2018 Electrical Safety NFPA 70E
Creating a Clearer Vision on Compliance!
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Presentation Thoughts/Clarifications:

- We are here to learn and share. Safety is one huge collective think tank. Tap into your resource pool.
- For anyone who is sensitive, I apologize in advance.....
- We want to have fun and share inputs as a group!
- We truly believe that most people just aren’t aware of this 70E topic in full disclosure or from multiple perspectives on what to put in place so hopefully we can all take something away from today?
2018 NFPA 70E Training Agenda:

- Define Electrical Safe Work Practices Needs for “Qualified Employees”
- Discuss Key 2018 NFPA 70E Code Changes
- Review of PPE Labeling Content and What it Means for Employees – How Are We Using PPE Labels?
- Review Program One-Line Diagrams and How to Interact with Those for LOTO Planning
- Break from Class to Perform “Skills Based Training” Individually with “Qualified Employees” in the Facility.
- Can Each Qualified Employee get Equipment to a Safe Working Condition?
Defining Our Perspectives on NFPA 70E:

“Arc flash”
It’s More Than Just a PPE Label

Our goal today is to not only help review the current 2018 code but to also challenge “what we think we know”.

From general experience over 18 years of helping companies nationally we have witnessed some common themes or trends nationally to share with companies.

Today we will cut to the core essential needs and build a proper foundation. From there everyone can then review arc flash as “one component” of the overall ESWP program.
Defining “Compliance”:

The NFPA has no power, nor does it undertake, to police or enforce compliance with the contents of the NFPA standards. Nor does the NFPA list, certify, test or inspect products, designs, or installations for compliance with this document. Any certification or other statement of compliance with the requirements of this document shall not be attributable to the NFPA and is solely the responsibility of the certifier or maker of the statement.
Some Concerns with Today’s NFPA 70E Process
Commonly Seen Nationally We Will Cover Today:

“DATA COLLECTION”

• IEEE 1584 has language in their engineering standards which discusses responsibility of data collection and today in the “arc flash” market, general data collection has become the norm with the Host Employer assuming all risk.

• The question is this? Is your equipment properly labeled and accurate for LOTO? Or are we simply assuming that it is???? Your engineering study is then based on that main assumption!

5.1 Responsibility of data verification

Determination of which party(s) is to be responsible for verification of one-lines, creating one-lines, and other site data collection must be determined prior to the quoting of the arc-flash hazard study.
**Scope Content & How to Dissect Them:**

- Trends on “Data Collection” hold the host employer accountable for having accurately labeled equipment PRIOR to any vendor coming in. Be mindful of what is written in scope documents.

**“Data Collection” Definitions**

“Field Technicians will visit your facility to collect the necessary electrical data to perform an Arc Flash Hazard Analysis. Electrical information will be gathered and the systems analyzed form the utility connection point to the equipment.”

“This style of assessment is very general in that it allows for basic data collection and all of the final deliverables are based off of the SKM software programs we use to calculate arc flash values.”

“We will use “as is” labeling information from your current systems for our data collection process, meaning it is the responsibility of “your company” to have all electrical equipment labeled as to the upstream disconnecting source prior to our arrival.”

-ABC Company

-Faith Technologies
Common Concerns with Today’s NFPA 70E Process:

Example:

• Customer A goes out on a bid request to do an “arc flash study.” They understand the general need for engineering services, data collection, PPE labels and a report.
• In the course of securing proposals, who carries the responsibility of accuracy of equipment labeling is not covered nor do they talk about who will open and close equipment.
• Customer could end up hiring a resource who simply collected nameplate data and the customer may still need to hire a contractor to come and open and close equipment too.

IEEE Std 1584.1-2013
IEEE Guide for the Specification of Scope and Deliverable Requirements for an Arc-Flash Hazard Calculation Study in Accordance with IEEE Std 1584

If the facility owner does not provide facility data to the study engineer, the owner should provide qualified personnel to guide those responsible for the site data collection to the equipment locations to assist as required, and to open necessary equipment doors, locks, etc. to collect nameplate data and protective device settings.
Putting the Perception Puzzle Together:

1. When we think “arc flash” do we think Engineering?

2. Instead of thinking “arc flash” should we start thinking Electrical Safe Work Practices?

3. IEEE 1584 is an Engineering guide to 70E and it does lean that way in wording to describe how the technical engineering side may view the process.

IEEE Std 1584.1-2013
IEEE Guide for the Specification of Scope and Deliverable Requirements for an Arc-Flash Hazard Calculation Study in Accordance with IEEE Std 1584

If the facility owner does not provide facility data to the study engineer, the owner should provide qualified personnel to guide those responsible for the site data collection to the equipment locations to assist as required, and to open necessary equipment doors, locks, etc. to collect nameplate data and protective device settings.
2018 NFPA 70E Summary of Expectations:

- From the first several slides hopefully we have a different perspective on what NFPA 70E represents and how we should reference it but not use it as ultimate compliance?

- Hopefully we can all help others as we move forward in keeping our vision on building overall program depth vs getting lured into just the “arc flash” end of things.

- Again, “Arc Flash is More Than Just a Label” ......
2018 NFPA 70E Overview

- This edition of the code can be summarized as follows:
  - This code has more wording and expectations regarding “HOW” we document activities and “What” methods we use in communicating risks.
  - The 2018 code in concept has the same common goal as all other past codes in that OSHA and 70E expect “qualified employees” to get equipment to a safe condition.
  - The definitions of qualified employee are important for us to discuss and agree upon between the employee and management alike. These expectations should also be documented in job descriptions etc.
A recent survey of 1,200 electricians revealed some facts that can help set the tone for today’s training:

- Of 1,200 electricians who took this survey, 97% of them said they had experienced an electrical shock in the workplace.
- Of the 1,200 electricians surveyed, 26% of them said they witnessed an electrical injury take place in their past experiences.

Thoughts?

- Are we in general taking too many risks on a daily level or do we simply now know what the real risks are??
- Did the 3% of people who claimed they never experienced a shock lying????
ARG workers injured by ‘electrical arc flash’ at the plant

By KATE DAY SAGER Era Reporter
kdsager@bradfordera.com | 0 comments

Posted: Thursday, January 29, 2015 10:00 am

Two American Refining Group (ARG) employees were injured early Wednesday when an electrical arc flash occurred as they were working on electrical equipment at the plant.

Sara Furlong, executive communications coordinator at ARG, said information released by Don Keck, senior vice president of operations, stated the incident occurred about 6:30 a.m. in the motor control center, or MCC, of the crude unit. Furlong said two male employees, who were not identified, were working in the facility, which is undergoing expansion due to expanding electrical requirements at the refinery. The crude unit is located in the plant between North Kendall Avenue and Mill Street in Bradford. The incident did not disrupt operations at the plant.
OSHA’s top 10 violations are:

#1 Fall Protection in construction (29 CFR 1926.501) 6,072 violations
#2 Hazard Communication (29 CFR 1910.1200) 4,176 violations
#3 Scaffolding (29 CFR 1926.451) 3,288 violations
#4 Respiratory Protection (29 CFR 1910.134) 3,097 violations
#5 Lockout/Tagout (29 CFR 1910.147) 2,877 violations
#6 Ladders in construction (29 CFR 1926.1053) 2,241 violations
#7 Powered Industrial Trucks (29 CFR 1910.178) 2,162 violations
#8 Machine Guarding (29 CFR 1910.212) 1,933 violations
#9 Fall Protection—training requirements (29 CFR 1926.503) 1,523 violations
#10 Electrical—wiring methods (29 CFR 1910.305) 1,405 violations
Most Frequently Cited OSHA Standards: (#1 Midwest)

#5. Control of hazardous energy (LOTO), general industry (29 CFR 1910.147) 3% Increase over 2016 in violations..

5. Lockout/Tagout (LO/TO): 3,414 Citations (1910.147) 3% increase from 2015
Safety Impacts/Loss Time:

What’s the cost of non-fatal electrical accidents?

In that BLS report, over 14,000 of the non-fatal injuries involved electrical current from an identified source within the workplace. Of the workers affected by those incidents, roughly one in five workers spent more than a month away from work as a result of their injuries.

1 in 5 workers from the 14,000 non-fatal electrical incidents spent more than a month away from work...
OSHA Has Some Fairly Common Citation Themes:


OSHA Regional News Release
U.S. Department of Labor
Office of Public Affairs
Region 5

May 3, 2016

Mansfield employer exposes workers to machine, electrical hazards

Employer Name: Edge Plastics Inc., 449 Newman St., Mansfield, Ohio

Citations issued: April 25, 2016

Investigation findings: The U.S. Department of Labor’s Occupational Safety and Health Administration issued eight serious and one other-than-serious safety violation to Edge Plastics Inc. Inspectors from the Toledo office found the plastic storage bin maker exposed workers to amputation, falls and electrical hazards at its Mansfield plant.

During its investigation, the agency found the employer:

- Did not de-energize machines prior to maintenance.
- Exposed workers in plastic injection molding operations as guard rails and ladders were inadequate.
- Failed to implement lockout/tag out procedures to prevent unintentional machine starts during service and maintenance such as clearing jams, and adjusting operating parts.
- Violated electrical safe work practices, including not providing personal protective equipment.
- Not training workers adequately in electrical safety related work practices.

