companies today have extensive safety programs developed over time. Sometimes sections of the program are nothing more than a cut and paste of an old program (or someone else's old program). Today's safety program must be "owned" by all involved. Extensive input is required to obtain knowledge from inside and outside the company.

For example: You wish to update or create an energized work policy/procedure. Your safety committee discovers 70E-2004 has a new Annex J for an Energized Electrical Work Permit. The committee incorporates beneficial parts into the existing policy/procedure. This is then submitted at the next employees' general safety meeting. The suggestions then go back to the safety committee and a new policy/procedure is created. Policy here means what you intend and the procedure is how you do it. Different companies will vary these definitions. Attached at the end of this article is an example of the ENERGIZED WORK PROCEDURE/PERMIT that Tony Demaria Electric created following the steps above.

#### Training all employees is the key to safety

Once a particular policy and procedure has been adopted, the next step is to train your personnel. The goals of the training are (1) to ensure that all appropriate employees understand the hazards to which they are exposed when performing a task and (2) have the skills to understand a written hazard analysis. A hazard analysis for a specific task can be written by supervision and the employee performing the task need only be able to read and understand the requirements. To validate proficiency, a test will be created including a written and hands-on performance evaluation. A hot training tip is to set up a simulated work task in your shop. Videotape the person performing the work. Watching this video will provide powerful feedback on improving skills. Remember if you do not document it, it has not been done!

Several talks at the workshop compared OSHA and NFPA 70E. A simplistic way of viewing their relationship is that OSHA demands by law that companies create and maintain a safe work environment and the 70E assists in the specifics of how to work safely. As a standard that deals with specifics, NFPA 70E goes into electrical safety in much greater depth than OSHA. Some said that if you conform to the NFPA 70E, you are conforming to OSHA on electrical issues. OSHA is currently revising Subpart S of CFR part 1910 to reflect the changes in NFPA 70E because 1979 was the last update! The wisdom is that OSHA is slow to change and NFPA is much more likely to conform to the most current practices and technologies. This gives us in the field the best protection information available.

One area that was covered in great depth at the conference was that of the arc flash hazard. NFPA 70E-2004, paragraph130.3, states, "a flash hazard analysis shall be done in order to protect personnel from the possibility of being injured by an arc flash." It goes on to explain that this analysis may be calculated **or**, as an alternative, use the PPE requirements of 130.7(C)(9).

The calculation can be performed several ways, but basically requires that several parameters be understood. They are the available bolted fault capacity at the point involved, the time to clear the arc (maximum total clearing time of the protective device), the working distance, and the system voltage. The type of grounding system can also impact the analysis. Please remember that this is a short summary. Your safety committee should review this important section in depth.

To accurately calculate the bolted fault capacity at a specific point, an up-to-date short circuit study must be performed. In addition to determining from the coordination study the time to clear the arc, other variables should be considered such as verifying that protective devices and their settings are in agreement with the coordination study and that maintenance was performed recently to insure that control systems are functional and that circuit breakers operate in their specified interrupting times. If no maintenance or testing has been performed recently, then arc flash calculations may be worthless. This information may not be available to an outside contractor, such as a NETA company, that is coming into a facility to perform work for the first time. Therefore it might be more appropriate to use table 130.7(C)(9)(a) in NFPA 70E. But, not all tasks are listed in the tables! While these considerations may make it difficult to accurately determine the PPE required, they should not be used as an excuse to avoid using PPE.

You must use all information and tools available to have a program that will allow a person to perform a specific task safely. A practical example of how to overcome some of the difficulties in the above paragraph is in Annex H of NFPA 70E-2004. Annex H is an example of how a facility could develop a simplified two-tier PPE requirement. This one was written for facilities but has parts that can be used for contractors. The annexes are not part of the requirements of the document, but they provide information to assist you.

The new NFPA 70E-2004 is a valuable tool to assist anybody concerned with electrical safety. It was created by the combined efforts of many dedicated people, with thousands of hours invested, using the most current data available to give us this resource. Our goal as end users, with our people's lives on the line, is to utilize this information and integrate it into our own safety programs. Knowing some of the difficulties we will encounter in adopting this new standard (or any new standard) does not relieve us from our responsibility to continually update our safety programs and to keep them usable by all employees. KISS (Keep It Simple Stupid!). If people cannot understand it, they cannot use it.

## Remember the three most important things, training, training, and training

A big help to accomplish this is to send people from your organization to the 2005 IEEE Electrical Workshop. See you there.

Tony Demaria served an IBEW Apprenticeship starting in 1963 and then worked for Los Angeles Department of Water and Power in substation maintenance for eight years. He has owned and operated Tony Demaria Electric for over 25 years, specializing in maintenance and testing switchgear and large motors for industrial facilities. Tony Demaria Electric is a NETA Full Member company, and Tony serves on the NETA Safety Committee.

## Appendix E— Energized Electrical Work Permit

Part	TI-Work Request				
1.	Site:		Area:		
2.	Work order/project #:				
3.	Planned start date:		Time:	Duration:	
1.	Description of the work to be done:				
5.	Work classification:				
	Prohibited Restricte	ed			
5.	The following equipment was requested to be shut down:				
7.	Requested by:		Temporarily, v	vhile barriers are being place	a
	(Signature)			(Title)	(Date)
Part	II—Justification for Request				
l.	Detailed job description procedure to be used in performing the above described work :				
2.	Description of the safe work practices to be employed:				
3.	Results of the shock hazard analysis:				
1	Determination of shock protection boundaries:				
т.					
5.	Results of the flash hazard analysis:				
δ.	Determination of the flash protection boundary:				
7.	Necessary personal protective equipment to safely perform the assigned task:				
3.	Means employed to restrict the access of unqualified persons from the work area:				
9.	Evidence of completion of a job briefing, including discussion of any job-specific task:				
0.	o you agree that the work described above can be done safely?				
	⊔ Yes		No		
	(Signature, Electrically Qualified Person)	)		(Date)	_
	(Signature, Electrically Qualified Person)	)		(Date)	_
Part	III—Approval to Perform the W	/ork	While Elec	trically Energized	
10 De C	Reason for live work request :				
2.	The next available date for shutdown is				
3.	I deny the request for shutdown and authorize the live work to be done.				
	(Signature, Operations Manager)			(Date)	
1.	Live work on this equipment is:				
	Approved Not approve	d			
	(Signature, Manufacturing Manager)			(Date)	
	(Signature, Safety Manager)			(Date)	
	(Signature, General Manager)			(Date)	
(	Signature, Maintenance/Engineering Manage	ər)		(Date)	
	(Electrically Knowledgeable Person)			(Date)	