Flexible Packaging Association

Electrical Safety – Arc Flash
NFPA 70E
Implementation
Introductions

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What Causes an Arc Flash??
Unexpected Equipment Hazards
Equipment Deteriorates with Age!
How Long Until Failure?
Proper Insulating Means?
NFPA 70E Overview

NFPA 70E states that all facilities must provide the following:

• A safety program with defined responsibilities for employees both (qualified and unqualified)

• Analysis for arc flash hazard degree

• Personal protective equipment (Clothing and tools, etc.) for all workers involved

• Training for all workers

• Correct warning labels on all electrical equipment
Written Electrical Safety Program

- Employers must have a written program
- Programs must be specific to the environment
  - As safety folks, we all share materials. Make sure you tweak the standard template to be tailored to your needs.
Elements of a Written Program

➢ Ask your electrical folks what tasks they consider ‘routine’
➢ Compile a list of routine electrical tasks
➢ Add tasks that may be infrequent or emergency related
An electrical safety program is required to identify the procedures for working on or near live parts operating at 50 volts or more or where an electrical hazard exists before work is started.
The Key is to PLAN Before Working
Maintenance Dept or Contractor???

- At this point, evaluate your contractors too.
- 70E has Multi-Employer language, so joint responsibility is created.
- Share your information with outside contractors
- Enforce your rules on contractors
Multi-Employer Language

110.4 Multiemployer Relationship.

(A) Safe Work Practices. On multiemployer worksites (in all industry sectors), more than one employer may be responsible for hazardous conditions that violate safe work practices.
Outside personnel (contractors, etc.).

(B) Outside Personnel (Contractors, etc.). Whenever outside servicing personnel are to be engaged in activities covered by the scope and application of this standard, the on-site employer and the outside employer(s) shall inform each other of existing hazards, personal protective equipment/clothing requirements, safe work practice procedures, and emergency/evacuation procedures applicable to the work to be performed. This coordination shall include a meeting and documentation.
Determination and Monitoring of Work on Live Systems.

- The onsite employer or its designee shall decide whether electrical contractor or maintenance work on lines and systems is to be performed in an energized or de-energized manner.
Pitfalls to Avoid w/ Contractors

- Don’t assume your contractor is compliant
- Don’t view hiring a contractor as a substitute for doing your own evaluation – liability still exists.
- Ask for written company programs and training records as verification
The 70E requirements do not specify what these procedures must be.

Examples are provided in Annex E for informational purposes.
Annex E.3 Typical Electrical Safety Program Procedures

Electrical safety program procedures can include, but are not limited to, the following:

- Purpose of task
- Qualifications and number of employees to be involved
- Hazardous nature and extent of task
- Limits of approach
Annex E.3 Typical Electrical Safety Program Procedures

Electrical safety program procedures can include, but are not limited to, the following:

- Safe work practices to be utilized
- Personal protective equipment involved
- Insulating materials and tools involved
- Special precautionary techniques
Annex E.3 Typical Electrical Safety Program Procedures

Electrical safety program procedures can include, but are not limited to, the following:

➢ Electrical diagrams
Annex E.3 Typical Electrical Safety Program Procedures

Electrical safety program procedures can include, but are not limited to, the following:

- Equipment details
- Sketches/pictures of unique features
- Reference data
Program Elements

- Statement about energized work
- Methods to verify electrically safe work condition
- Live Work Permits
- Lockout / Tagout
- Training
- PPE
- Tools
Statement on Energized Work

- Easy to put in writing
- Extremely difficult to put in practice
- This represents a major cultural shift
- Currently, most electricians view live work as a normal part of their job
Culture

Too often a culture is in place where:

- there is a tendency to routinely work on or near electrical circuits while energized
- workers are expected and allowed to work energized
- electricians believe that working energized is part of their job or expected of them
- contractors have customers with unrealistic expectations when it comes to energized work
The tendency to accept the risk of an electrical injury must change to recognize that risk of an electrical injury is unacceptable.

It is important for this to be recognized by all involved in the decision-making process.
Methods to Verify Electrical Safe Work Condition

- Testing & Measuring is one of the four largest causes of accidents
- This is often overlooked
- Testing is an important part of every LOTO operation
Voltage Testing Can Be Fatal!

Incorrect fuse used in multi-meter
Employee Training

- All employees need some level of training
- How many of your middle managers would feel comfortable troubleshooting a power outage?
- Need to clearly define limits for all personnel
Unqualified Persons

Unqualified Persons. Unqualified persons shall be trained in and be familiar with any of the electrical safety related practices that might not be addressed specifically by Chapter 1 but are necessary for their safety.
Employee Training

- Qualified Personnel
  - Need to be trained and familiar with the specific equipment that they’re working
  - Often accidents happen when employees aren’t familiar with the equipment they’re working

- How do you verify this?
- How do you document it?
Qualifications

- Safety related training is over and above the ‘trade’ training
- You may want to consider testing
  - Written – to verify knowledge of procedures
  - Hands-on – to verify application in the real world
Qualified Persons

(1) Qualified Person. A qualified person shall be trained and knowledgeable of the construction and operation of equipment or a specific work method and be trained to recognize and avoid the electrical hazards that might be present with respect to that equipment or work method.
How do you handle the ‘qualified’ employee who you bring on as a new hire?