Quote: "Common sense safety procedures like powering down equipment and preventing unintentional movement can protect maintenance workers from amputation and other serious injuries," said Kim Nelson, OSHA’s area director in Toledo. "Employers like Edge Plastics must review their safety and health procedures and make immediate improvements to protect workers on the job."

Proposed Penalties: $43,200

View Citations here®.

To ask questions, obtain compliance assistance, file a complaint, or report amputations, eye loss, workplace hospitalizations, fatalities or situations posing imminent danger to workers, the public should call OSHA’s toll-free hotline at 800-321-OSHA (6742) or the agency’s Toledo Area Office at 419-259-7542.
Typical Control Panel Incident Video Example:
What Employee Group Should We Watch?

• In safety we all can relate to one common theme. That general theme is as human beings, we all have some tendencies and at times common traits.

• Which age group of employees has shown they present a higher risk in not following along with safety expectations or policies?

  1. 18 – 25
  2. 25 – 40
  3. 40 - Retirement
What Employee Group Should We Support?

• If most of you picked #3 in the options you aren’t alone and commonly many people think that section of our workforce is where we should focus our attention.

• The answer is 25-40 and the statistics prove this to be true from OSHA. When new programs get released this group tends to not follow them as fast and can feel their productivity and past value to the company outweighs safety expectations etc.....

25 – 40
We “Don’t Know What We Don’t Know” ........

- Employee used wasp spray on an exterior bus. Wasps died along with major injuries to the employee when the bus faulted as the nest fell onto live bus.
Are We Creative in the Electrical Trade?

Field Modifications are sometimes necessary but do we follow up to make them more correct?

Some of these field modifications are darn right genius in the moment but not correct of course and then we get distracted and don’t go back to make them RIGHT.....
And Just When You Think You’ve Seen it All?

First place prize winner so far in 2018 on creativity.
How Qualified are We?
The NFPA Code is comprised of three chapters:

1. Chapter 1 (Safety-Related Work Practices)
2. Chapter 2 (Safety-Related Maintenance Requirements)
3. Chapter 3 (Safety Requirements for Special Equipment)

For our training we are conducting today all of our time will be focused in Chapter 1 along with some comments on maintenance of equipment at the end of the slide presentation.

• As we go through Chapter 1 content we will make a notation on which article we are discussing in the power point slide deck.
Article 105 (Chapter 1)

Application of Safety-Related Work Practices and Procedures:

• Article 105 in summary discusses the application of programs for employees to follow which are set up and managed by the employer. This article is not large in content but establishes the basis of responsibility.

105.3 Responsibility.

N (A) Employer Responsibility. The employer shall have the following responsibilities:

(1) Establish, document, and implement the safety-related work practices and procedures required by this standard.
(2) Provide employees with training in the employer’s safety-related work practices and procedures.

N (B) Employee Responsibility. The employee shall comply with the safety-related work practices and procedures provided by the employer.
**Article 110 (Chapter 1)**

**General Requirements for Electrical Safety-Related Work Practices:**

- Article 110 in summary discusses the application of documentation and expectations that employers set up for qualified employees to follow for example starting out with:
  
  - Article 110.1 Electrical Safety Program starts out this article section
  
  - Much of this entire article was created to help us document expectations of our programs and for qualified employees regarding training, risk assessment and job planning etc.
  
  - Not a simple task as we all can relate to challenges with documenting just about anything we do right?
110.3 Host Employer Responsibilities:

One of the easier OSHA related targets. As the Host Employer, Companies take on responsibility for contractors and how safe they perform work.

If an incident happens, do we have a documented job safety plan between the host employer and contract employer???

Contractor responsibilities also exist where the contract employer is also supposed to communicate safety planning and execution back to the Host Employer.

**Bottom Line:** Don’t assume contractors are all up to speed and make time to discuss and document how projects are to be done according to your expectations on safety and NFPA 70E.
110.3 Host and Contract Employers’ Responsibilities

(A) Host Employer Responsibilities.

(1) The host employer shall inform contract employers of the following:

(1) Known hazards that are covered by this standard, that are related to the contract employer’s work, and that might not be recognized by the contract employer or its employees.

(2) Information about the employer’s installation that the contract employer needs to make the assessments required by Chapter 1.

(2) The host employer shall report observed contract employer–related violations of this standard to the contract employer.

Informational Note: Examples of a host employer can include owner or their designee, construction manager, general contractor, or employer.

Bottom Line: Don’t assume contractors are all thinking the same or proper with safety.
Article 110.1 – Safety Related Work Practices:

110.1 in Safety Related Work Practices essentially says;

How Do We Manage & how Do We Document?

New Additions to the 2018 NFPA 70E Include:

A. Inspection of Newly Installed Equipment
B. Condition of maintenance
C. Risk Assessment procedure
D. Human Error
E. Hierarchy of Risk Controls
F. Job Safety Planning and Job Briefing
G. Job Safety Planning
H. Job Briefing
I. Change in Scope
J. Incident Investigations
K. Lockout/Tagout Program and Procedure Audit
Review:
Key **2018 code** additions here are changes with **Risk Assessment Procedures** and **Job Safety Planning**.

- What the code is saying in simple terms is we assume too much at times on what our staff is doing and if they are truly qualified to assess their hazards and avoid them.

- Both of these additions in the above two mentioned are key indicators that NFPA is telling us we need to be better structured in how we communicate and plan internally on a daily or job specific basis etc.
110.1 Risk Assessment Procedure Outline:

“Risk Assessments” essentially rely on one primary goal and that is the employee is able to recognize or “Identify Hazards”.

△ (H) Risk Assessment Procedure. The electrical safety program shall include a risk assessment procedure and shall comply with 110.1(H)(1) through 110.1(H)(3).

(1) Elements of a Risk Assessment Procedure. The risk assessment procedure shall address employee exposure to electrical hazards and shall identify the process to be used by the employee before work is started to carry out the following:

(1) Identify hazards
(2) Assess risks
(3) Implement risk control according to the hierarchy of risk control methods
110.1 Risk Assessment Procedure Outline:

Thoughts:

- Has a place and value at times.
- Code book isn’t specific on expectations regarding “every task “or those where qualified employees get exposed to tasks outside of their normal routines.
- I see this as one additional tool in our toolbox to use when needed.
110.1 Risk Assessment Procedure Outline:

Thoughts: (Cont.):

- Not to be confused with “Energized Work Permits”
- This assessment form is simply a way for qualified employees to dive deeper into “evaluating” certain activities.
- Example might be: Documenting some risks for de-energizing a high arc flash risk item like main switchgear?
110.1 Risk Assessment Procedure Outline:

(Recent Example)

- Qualified electrician was asked to troubleshoot a breaker disconnect after a forklift had bumped the cabinet because the lights had gone out.
- In the process of turning off the breaker, the internal components failed and the fault came out the handle.
- Could a Risk Assessment possibly have helped the employee recognize the need for minimally leather gloves to help with potential burn protection when he already knew something wasn’t right on the inside of that cabinet?
(I) **Job Safety Planning and Job Briefing.** Before starting each job that involves exposure to electrical hazards, the employee in charge shall complete a job safety plan and conduct a job briefing with the employees involved.

(1) **Job Safety Planning.** The job safety plan shall be in accordance with the following:

1. Be completed by a qualified person
2. Be documented
3. Include the following information:
   a. A description of the job and the individual tasks
   b. Identification of the electrical hazards associated with each task
   c. A shock risk assessment in accordance with 130.4 for tasks involving a shock hazard
   d. An arc flash risk assessment in accordance with 130.5 for tasks involving an arc flash hazard
   e. Work procedures involved, special precautions, and energy source controls
Pre-Planning Activities is Crucial. How Can we Implement More Communication? Can this fit Article 110 Needs?

• Don’t Rush Into Tasks:
  - Human tendencies are to rush in and get something fixed. We have to guard against this!

The 2018 NFPA code is requesting us to do Job Planning and Job Briefings...
Summary on Contact Release and CPR:

• The 2018 code now added a clarification that “those responsible for responding” does not have to only include first responders. The employer needs to clarify who these employees are at each company to get training.

• Contact release is often not taught by common CPR companies so employers will have to ask for this to be taught or teach contact release internally so employees know how to get employees who are electrically “hung up” or can’t let go free from the shock hazards etc.

• How to get employees free from hazards is something we need to ask our CPR training resources........
2018 NFPA 70E 110 Emergency Response CPR:

(C) Emergency Response Training.

1. Contact Release. Employees exposed to shock hazards and those responsible for the safe release of victims from contact with energized electrical conductors or circuit parts shall be trained in methods of safe release. Refresher training shall occur annually.


   (a) Employees responsible for responding to medical emergencies shall be trained in first aid and emergency procedures.

   (b) Employees responsible for responding to medical emergencies shall be trained in cardiopulmonary resuscitation (CPR).

   (c) Employees responsible for responding to medical emergencies shall be trained in the use of an automated external defibrillator (AED) if an employer’s emergency response plan includes the use of this device.

   (d) Training shall occur at a frequency that satisfies the requirements of the certifying body.

Informational Note: Employees responsible for responding to medical emergencies might not be first responders or medical professionals. Such employees could be a second person, a safety watch, or a craftsperson.

Little change to training other than to clarify wording in « Contact Release » and also a clarification in the Informational Note.

This tells me some employers took the 2015 code too literally and only trained those that were truly first responders.

It’s up to you to train those you feel are exposed to risks.
Redcross has a good refresher training video on their website to utilize.

www.redcrossrefresher.com
Establishing an Electrically Safe Work Condition:

- **Article 120** in summary discusses the most important focus that we can review with NFPA 70E and actually represents the one main OSHA emphasis they will key in on when talking with any qualified employee.

  – Article 120 starts out this article section with Lockout/Tagout Programs and expectations for achieving a “Safe Working Condition”

  – Note: We feel differently in some regards with additional emphasis needed than the current code book is teaching in reference to expectations and procedures we follow to get equipment to a “Safe Condition” and we will discuss those in upcoming slides.
Article 120.5 Process for Establishing and Verifying an “Electrically Safe Work Condition”

This aspect of NFPA 70E is our main focus for training today with Faith Technologies.

- If we can demonstrate that as “qualified employees” we can effectively get equipment to a “SAFE WORKING CONDITION” then we have achieved the foundational goal of NFPA 70E and what OSHA is expecting of us.
- The slides are directly taken from the 2018 code book and we will discuss what our Skills Demonstration form looks like compared to what the code book is saying.
120.5 Process for Establishing and Verifying an Electrically Safe Work Condition. Establishing and verifying an electrically safe work condition shall include all of the following steps, which shall be performed in the order presented, if feasible:

1. Determine all possible sources of electrical supply to the specific equipment. Check applicable up-to-date drawings, diagrams, and identification tags.

2. After properly interrupting the load current, open the disconnecting device(s) for each source.
Article 120.5 Process for Establishing and Verifying an Electrically Safe Work Condition (Cont)

(3) Wherever possible, visually verify that all blades of the disconnecting devices are fully open or that drawout-type circuit breakers are withdrawn to the fully disconnected position.

(4) Release stored electrical energy.

(5) Release or block stored mechanical energy.

(6) Apply lockout/tagout devices in accordance with a documented and established procedure.

(7) Use an adequately rated portable test instrument to test each phase conductor or circuit part to verify it is de-energized. Test each phase conductor or circuit part both phase-to-phase and phase-to-ground. Before and after each test, determine that the test instrument is operating satisfactorily through verification on any known voltage source.
2018 Article 120.5 (Process for Verification):

1. **Determine all sources of electrical supply or energy to the equipment.** Check up to date drawings as required
2. **Open the upstream disconnecting sources for each source of power.**
3. **Release stored electrical energy if present**
4. **Release or block stored mechanical energy**
5. **Apply Lockout/Tagout devices in accordance with established procedures**
6. **Determine expected PPE needs for the piece of equipment you intend to power down.** Obtain correct arc flash and shock hazard protection including the appropriate voltage meter for upcoming steps.
7. **Use an adequately rated portable test instrument to test all aspects of the power supply to verify upstream power has been eliminated.** Meter shall be tested on a known 120V power supply before and after LOTO verification steps to ensure the meter works properly
Exception No. 1: An adequately rated permanently mounted test device shall be permitted to be used to verify the absence of voltage of the conductors or circuit parts at the work location, provided it meets the all following requirements: (1) It is permanently mounted and installed in accordance with the manufacturer’s instructions and tests the conductors and circuit parts at the point of work; (2) It is listed and labeled for the purpose of verifying the absence of voltage; (3) It tests each phase conductor or circuit part both phase-to-phase and phase-to-ground; (4) The test device is verified as operating satisfactorily on any known voltage source before and after verifying the absence of voltage.

There are many potential issues associated with this introduction within the code. Installing these meters will not act as a substitute to the proper steps we take to ensure power is absent inside equipment etc!
2018 NFPA 70 Code Insert on Devices:

In past years we’ve seen LED indicators as quote “round one” from manufactures to sell employers as a feel safe application. OSHA teaches “Point on Point” contact testing with a qualified test instrument and qualified employee with “live dead live” formats to ensure accuracy.

New designs have now incorporated both the visual and “Point on Point” contact testing means to help make improvements.

To rely on devices like these, we carry risks also so.. Who installs them, are the installed correctly, why do we need them and who verifies they work correctly?
Video Links on Test Units:

Video from Panduit

See video:

Video from Grace Engineered Products

Voltage Test Station and Safe-Test Points Grace Engineered Products 061316

http://www.bing.com/videos/search?q=Voltage+Test+Station+and+Safe-Test+Points+Grace+Engineered+Products+061316+&qft=+filterui%3amsite-youtube.com&view=detail&mid=0FB89571946487197F2C0FB89571946487197F2C&FORM=VRDGAR
2018 NFPA 70 Code Insert on Devices:

This video from Panduit we watched shows they installed the device on the “LOAD” side of the control panel disconnect.

One main concern with insertions of codes like these is that the general public will install these devices and feel they have created a “safe work environment” but the reality is “ALL ENERGY” must be removed from the enclosure so installing people are going to not be truly compliant.
Safety integrity levels (SILs) are orders of magnitude levels of risk reduction. There are four SILs defined in IEC 61508. SIL1 has the lowest level of risk reduction. SIL4 has the highest level of risk reduction. The SIL table for “demand mode” is shown in Figure 4. The SIL table for the continuous mode is shown in Figure 5.

<table>
<thead>
<tr>
<th>Safety Integrity Level</th>
<th>Probability of failure on demand, average (Low Demand mode of operation)</th>
<th>Risk Reduction Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIL 4</td>
<td>$\geq 10^{-5}$ to $&lt;10^{-4}$</td>
<td>100000 to 10000</td>
</tr>
<tr>
<td>SIL 3</td>
<td>$\geq 10^{-4}$ to $&lt;10^{-3}$</td>
<td>10000 to 1000</td>
</tr>
<tr>
<td>SIL 2</td>
<td>$\geq 10^{-3}$ to $&lt;10^{-2}$</td>
<td>1000 to 100</td>
</tr>
<tr>
<td>SIL 1</td>
<td>$\geq 10^{-2}$ to $&lt;10^{-1}$</td>
<td>100 to 10</td>
</tr>
</tbody>
</table>
So, let’s **bottom line** this general topic somehow…

- It’s not a quick answer. Why are we going to install these? To protect from what?
- They need to be installed by someone who understands how they work and can install and wire them correctly. How do we document this?
- They may be UL listed but what IEC 61508-1 rating do they carry for (SIL)? Safety Integrity Levels…

**Example:**
- We have roughly 1 billion people in the world and if we take off from a rocket ship per hour based on safety standards from 13849-1 and the corresponding SIL ratings we can relate to it in this way.
  - Ple = 47 booms
  - Pld = 290 booms
  - Plc = 1700 booms
  - Plb = 5000 booms
  - Pla = 20,000 booms
What is the OSHA Focus on “Safe Work Practice”?

Their focus is and has always been aimed at the overall topic of: “Electrical Safe Work Practice!”

What does this statement mean?

• Many of us refer to NFPA 70E as the reference guide for safety and it is a good starting point.

• OSHA on the other hand has one main goal. The main question is how are we managing ourselves and can we get equipment to a “safe condition” before work is performed.

• OSHA Sub Part S 331-335 references are often used. On Maintenance of systems, 1910-303 is the primary source OSHA can refer to on maintaining site equipment for operational safety.

• OSHA will rarely if ever come in and ask “How are you managing “arc flash”... They want you to prove you can get equipment de-energized and safe.
2018 NFPA 70E Training Requirements (Qualified)

Training Requirements Under Article 110.2

- Training requirements continue to expand in the 2018 code
- Type of training and Documentation have been clarified more

⚠️ (4) Type of Training. The training required by 110.2(A) shall be classroom, on-the-job, or a combination of the two. The type and extent of the training provided shall be determined by the risk to the employee.

 предостережение

⚠️ (5) Electrical Safety Training Documentation. The employer shall document that each employee has received the training required by 110.2(A). This documentation shall be in accordance with the following:

1. Be made when the employee demonstrates proficiency in the work practices involved
2. Be retained for the duration of the employee’s employment
3. Contain the content of the training, each employee’s name, and dates of training
How Do We Qualify Employees?:

Can the staff employees effectively identify and avoid hazards and get equipment to a “Safe Condition”.

Only the Host Employer ultimately can deem the employee “Qualified”. No external resource can do that for us officially.