- Documentation of training?
- Are they qualified on your electrical systems?
- Do you test them?
- Do you observe them?
Employee Training

- What about apprentices and trainees?
- At what point in their training are they allowed to work energized?
- Who mentors them?

- All of these issues need to be addressed in your electrical safety program.
Proper Hazard Assessment??

- All personnel must be trained
- Avoid overly general policies
- PPE should be specific to the level of the hazard
Energized Electrical Work Permit

(1) Where Required. If live parts are not placed in an electrically safe work condition (i.e., for the reasons of increased or additional hazards or infeasibility per 130.1), work to be performed shall be considered energized electrical work and shall be performed by written permit only.
Energized Electrical Work Permit

- (3) Exemptions to Work Permit.

- Work performed on or near live parts by qualified persons related to tasks such as testing, troubleshooting, voltage measuring, etc., shall be permitted to be performed without an energized electrical work permit, provided appropriate safe work practices and personal protective equipment in accordance with Chapter 1 are provided and used.
Live Work Permit

- Intended to prevent ‘spontaneous’ live work
- Is a pre-planning tool
- Requires management approval for tasks
- Becomes an outline for the job briefing
Job Briefing

- Before starting each job, the employee in charge shall conduct a job briefing with the employees involved.
- The briefing shall cover such subjects as hazards associated with the job, work procedures involved, special precautions, energy source controls, and personal protective equipment requirements.
Job Briefing

- If the work or operations to be performed during the work day or shift are repetitive and similar, at least one job briefing shall be conducted before the start of the first job of the day or shift.

- Additional job briefings shall be held if significant changes that might affect the safety of the employees occur during the course of the work.
Job Briefing

- A brief discussion shall be satisfactory if the work involved is routine and if the employee, by virtue of training and experience, can reasonably be expected to recognize and avoid the hazards involved in the job.

- A more extensive discussion shall be conducted if the work is complicated or particularly hazardous, or if the employee cannot be expected to recognize and avoid the hazards involved in the job.
Job Briefing

- Annex I contains an example of what a Job Briefing and Planning Checklist could look like
- Includes elements for a Job Briefing and Planning Checklist
NFPA Tables [130.7 (C) (9)] can be used until an engineering study is complete.

The tables by themselves can be challenging to understand.

They certainly are too complicated to use for every single task.
Create a combination of tables for your company that is:

- Easy to understand
- Specific to your PPE program
- Detailed
- Tailored to the tasks you might encounter
Why PPE?
There are dozens of clothing vendors
Don’t buy from the first one who calls on you
Select PPE based on:
- Protection
- Comfort
- Ease of use
- Ease of care & laundering
### Fabric Selection

**Arc Thermal Performance Value (ATPV):** Amount of heat energy in calories/cm² a fabric or garment is rated to protect the wearer from a second degree burn.

<table>
<thead>
<tr>
<th>Fabric</th>
<th>Weight*</th>
<th>ATPV (E₀)**</th>
<th>HAF***</th>
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<td><strong>SHIRTING FABRICS</strong></td>
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<td>Aramid/FR Rayon Blend</td>
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<td>Nomex IIIIA</td>
<td>7.5 (254)</td>
<td>6.8</td>
<td>66</td>
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Gloves

- This is one area where you don’t want to over-protect

- Two key factors to gloves:
  - *Sized* to fit the employee
  - *Rated* for voltage

- Remember, we have to be able to manipulate tools & small parts!
<table>
<thead>
<tr>
<th>Class</th>
<th>Max Use Voltage</th>
<th>AC Test Voltage</th>
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</thead>
<tbody>
<tr>
<td>00 Beige</td>
<td>500v</td>
<td>2.5Kv</td>
</tr>
<tr>
<td>0 Red</td>
<td>1Kv</td>
<td>5Kv</td>
</tr>
<tr>
<td>2 Yellow</td>
<td>17Kv</td>
<td>20Kv</td>
</tr>
<tr>
<td>3 Green</td>
<td>26.5Kv</td>
<td>30Kv</td>
</tr>
<tr>
<td>4 Orange</td>
<td>36Kv</td>
<td>40Kv</td>
</tr>
</tbody>
</table>
Gloves

- Need to establish procedures for tracking, testing & maintaining gloves.
- Gloves need electrical tests at six month intervals
- Inspection required every use
- If you don’t track your gloves, how do you know if they’re current?
Other Protective Equipment

Insulated Tools must be:

- rated for the voltages on which they are used
- be designed and constructed for the environment to which they are exposed and the manner in which they are used
- be protected from damage to the insulating material
Other Protective Equipment

The employer must:

- demonstrate why equipment must be worked on or near in an energized state
- require employees to use insulated tools when working on or near equipment that is not placed in an electrically safe work condition
additional types of equipment that *NFPA 70E* address:

- Fuse or Fuse Holding Equipment
- Ropes and Handlines
- Fiberglass-Reinforced Plastic Rods
- Portable Ladders
additional types of equipment that *NFPA 70E* address:

- Protective Shields
- Rubber Insulating Equipment
- Voltage Rated Plastic Guard Equipment
- Physical or Mechanical Barriers
Safe Workplace, or Never Ending Accidents?

We can stop the cycle of electrical incidents!