(4) Decision-making process necessary to be able to do the following:

   a. Perform the job safety planning
   b. Identify electrical hazards
   c. Assess the associated risk
   d. Select the appropriate risk control methods from the hierarchy of controls identified in 110.1(G), including personal protective equipment

   (d) An employee who is undergoing on-the-job training for the purpose of obtaining the skills and knowledge necessary to be considered a qualified person, and who in the course of such training demonstrates an ability to perform specific duties safely at his or her level of training, and who is under the direct supervision of a qualified person shall be considered to be a qualified person for the performance of those specific duties.
Different Ways to Qualify Employees:

**ELECTRICAL QUALIFIED WORKER**

**PRACTICAL COMPETENCY CHECKLIST SAMPLE**

<table>
<thead>
<tr>
<th>Competency Categories</th>
<th>N/A</th>
<th>Inspector (y)</th>
<th>Date</th>
<th>OK (v)</th>
<th>Needs Work - State</th>
<th>Follow Up Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>(To be completed within 60 days of hire date)</td>
<td></td>
<td>(y) Initials</td>
<td>Verified (v)</td>
<td>(v) Corrective Actions</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Preparation</strong></td>
<td></td>
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<tr>
<td>Ability to read and understand arc flash labeling - specifically approach zones, arc flash boundaries and PPE requirements</td>
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<td></td>
</tr>
<tr>
<td>Ability to read, understand and update one-line and ladder diagrams or schematics as necessary to keep current programs up to date</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ability to understand and follow plant-wide electrical LOTO and machine specific LOTO procedures. Confirm the employee knows the difference between both types.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of required PPE, insulated tools and shielding materials including any test requirements</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Understanding and appropriate use of the energized work permit process</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Testing / Troubleshooting</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Training for qualified employee status is largely based on the concepts of “show me”.

In summary, we can have great safety policies and good equipment labeling in place BUT if employees do not demonstrate effective practice of our safety needs, this represents a problem with compliance.
Obtaining a De-Energized State Correctly is our Primary Goal with ESWP and OSHA:

- This example shows a standard disconnect with ideal labeling in place which in turn supports the fundamental goal for any safety program.

- If an employee was asked this question, how would they be able to respond?

- OSHA Question: If you had to change a fuse in this disconnect, explain to me how you would do that????
Employee Scenario: But I’m Working Over on the Far Left Side So Why Are You Saying I Have a Risk?

If the main breaker disconnect is on, the interpretation is we still have a potential hazard within the overall enclosure. Why not just kill power up-stream? Then the entire cabinet is de-energized.
Article 130 (Chapter 1)

Work Involving Electrical Hazards:

• Article 130 in summary discusses how we determine risks and which methods we have used to know our exact hazard levels. It also is the largest article in Chapter 1 and includes multiple tables associated with arc flash and shock hazard tables along with explaining the four hazard categories.

  – Article 130 starts out this article section with establishing what is “Safe Working Condition” and article 130.2 is a key code reference we can use as a basis for internal conversations surrounding activities such as troubleshooting vs. repair related work etc.

  – Article 130.5 is an article we reference on PPE Labeling
This article establishes our goal which is to get equipment locked out and safe before “work” is performed.

130.2 Electrically Safe Work Conditions. Energized electrical conductors and circuit parts operating at voltages equal to or greater than 50 volts shall be put into an electrically safe work condition before an employee performs work if any of the following conditions exist:

(1) The employee is within the limited approach boundary.
(2) The employee interacts with equipment where conductors or circuit parts are not exposed but an increased likelihood of injury from an exposure to an arc flash hazard exists.
Article 130.2 Normal Operations (Maintenance):

Maintenance:
Define “Normal Operation”? What is clear, is the code is expressing the need to address Maintenance of equipment. There are direct ties to our arc flash outcomes based on how breakers react when called upon to trip etc.

△ (4) Normal Operating Condition. Normal operation of electric equipment shall be permitted where a normal operating condition exists. A normal operating condition exists when all of the following conditions are satisfied:

1. The equipment is properly installed.
2. The equipment is properly maintained.
3. The equipment is used in accordance with instructions included in the listing and labeling and in accordance with manufacturer’s instructions.
4. The equipment doors are closed and secured.
5. All equipment covers are in place and secured.
6. There is no evidence of impending failure.

Informational Note: The phrase properly installed means that the equipment is installed in accordance with applicable industry codes and standards and the manufacturer’s recommendations. The phrase properly maintained means that the equipment has been maintained in accordance with the manufacturer’s recommendations and applicable industry codes and standards. The phrase evidence of impending failure means that there is evidence such as arcing, overheating, loose or bound equipment parts, visible damage, or deterioration.
This Code Article brings up a challenging question. How do we address “Closed Door Switching PPE Needs”:

• Some people interpret closed door switching of breaker or disconnects as if we should dress up to the same PPE levels as determined by “OPEN EXPOSURE” levels?

• Condition of our equipment is very important and to be clear this code article has good intentions.

• However, it should be made clear in this training session that regardless of how well maintained our equipment is, there is always that potential for hazard within and we can never assume that just because our equipment is in good condition that we won’t experience a fault/failure.
Watch OEM labeling also. Often we see generalized labels that also mirror comments from NFPA 70E:

When this Square D NEMA 12/3R heavy-duty 600VAC safety switch disconnect is properly maintained and applied, it may be switched [on / off] without any clothing PPE requirements when the enclosure is properly closed and secured. Proper application is defined by the physical environment, voltage rating, and the available short-circuit current, as validated by a power system study that is less than 60 months old. The task of switching this device is not considered exposed or energized as defined by NFPA 70E 2009 Edition, Article 110 “Exposed – As Applied To Energized Electrical Conductors or Circuit Parts”. However, eye and ear PPE is still required for all switching tasks, and the proper left-hand rotated-torso switching procedures must also be utilized, with the face and torso positioned a minimum of 18 inches from the equipment being switched.

For more information, please contact Schneider Electric Engineering Services at 888-SQUARED (888-778-2733). This label is invalidated by unauthorized field modifications to the equipment. For equipment field modifications, please contact Schneider Electric Services.
This Article Will Inevitably Bring Up the Age Old Question of “Closed Door Switching PPE Needs” and is a key topic when the code committee decides what the “likelihood” of an exposure might be etc.

Here is what has commonly been used to define *closed door* risk management and PPE needs.

- For known (calculated) HRC Levels of 0, 1 or 2
- Recommended HRC Level 0 PPE for switching procedures
- For known (calculated) HRC Levels of 3, 4 or Dangerous
- Recommended HRC Level 2 PPE for switching procedures

*Remember the maintenance component discussed earlier and work with employees to understand the importance of shedding load on a system before we re-engage breaker disconnects.*
Before we move on, who has questions on this “Closed Door” PPE operation topic?

- For known (calculated) **HRC Levels of 0, 1 or 2**
- Recommended HRC Level 0 PPE for switching procedures
- For known (calculated) **HRC Levels of 3, 4 or Dangerous**
- Recommended HRC Level 2 PPE for switching procedures
Equipment Labeling is The **MAIN** Key Aspect to Your Program Success!!! Good Formats Promote Good Behavioral Employee Decisions.

- Think of a PPE label like a GPS road map.
- If our PPE label gives our employees the right road map, then we can feel confident the employee has all the right info.
- If it doesn’t address all needs or give good direction we get lost....
Connecting OSHA & NFPA 70E – PPE Labeling

U.S. Department of Labor
Occupational Safety and Health Administration

Inspection Number:                        
Inspection Date(s):  /2012 - 2012
Issuance Date:   /2012

Citation and Notification of Penalty

Company Name:
Inspection Site:

The alleged violations below have been grouped because they involve similar or related hazards that may increase the potential for injury or illness.

Citation 1 Item 4 a Type of Violation: **Serious**

**29 CFR 1910.303(e)(1)(ii):** Markings were not provided on electrical equipment giving voltage, current, wattage, and other ratings as necessary:

(a) Drill bank; Two electrical panels were not marked with applicable ratings.

Date by which Violation must be Abated: /2012
Proposed Penalty: $4400.00
Labeling Goals for Arc Flash and Shock (LOTO) Programs

• Equipment Labeling should include three key components which are:

• 130.5 does not view PPE labeling from the ESWP process for LOTO goals however our views on LOTO align with OSHA expectations for “Safe Work Practice”. Summary, One PPE Label, all Inclusive for goals on ESWP!!!

1. Complete Arc flash hazard ratings and PPE needs
2. Shock hazard ratings and glove needs
3. What is my equipment name? & Where do I turn off power?
Labeling Goals for Arc Flash and Shock (LOTO) Programs

Part #1: Complete Arc flash hazard ratings and PPE needs so employees can perform their activities without questioning what is exactly required.

Many PPE labels we see often are ok with this component of the 70E topic. Some however may refer you to the code book for PPE selection based on the vendor you chose?

**29” Flash Hazard Boundary**

**2.6 cal/cm² Flash Hazard at an 18” Working Distance**

**PPE Level, AR Shirt, AR Pants, Hard Hat, 4 cal/cm² Face Shield, Safety Glasses, Hearing Protection**
Labeling Goals for Arc Flash and Shock (LOTO) Programs

Part #2: Shock hazards and PPE needs associated with the voltage employees may be exposed to.

Generally vendors rely too much on software systems to create PPE labeling so shortcuts are common.

480 VAC Shock Hazard when Cover is Open/Removed
42" Limited Approach
12" Restricted Approach - Class 00 500Volt Gloves

Missing glove ratings
Part #3: NFPA 70E does not comment on the core value PPE labels can bring or how they could tie into the overall ESWP process.

Generally equipment labeling and upstream Lock Out sources are either not present or questionable for true value. This part of the PPE label starts creates safety value and direction for your program!


Fault Current: 25 kA  Date: 08-23-17  Faith Technologies 800-274-2345
Labeling Should be Considered as a Good Road Map!

NFPA 70E sometimes gets stuck on pieces of a topic but fails to mention how they all should work together.

This PPE label may satisfy some very minimal need to say what the arc flash rating is but what else does it help with???
Machine Specific vs Electrical Upstream LOTO Goals:

Correct Upstream Electrical LOTO Point for ESWP Means

Common Equipment Disconnect
Check Your LOTO Procedures (Mechanical vs Electrical):

Commonly if Only E1 is listed on the LOTO sheet the program is more mechanical based.

On this PPT example E1 is correct but commonly we see the equipment disconnect only listed!

<table>
<thead>
<tr>
<th>ID</th>
<th>Source</th>
<th>Location</th>
<th>Method</th>
<th>Check</th>
<th>Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1</td>
<td>Electrical 480V</td>
<td>Disconnect located at the MCC located on North Wall</td>
<td>Move E-1 disconnect to off. Lock out.</td>
<td>Attempt restart at CP-1.</td>
<td>Lockout Hasp and Lock</td>
</tr>
<tr>
<td>W1</td>
<td>Hot Water Supply</td>
<td>Disconnect Above the Boiler. Valve on West Side</td>
<td>Turn W-1 valve off. Lock out.</td>
<td>Verify pressure has bled off.</td>
<td>Cable Lockout</td>
</tr>
<tr>
<td>W2</td>
<td>Hot Water Return</td>
<td>Disconnect Above the Boiler. Valve on West Side</td>
<td>Turn W-2 valve off. Lock out.</td>
<td>Verify pressure has bled off.</td>
<td>Cable Lockout</td>
</tr>
<tr>
<td>G1</td>
<td>Natural Gas</td>
<td>Disconnect on West side of Boiler unit.</td>
<td>Turn G-1 valve off. Lock out.</td>
<td>Verify pressure has bled off.</td>
<td>Universal Ball Valve Lockout</td>
</tr>
</tbody>
</table>

OPENING A GUARD DOES NOT CONSTITUTE A LOCKOUT!

DANGER Any machine modifications must be shown in procedure. Contact facilities to update procedure.

FAITH TECHNOLOGIES®
Can Our Employees Relate with Boundaries and Risk?

- As qualified employees, do we all understand the hazard boundary information and what the shock and arc flash levels mean in distance?
- Do we know how to process a PPE label and the information provided?
(1) Nominal system voltage
(2) Arc flash boundary
(3) At least one of the following:
   - Available incident energy and the corresponding working distance, or the arc flash PPE category in table 130.7(C)(15)(a) or table 130.7(C)(15)(b) for the equipment, but not both.
   - Minimum arc rating of clothing
   - Site-Specific level of PPE

We will discuss this concept further in class. General theme is to differentiate which method the employer chose on PPE determinations etc.
Overview of Informative 2018 PPE Label Format:

- ARC FLASH AND SHOCK HAZARD
- APPROPRIATE PPE REQUIRED

<table>
<thead>
<tr>
<th>29&quot; Flash Hazard Boundary</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.6 cal/cm² Flash Hazard at an 18&quot; Working Distance</td>
</tr>
<tr>
<td>PPE Level, AR Shirt, AR Pants, Hard Hat, 4 cal/cm²</td>
</tr>
<tr>
<td>Face Shield, Safety Glasses, Hearing Protection</td>
</tr>
</tbody>
</table>

| 480 VAC Shock Hazard when Cover is Open/Removed |
| 42" Limited Approach                             |
| 12" Restricted Approach - Class 00 500Volt Gloves |

Device Name: PNL-PP2-WARE  

Fault Current: 25 kA  
Date: 08-23-17  
Faith Technologies 800-274-2345

- Complete Statements in PPE listings
- Shows When Gloves are needed. Prohibited Approach Boundary was eliminated for 2015
- Supports Electrical LOTO Needs
- Date Optional for 70E
- Shows Fault Current Levels to Aid in Breaker Applications
2018 PPE Label Format (Look) Changes:

Why is 2018 code now saying we shouldn’t say what “category” our PPE risk levels fall within if we’ve done a formal ESWP audit and calculated true cal/cm² exposures?

- The code committee is essentially creating a differentiator in PPE labels based on what method we used to determine the risks.
- If we are an employer who uses the code book to select PPE levels then we can use the wording “category” and keep that on the PPE label.
- If we do formal ESWP auditing and calculated exposures then we cannot use the wording “category”.

![Example PPE Label](image-url)
Does Engineering PPE Labeling Content Equal Compliance?

Many PPE label formats don’t fully disclose valuable PPE Information

<table>
<thead>
<tr>
<th>64 inch</th>
<th>Flash Hazard Boundary</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.67</td>
<td>cal/cm^2 Flash Hazard at 18 inches</td>
</tr>
<tr>
<td>Category 3</td>
<td>PPE - Category Appropriate</td>
</tr>
<tr>
<td>480 VAC</td>
<td>Shock Hazard when cover is removed</td>
</tr>
<tr>
<td>00</td>
<td>Glove Class</td>
</tr>
<tr>
<td>42 inch</td>
<td>Limited Approach (Fixed Circuit)</td>
</tr>
<tr>
<td>12 inch</td>
<td>Restricted Approach</td>
</tr>
<tr>
<td>1 inch</td>
<td>Prohibited Approach</td>
</tr>
</tbody>
</table>

Bus: WasteWtrUnit  Prot: WT1A 7

Protective Device Names will often not represent true LOTO points in a system so be careful on what your labels reference here..
<table>
<thead>
<tr>
<th>Category</th>
<th>Required Protection FR Clothing</th>
<th>2018 Code again does not discuss what we used to recognize as Category 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category 0*</td>
<td>Untreated Cotton Long Sleeve Shirt, Pants, Safety Glasses, Hearing Protection</td>
<td>*The need for natural fibered garments and general PPE however has not changed!!</td>
</tr>
<tr>
<td>Category 1</td>
<td>AR Shirt, AR Pants, Hard Hat, 4 cal/cm² Face Shield, Safety Glasses, Hearing Protection</td>
<td></td>
</tr>
<tr>
<td>Category 2</td>
<td>AR Shirt, AR Pants, Hard Hat, Balaclava/Hood, 8 cal/cm² Face Shield, Safety Glasses, Hearing Protection</td>
<td></td>
</tr>
<tr>
<td>Category 3</td>
<td>AR Shirt &amp; Pant + AR Coverall, Switching Hood, Safety Glasses, Hearing Protection</td>
<td></td>
</tr>
<tr>
<td>Category 4</td>
<td>AR Shirt &amp; Pant + AR Coverall, Double Layer Switching Coat and Hood, Safety Glasses, Hearing Protection</td>
<td></td>
</tr>
</tbody>
</table>
The levels of PPE in concept when we talk about “categories” has remained consistent from the 2015 Code.

- **PPE Category 1**: Minimum Arc Rating of 4 cal/cm²
  - Arc Rated Clothing:
    - AR long-sleeve shirt and pants, or AR coverall
    - AR face shield, or AR flash suit hood
    - AR jacket, parka, rainwear, or hard hat liner (as needed)
  - Protective Equipment:
    - Hard hat
    - Safety glasses or safety goggles
    - Hearing protection (with inserts)
    - Heavy-duty leather gloves
    - Leather footwear (as needed)

- **PPE Category 2**: Minimum Arc Rating of 8 cal/cm²
  - Arc Rated Clothing:
    - AR long-sleeve shirt and pants, or AR coverall
    - AR flash suit hood, or AR face shield and AR balaclava
    - AR jacket, parka, rainwear, or hard hat liner (as needed)
  - Protective Equipment:
    - Hard hat
    - Safety glasses or safety goggles
    - Hearing protection (with inserts)
    - Heavy-duty leather gloves
    - Leather footwear

- **PPE Category 3**: Minimum Arc Rating of 25 cal/cm²
  - Arc Rated Clothing:
    - As required: AR long-sleeve shirt, AR pants, AR coverall, AR flash suit jacket, and/or AR flash suit pants
    - AR flash suit hood
    - AR gloves
    - AR jacket, parka, rainwear, or hard hat liner (as needed)
  - Protective Equipment:
    - Hard hat
    - Safety glasses or safety goggles
    - Hearing protection (with inserts)
    - Heavy-duty leather gloves
    - Leather footwear (as needed)

- **PPE Category 4**: Minimum Arc Rating of 40 cal/cm²
  - Arc Rated Clothing:
    - As required: AR long-sleeve shirt, AR pants, AR coverall, AR flash suit jacket, and/or AR flash suit pants
    - AR flash suit hood
    - AR gloves
    - AR jacket, parka, rainwear, or hard hat liner (as needed)
  - Protective Equipment:
    - Hard hat
    - Safety glasses or safety goggles
    - Hearing protection (with inserts)
    - Heavy-duty leather gloves
    - Leather footwear (as needed)
Table 130.7(C)(16) Protective Clothing and Personal Protective Equipment (PPE)

<table>
<thead>
<tr>
<th>Hazard/Risk Category 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arc-Rated clothing, minimum Arc Rating of 4 cal/cm². (See Note 3)</td>
</tr>
<tr>
<td>Arc-rated long-sleeve shirt and pants or arc-rated coverall</td>
</tr>
<tr>
<td>Arc-rated face shield (see Note 2) or arc flash suit hood</td>
</tr>
<tr>
<td>Arc-rated jacket, parka, rainwear, or hard hat liner (AN)</td>
</tr>
<tr>
<td>Protective Equipment</td>
</tr>
<tr>
<td>Hard hat</td>
</tr>
<tr>
<td>Safety glasses or goggles (SR)</td>
</tr>
<tr>
<td>Hearing protection (ear canal inserts)</td>
</tr>
<tr>
<td>Heavy duty leather gloves (See Note 1.)</td>
</tr>
<tr>
<td>Leather work shoes (AN)</td>
</tr>
</tbody>
</table>

- Remember this table no longer defines PPE Category 0 however we are still enforcing the minimal PPE expectations on labeling such as Cotton Clothing, Safety Glasses and hearing protection etc.!
2018 Article 130.5 “Picking a Path on Arc Flash Methods”

- The code book gives us two methods to select PPE and assess risk levels.
- The code book PPE category Method or doing Incident Energy Analysis or Engineering to determine exact risk levels.
- You can only pick one path. Cannot use both.

![Symbol for caution]

(F) Arc Flash PPE. One of the following methods shall be used for the selection of arc flash PPE:

1. The incident energy analysis method in accordance with 130.5(G)
2. The arc flash PPE category method in accordance with 130.7(C)(15)

Either, but not both, methods shall be permitted to be used on the same piece of equipment. The results of an incident energy analysis to specify an arc flash PPE category in Table 130.7(C)(15)(c) shall not be permitted.
2018 Article 130.5C Estimation of Likelihood of Occurrence

The code has language and articles in place which were meant to help us with their definition of the pre-project “risk assessment”. Be guarded when taking these general code comments into consideration on Likelihood.

<table>
<thead>
<tr>
<th>Task</th>
<th>Equipment Condition</th>
<th>Likelihood of Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading a panel meter while operating a meter switch.</td>
<td>Any</td>
<td>No</td>
</tr>
<tr>
<td>Performing infrared thermography and other non-contact inspections outside the restricted approach boundary. This activity does not include opening of doors or covers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working on control circuits with exposed energized electrical conductors and circuit parts, nominal 125 volts ac or dc, or below without any other exposed energized equipment over nominal 125 volts ac or dc, including opening of hinged covers to gain access.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examination of insulated cable with no manipulation of cable.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>For dc systems, insertion or removal of individual cells or multi-cell units of a battery system in an open rack.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>For dc systems, maintenance on a single cell of a battery system or multi-cell units in an open rack.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**NFPA 70E Task Based Support Table:**

Table 130.7(C)(15)(A)(a) Arc Flash Hazard Identification for Alternating Current (ac) and Direct Current (dc) Systems

<table>
<thead>
<tr>
<th>Task</th>
<th>Equipment Condition*</th>
<th>Arc Flash PPE Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading a panel meter while operating a meter switch</td>
<td>Any</td>
<td>No</td>
</tr>
<tr>
<td>Normal operation of a circuit breaker (CB), switch, contactor or starter</td>
<td>All of the following:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The equipment is properly installed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The equipment is properly maintained</td>
<td></td>
</tr>
<tr>
<td></td>
<td>All equipment doors are closed and secured</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>All equipment covers are in place and secured</td>
<td></td>
</tr>
<tr>
<td></td>
<td>There is no evidence of impending failure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>One or more of the following:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The equipment is not properly installed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The equipment is not properly maintained</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Equipment doors are open or not secured</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Equipment covers are off or not secured</td>
<td></td>
</tr>
<tr>
<td></td>
<td>There is evidence of impending failure</td>
<td></td>
</tr>
<tr>
<td>For ac systems: Work on energized electrical conductors and circuit parts, including voltage testing</td>
<td>Any</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*Remember the task tables are for those employers who have not formally determined risk levels through actual 70E audits and they are forced to assume PPE needs based on the code book recommendations!*
2018 Table to Define Risk PPE Levels (Table Based). People Would Use This Method Only if No Formal Engineered Label Exists:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Arc Flash PPE Category</th>
<th>Arc Flash Boundary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panelboards or other equipment rated 240V and below</td>
<td>1</td>
<td>485 mm (19 in.)</td>
</tr>
<tr>
<td>Parameters: Maximum of 25 kA short-circuit current available; maximum</td>
<td></td>
<td>(3 ft.)</td>
</tr>
<tr>
<td>of 0.03 sec (2 cycles) fault clearing time; working distance 455 mm (18 in.)</td>
<td></td>
<td>900 mm (3 ft.)</td>
</tr>
<tr>
<td>Panelboards or other equipment rated &gt;240V and up to 600V</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Parameters: Maximum of 25 kA short-circuit current available; maximum</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>0.03 sec (2 cycles) fault clearing time; working distance 455 mm (18 in.)</td>
<td></td>
<td>1.5 m (5 ft.)</td>
</tr>
<tr>
<td>600-V class motor control centers (MCCs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parameters: Maximum of 65 kA short-circuit current available; maximum</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>of 0.03 sec (2 cycles) fault clearing time; working distance 455 mm (18 in.)</td>
<td>2</td>
<td>4.3 m (14 ft.)</td>
</tr>
<tr>
<td>600-V class motor control centers (MCCs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parameters: Maximum of 42 kA short-circuit current available; maximum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>of 0.33 sec (20 cycles) fault clearing time; working distance 455 mm (18 in.)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>600-V class switchgear (with power circuit breakers or fused switches)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>and 600 V class switchboards</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parameters: Maximum of 35 kA short-circuit current available; maximum</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>up to 0.5 sec (30 cycles) fault clearing time; working distance 455 mm (18 in.)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Other 600-V class (277V through 600 V nominal) equipment</td>
<td>1</td>
<td>1.5 m (5 ft.)</td>
</tr>
</tbody>
</table>
When does the “Work Permit” discussion come into play?

There are two categories of what we consider “Working On” and it is assumed your employees are wearing/using appropriate PPE!!

**Diagnostic (testing)** is taking readings or measurements of electrical equipment with approved test equipment that does not require making any physical change to the equipment

**Repair** is any physical alteration of electrical equipment (such as making or tightening connections, removing or replacing components, etc.

Only “Repair” related tasks require permits. This does not mean we don’t evaluate risks before we open doors and troubleshoot equipment but if we aren’t fixing or repairing equipment under energized load, then we don’t need a written permit.
2018 Article 130.2 on Work Permits:


(B) Energized Electrical Work Permit.

(1) When Required. When work is performed as permitted in accordance with 130.2(A), an energized electrical work permit shall be required and documented under the any of following conditions:

(1) When work is performed within the restricted approach boundary
(2) When the employee interacts with the equipment when conductors or circuit parts are not exposed but an increased likelihood of injury from an exposure to an arc flash hazard exists
Do We Consider Exposures in Enclosures Correctly?:

Enclosure:

Note: When you consider electrical exposure you must consider the entire enclosure. Often we see people interpreting “exposures” incorrectly.
130.2 Electrically Safe Working Conditions:

130.2(B): Exemptions to Work Permit. Some Wording Changes in 2018

(3) Exemptions to Work Permit. Electrical work shall be permitted without an energized electrical work permit if a qualified person is provided with and uses appropriate safe work practices and PPE in accordance with Chapter 1 under any of the following conditions:

(1) Testing, troubleshooting, or voltage measuring
(2) Thermography, ultrasound, or visual inspections if the restricted approach boundary is not crossed
(3) Access to and egress from an area with energized electrical equipment if no electrical work is performed and the restricted approach boundary is not crossed
(4) General housekeeping and miscellaneous non-electrical tasks if the restricted approach boundary is not crossed
What Constitutes Valid Reasons to Work on Energized Equipment?

1. **Additional hazards or Increased risk:** Employer must demonstrate that de-energizing introduces additional hazards or increased risks to the employee.

2. **Infeasibility:** Employer must demonstrate that the task to be performed is infeasible in a de-energized state due to the equipment design or operational limitations. *(Be very cautious of discussing costs or money in any way if you chose to use this)*

3. **Less than 50 volts:** Self explanatory...
Work Permit Question – “Can I change a fuse in this Bucket”?:

- If the MCC handle is in the Off Position is there a risk?:
- Does working in this open bucket create a conflict with any “live work” conversations?
There are no good defined statements in the OSHA circles to rely on but between NFPA 70E article 130.2 and IEEE comments above, both are saying that we can’t rely on the breaker alone to lower downstream energy levels **if we have no isolation/separation of equipment sections**. Arc Flash ratings then apply to the entire enclosures!!

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WORK PERMIT EXAMPLE:

- It is more important to learn how to fill these out and what they mean so you can help others and also manage expectations with staff on being complete in documentation!
Flow Chart on Daily Internal LOL Work Requests:

Job Request

What is the Voltage?
- 50 Volts or more
  - Are there any exposed energized parts?
  - Testing, Troubleshooting, voltage measuring, or visual inspection only?
- Less than 50 Volts
  - The decision to de-energize should include consideration of the capacity of the electrical source and any overcurrent protection (fuse or circuit breaker) between the source and the worker.
  - Follow equipment label or faith safety matrix for appropriate PPE to be worn within defined boundaries.

Physical Alterations of Equipment Required?
- Will any physical alterations be done, such as but not limited to making or tightening connections, removing or replacing components, pulling wire, drilling holes, or running pipe?

Will the equipment be put in an electrically safe work condition?
- De-Energized
- Locked out
- Tested
- Grounded

Energized Work Only Allowed When
1. De-energizing introduces a greater hazard
2. De-energizing is infeasible due to equipment design or operational limitations
3. Equipment operates at less than 50V

Energized Electrical Work Permit Required. Contact Safety Department.

Identify the hazard, test before touch, follow all safe work practices that apply.

Steps for Establishing an Electrically Safe Work Condition
1. Determine all sources of electrical supply. Check up-to-date drawings, one-lines, etc.
2. After interrupting the load current, open the disconnecting device(s) for each source.

Appropriate PPE required during absence of voltage testing procedures!!!

4. Apply Lockout/Tagout devices in accordance with a documented and established policy.
5. Use adequately rated voltage detector to verify parts are de-energized.
6. Where possibility of stored energy exists, ground

Confirmation the equipment has been placed in an electrically safe work condition?
- De-Energized
- Locked out
- Tested
- Grounded

Proceed to work safely.
Alternate Design Considerations on Control Cabinets:

In this application, the customer chose to have the control cabinet built with the internal disconnect switch entirely enclosed which is one method of creating more isolation!

Another consideration might be to simply use a common OEM disconnect and mount it on the outside of the cabinet. Always watch to ensure UL ratings are maintained too!
Installation Designs That Can Benefit Maintenance:

How can we design systems differently to make maintenance more practical and less challenging to perform?

Customer followed our simple design goal to separate the new service sections. The resulting arc flash outcome was a dangerous no live entry on the left incoming section and a HRC 1 on the right load center.

This application allows the employer to schedule their own controlled down time easier with no utility involvement.
2017 NEC Code 240.87 on Arc Energy Réduction:

(A) Documentation. Documentation shall be available to those authorized to design, install, operate, or inspect the installation as to the location of the circuit breaker(s).

(B) Method to Reduce Clearing Time. One of the following means shall be provided:

1. Zone-selective interlocking
2. Differential relaying
3. Energy-reducing maintenance switching with local status indicator
4. Energy-reducing active arc flash mitigation system
5. An instantaneous trip setting that is less than the available arcing current
6. An instantaneous override that is less than the available arcing current
7. An approved equivalent means

Informational Note No. 1: An energy-reducing maintenance switch allows a worker to set a circuit breaker trip unit to “no intentional delay” to reduce the clearing time while the worker is working within an arc-flash boundary as defined in NFPA 70E -2015, *Standard for Electrical Safety in the Workplace*, and then to set the trip unit back to a normal setting after the potentially hazardous work is complete.

When we look at NEC Code for installation of systems, it is clear that the NEC is trying to drive better/safer systems for NFPA 70E hazard reductions within new installations.
Orderly Shut Down Processes Rely Heavily on Functional Prints: Review of Internal One-Lines....:
Defining One-Line Diagrams?? What should we use these for?

One-Line Diagrams are a functional support tools for organized outages and daily LOTO goals. If we don’t have an up to date One-Line Diagram, we don’t have a good method to manage risks.

(C) Lockout/Tagout Procedure.

A lockout/tagout procedure shall be developed on the basis of the existing electrical equipment and system and shall use suitable documentation including up-to-date drawings and diagrams.
One-Line Diagram Variations Exist Based on Opinions:

- Common to see Engineering Software based drawings that look similar but can lack detail.
- Breaker ID for LOTO Missing?
- Breaker MFG? or Cat #?

- What is PP-20-002?
- How many loads does it serve?
Scope Content & How to Dissect Them: (Drawings)

• From the beginning the term “One-Line Diagrams” has been widely interpreted in structure or value. Software systems can all create a drawing but these can lack depth and value.

Engineering Driven One-Line Prints Definitions

“The short-circuit calculations will be accompanied by a bus-to-bus listing of all the system impedances referenced to the completed system one-line diagram.”
“An computer printout for each study condition will accompany the report for record purposes.”
-G Energy

“Provide a short circuit study, protective device evaluation and a coordination study from the single-line diagram and field data. A single-line diagram of the electrical system in the analysis software output format covered by the scope of work will be included in the report.”
-Em

“Our AutoCAD department will create a newly designed electrical print. The AutoCAD print will be created in the SKM Power Tools Tutorial database and bordered to fit your requirements.”
“SKM excel files will be used to create final labeling and reference bus names and protective device information created from our data collection process.”
-Faith Technologies
Value Based Engineering Reports: Changing how we Install Equipment Today vs the Past.

Arc Flash Mitigation Table

<table>
<thead>
<tr>
<th>Location (Sheet #)</th>
<th>Protective Device</th>
<th>Initial Setting or Device</th>
<th>Present Cal/cm² and Category</th>
<th>Recommended Change</th>
<th>Coordination for Engineering Recommendations</th>
<th>New Cal/cm² and Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSB (EE201)</td>
<td>UTILITY</td>
<td>Utility Relay</td>
<td>116.1</td>
<td>Install new isolated breaker disconnect before MSB using SQ-D type RJ 2000 amp breaker; set at: LTPU=1, LTD=8, INST=3</td>
<td>Adjust MSB-4 to INST=2, adjust MSB-7 to INST=3, adjust MSB-1 to INST=5</td>
<td>Category 1</td>
</tr>
</tbody>
</table>

Figure 1 Example of a separate isolated breaker disconnect.

<table>
<thead>
<tr>
<th>Item #</th>
<th>Location (Sheet #)</th>
<th>Protective Device</th>
<th>Initial Setting or Device</th>
<th>Present Cal/cm(^2)</th>
<th>Hazard Class</th>
<th>Recommended Change</th>
<th>New Cal/cm(^2)</th>
<th>Hazard Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TURB-SWGR (E-002)</td>
<td>GEN-1, GEN-2 &amp; RESER-SWGR-CAB-1B</td>
<td>CO-6 Relay set at: 1200A, Tap=5.0, Time=4.0, GEN-1 and GEN-2</td>
<td>49</td>
<td>Dangerous!</td>
<td>Remove utility feed at RESERVIOR-SWGR-CAB-1B</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>CP-44-PKR-B (E-101)</td>
<td>CP-44-PKR</td>
<td>Shawmut type AJT 250 amp fuses</td>
<td>1.7</td>
<td>1</td>
<td>Replace CP-44PKR fuses with Bussmann type LPS-RK 250 amp fuses</td>
<td>0.44</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>CP-45A-1 (E-109)</td>
<td>MCC-Z45C-6E</td>
<td>Sq-D 60 amp breaker</td>
<td>3.3</td>
<td>1</td>
<td>Install a fused disconnect before CP-45A-1 using Bussmann type LPS-RK 60 amp fuses</td>
<td>0.05</td>
<td>0</td>
</tr>
</tbody>
</table>
Qualified Persons “Big Picture Decision Process”:

- Proper use of precautionary techniques?
- Proper PPE, including arc-flash & shock protection?
- Selecting Proper Insulated tools for the tasks?
- Demonstrates how to select and use a correct voltage meter?
- Decision-making process used to determine the degree and extent of the hazard & how to identify hazards?
Using Proper Meters:

Double check your meter to ensure it is current.

New
1000 V CAT III and 600 V CAT IV meters designed to withstand 8000 V transients

Use meters with these markings: 1000 V CAT III or 600 V CAT IV

Old
Fluke Meters designed to older standards do not show category rating on front of instrument

Do not use meters without proper CAT markings on 480 V circuits

Please make sure your meter leads are correct.
Troubleshooting Does Present Hazards:

Incorrect fuse used in multi-meter
Commonly Even Low Voltages Create Real Risk.....
Buy Quality Tools! Look for ASTM References Too:

Look for this symbol to indicate approved tools but be careful:

The tool should be **ASTM** tested so look for **ASTM** references!

Δ 1000 V

Once the screw is set in the holder, you don’t have to touch it again. Both the handle and shanks are insulated against up to 1000 volts, only the chrome vanadium tips are exposed.

- Pieces: 5
- Design: flat and cross point
- Description: 5 x 150, 4 x 125, and 3 x 125 mm flat points, 6 x 175 No. 2, and 4 x 125 No. 1 cross points
- Shipping weight: 1 lb.
Voltage Rated Glove Use:

- First line of defense
- Choose the right size
- Leather protectors must be worn over the rubber gloves
- Gloves must be dielectrically tested
  - Before first issue and every 6 months
  - If tested, but not issued for service, glove may not be put into service unless tested within previous 12 months.
- Checked before use
  - Roll-up test
  - Inflator test
Within Your Programs, Inventory and Publish Your Safety Equipment for Staff”:

**ELECTRICAL SAFE WORK PRACTICE - SAFETY EQUIPMENT**

BE PREPARED, FROM FIRST AID KITS FOR EMERGENCIES TO FALL PROTECTION WHEN WORKING ATOP ELECTRICAL GEAR.

**LIVE WORK / HIGH VOLTAGE**

12 Calorie Hot Work Kit:

Kit consists of a hard hat/face shield, jacket, bib over pants, danger tape, HV glove tester & dust, washing instructions, and a copy of Faith’s Safety policy re: Energized work in a duffel bag.

*Note: Individual replacement pieces are available.*

45/51 Calorie Hot Work Kit:

Kit consists of a hard hat, hood, jacket, bib overalls, danger tape, HV glove tester & dust, washing instructions, and a copy of Faith’s Safety policy re: Energized work in a duffel bag.

*Note: Individual replacement pieces are available.*

**HV Gloves:**

*Classes & sizes available from shop are:*

Class 00, 0, 2, & 4 in Sizes 9, 10 & 11
Ties NFPA 70E has with Maintenance:

NFPA 70E Defines Maintenance in chapter 2:

Chapter 2 Safety-Related Maintenance Requirements

ARTICLE 200 Introduction

200.1 Scope. Chapter 2 addresses the requirements that follow.

(1) Chapter 2 covers practical safety-related maintenance requirements for electrical equipment and installations in workplaces as included in 90.2. These requirements identify only that maintenance directly associated with employee safety.

(2) Chapter 2 does not prescribe specific maintenance methods or testing procedures. It is left to the employer to choose from the various maintenance methods available to satisfy the requirements of Chapter 2.

(3) For the purpose of Chapter 2, maintenance shall be defined as preserving or restoring the condition of electrical equipment and installations, or parts of either, for

facturers’ instructions or industry consensus standards to reduce the risk associated with failure. The equipment owner or the owner’s designated representative shall be responsible for maintenance of the electrical equipment and documentation.

Informational Note: Common industry practice is to apply test or calibration decals to equipment to indicate the test or calibration date and overall condition of equipment that has been tested and maintained in the field. These decals provide the employee immediate indication of last maintenance date and if the tested device or system was found acceptable on the date of test. This local information can assist the employee in the assessment of overall electrical equipment maintenance status.

205.4 Overcurrent Protective Devices. Overcurrent protective devices shall be maintained in accordance with the manufacturers’ instructions or industry consensus standards. Maintenance, tests, and inspections shall be documented.
Ties NFPA 70E has with NFPA 70B Standards:

NFPA 70B has more suggestive code references than NFPA 70E meaning this code seems more soft in written content than some codes but it still does get referred to when incidents or failures occur and it is a common “go to” reference guide for insurance carriers and third party litigation experts:

Common Questioning we Ask Employers:
• How do we evaluate effective elements of EPM Program needs?

5.2 Essential Elements of an EPM Program. An EPM program should consist of the following essential elements:

(1) Responsible and qualified personnel
(2) Regularly scheduled inspection, testing, and servicing of equipment
(3) Survey and analysis of electrical equipment and systems to determine maintenance requirements and priorities
(4) Programmed routine inspections and suitable tests
(5) Accurate analysis of inspection and test reports so that proper corrective measures can be prescribed
(6) Performance of necessary work
(7) Concise but complete records
2015 Additions for Maintenance

205.3 General Maintenance Requirements:
Electrical equipment shall be maintained in accordance with manufacturers’ instructions or industry consensus standards to reduce the risk associated with failure. The equipment owner or the owner’s designated representative shall be responsible for the maintenance of the electrical equipment and documentation.
205.3 General Maintenance Requirements:

- Commonly, many companies focus primary attention on breakers or loads 400 amps or larger considering smaller loads are common or considered “off the shelf” items.
- Focus on some “high maintenance” items or those equipment types that may pose a greater level of maintenance such as bolted pressure switches. These types of equipment have many moving parts and require special lubricants and exercising regularly.
Switchgear Testing Inventory Plans:

When performing maintenance/testing on your main electrical systems, please incorporate a good inventory program on equipment and tools used for the testing....

It would be bad to leave behind tools or equipment inside when you go to re-energize the systems.

The worst example would be to leave grounding jumpers in place accidentally and then energize your system!
OSHA Connections to Maintenance:

OSHA 1910.303(b)(5)...

*Adds requirements for the coordination of over current protection for circuits and equipment.
Identifying the often forgotten risk factors on electrical systems is something that OSHA has covered already!!!!

Maintenance and working condition of key electrical systems is one of those topics that any accident investigation will seek for supporting documentation!
What does a new PPE Arc Flash Hood Look Like?
PPE is Designed to Create Survivable Outcomes.

This PPE did its Job!
Remember What the “Before” Looked Like?
(I Need Three Volunteers).

• Safety Director?
• Maintenance/Qualified Employee?
• OSHA Compliance Officer?
You will go back to your Facility after today and:

- **Safety Director** to **Maintenance Electrician**:
  - “I just learned about arc flash and blast, it scared the bleep out of me.”
  - “Do you work energized?”

- **Electrician** to **Safety director**:
  - “I always turn it off”

Safety Director’s response: **Thank You!!**
Now we have an OSHA inspection

- **OSHA Officer** to **Safety Director**:
  - What do you have for an Electrical Safe Work Practice program?

- **Safety Director** to **OSHA**:
  - “We never work energized we lock it out all the time”.

- **OSHA Officer** to **Safety Director**:
  - That’s good, well let’s get started and go out to do the walk around inspection of your facility.
• **OSHA Officer** to **Maintenance Electrician**:
  - What kind of testing devices do you have?

• **Electrician** to **OSHA**
  - I have an ammeter, phase tester, a Volt Ohm Meter (VOM) from *****, a solenoid tester, an electrical field tester, and a few others.

• **OSHA** to **Maintenance Elec.**
  - What do you have to for PPE?

• **Electrician** to **CSHO**, Safety glasses and a hard hat with muffs

• **OSHA** response….HMMMMMMMM??
• **OSHA to Maintenance Elec**: How old is this place?

• **OSHA to Maintenance Elec**: What kind of a system do you have to maintain?

• **Maintenance Elec to OSHA**: This place is 40 years old and we have added a lot of new equipment. The only new stuff is the buss bar on the new line.

• **OSHA to Maintenance Elec**: Do you have any of those old 70s breakers?

• **Maintenance Response**: Yes, We replace them when they fail.
• **OSHA** to **Maintenance Elec:**
  - Do you have a one line diagram?

• **Maintenance Response:** “Somewhere I think”

• **OSHA** to **Maintenance:**
  - So when you have to trouble shoot a problem in this old plant what do you use.

• **Maintenance Response:** “I’ve been in this plant for 29 years”

• **OSHA:** Any other new guys like you?

• **Maintenance Response:** “yea Curly and Mo retired so they hired Larry We are training him”
• **OSHA to Maintenance Elec:**
  - What is your up time goal?

• **Maintenance Response:** 90%

• So when you troubleshoot and find the problem, you always turn the power off?

• **Maintenance Response:** Welllllllllllllllllllllll. Sometimes we can’t

• When can’t you?

• **Maintenance Resp:** The new line has one main disconnect, that kills the program if you turn it off. We did it once and the production supervisor had a fit.
• **OSHA** to **Maintenance Elec:**
  ▪ Any other times that you can’t turn it off?

• **Maintenance Resp:** No

• **OSHA** to **Maintenance:** You mean you know where every thing is fed from?

• **Maintenance:** Wellllllllllll, most of the time

• **OSHA** to **Maintenance:** What about your new guy Larry

• **Maintenance Resp:** Oh he is just learning

• **OSHA Comment:** So he guesses??
OSHA to Maintenance Electrician

- Could I look in your tool box?????
Electricians’ Tools

- Electrical Tape as Insulation
- Gouge – Weld Mark
OSHA to Maint Electrician Comments

• So you do work energized,
• Your tools are not rated,
• You have no idea of the calorie levels to which you are exposed,
• You have no arc PPE and you work hot swapping buss plugs from a ladder.
• You don’t have any live work procedures.

• Maintenance Response to OSHA: Yea, but I am careful!
OSHA to Safety Director:

• You were made aware of Arc Flash and Blast at ABC Company.
• You have ignored all of the hazards
• You will be receiving correspondence from us in the future. Now let us discuss some abatement dates.
Ending Thoughts:

• The 2018 NFPA 70E code book has some interesting new revisions but don’t get distracted from the fundamental goals of electrical safety and your role as a “qualified employee”!!

• Key Goals From Today’s Training:
  – Focus on finding ways to always get equipment to a “de-energized” state and use appropriate PPE and meters.
  – Find ways to talk with other company members like production etc. and work to schedule times to fix equipment. DO NOT RUSH into fixing things in an improper manner!
  – Test and check PPE regularly and make sure your gloves are safe.
  – Always read PPE exposures correctly on labeling
  – Never trust upstream LOTO references and check to ensure you have correctly locked out all upstream power sources!
Questions: