

NFPA 70E PPE Best Practices 2021



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Our Agenda

Understanding the Hazards

Evolution of NFPA 70E

Risk Assessments

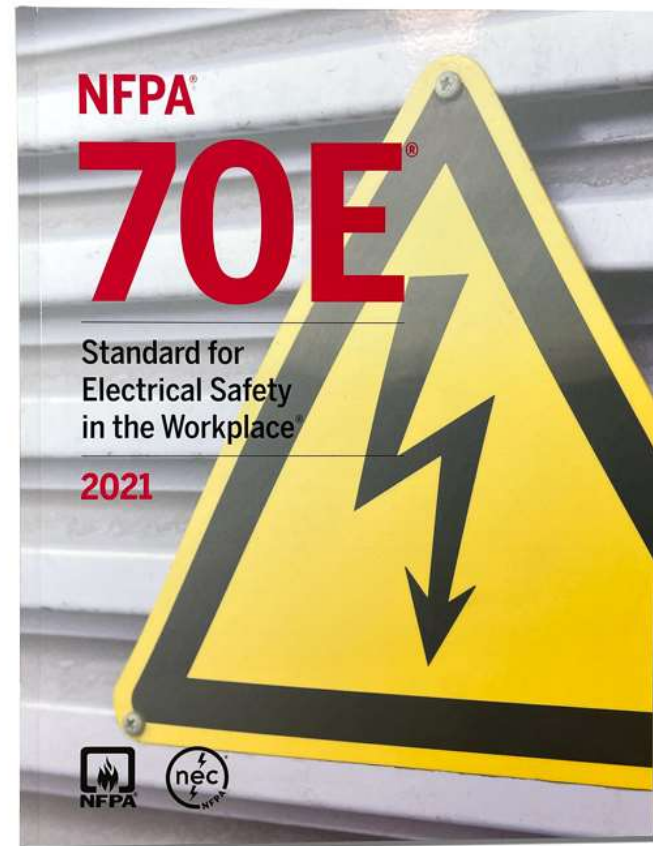
Hand & Head Protection

Care, Maintenance, &
Proper Use

Best Practices

Conclusions & Next Steps

Questions




Respecting the Hazards

Arc Flash Hazard:

A dangerous condition associated with the possible **release** of energy caused by an electric arc.

Shock Hazard:

A dangerous condition associated with the possible release of energy caused by **contact** or approach to energized electrical conductors or circuit parts.

 WARNING	
Arc Flash and Shock Hazard Appropriate PPE Required	
6.5 cal/cm² @ 18"	Nominal System Voltage 480V Arc Flash Boundary 38" Limited Approach Boundary 42" Restricted Approach Boundary 12" Prohibited Approach Boundary 1"
PPE: Reference NFPA 70E-2012 Table 130.7 (C)(16)	
Equipment Bus: PAINT ROOM MCC-1 Lockout Device: MDP-1 3B Date: 1/1/14 Reference Document: IEEE Std 1584 through 1584b-2011	

Not IF, but When

Statistics:

30,000 arc
flashes/year (NFPA)

7,000 result in injury
(OSHA)

2,000 admitted to
burn center

300-400 fatalities
annually



Why an Arc Flash is Dangerous

You don't get just
one...you get them
ALL!

Heat

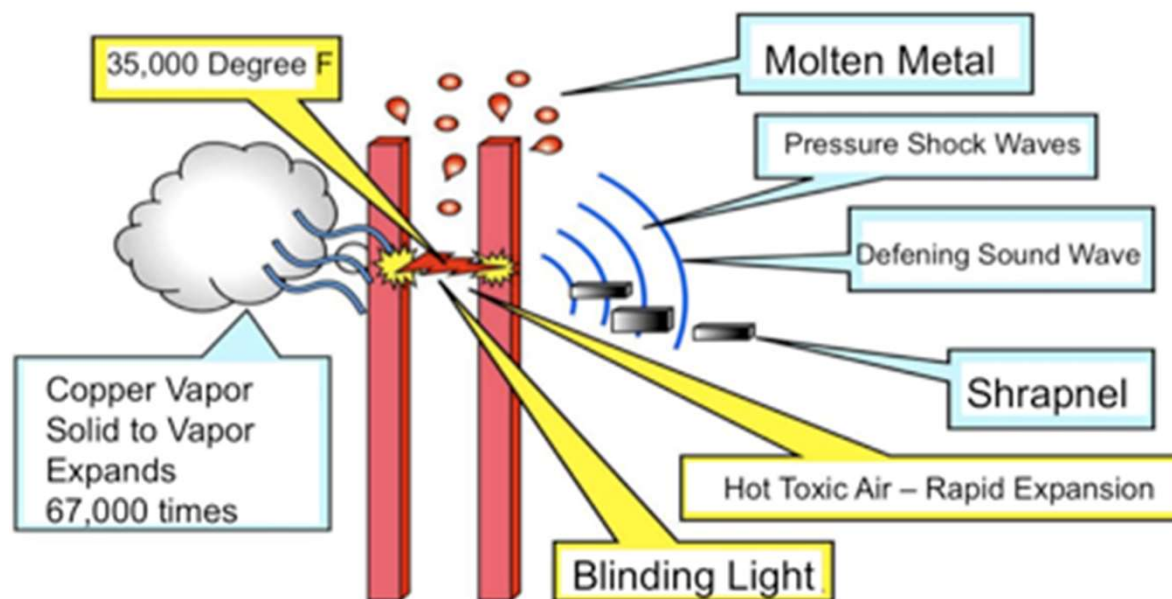
Molten Metal

Sound

Toxic Air

Pressure

Shrapnel



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SAFETY > ARC FLASH

OSHA Investigating Arc Flash Incident at Veterans Affairs

SAFETY > ARC FLASH

OSHA Investigating Arc Flash Incident at Veterans Affairs Hospital

Two workers were injured on Tuesday while they were working on an energized electrical panel

The federal Occupational Safety and Health Administration is investigating an electrical arc flash event at the construction site of a Veterans Affairs hospital in Tallahassee, Fla.

According to a [report from *The Tallahassee Democrat*](#), two workers were injured on Tuesday while they were working on an energized electrical panel.

Dispatch notes from a Tallahassee Fire Department incident report said two men were involved in an electrical accident while working in a high-voltage area in a maintenance room. The report said power to the source was turned off after the incident.

Leon County Emergency Medical Services took one person to Tallahassee Memorial HealthCare. The other was flown to Shands Hospital in Gainesville. Details of their injuries were unavailable on Wednesday.

Yes, Hospitals Too

Common Causes of Arc Flash

Lack of properly de-energizing equipment

Uninsulated Tools

Phase to Phase Contact

Phase to Ground Contact

Rodents, Bees, Reptiles

Any element in a breaker or service area, that could compromise the distance between energized components



Understanding Body Burn

1st Degree

Red skin, no blister

2nd Degree

Blisters, Epidermis must regenerate

3rd Degree

Full thickness burn, skin cannot regenerate, & scar tissue forms

4th Degree

Damage to muscle & bone

Inhalation Injuries



Sources: Burn Survivor Resource Center: http://burnsurvivor.com/burn_types_first

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The Cost of Body Burn

Direct Costs:

Medical

Wage Indemnity

Claims & Admin Fees

Additional Costs:

General Liability Costs &
Litigation

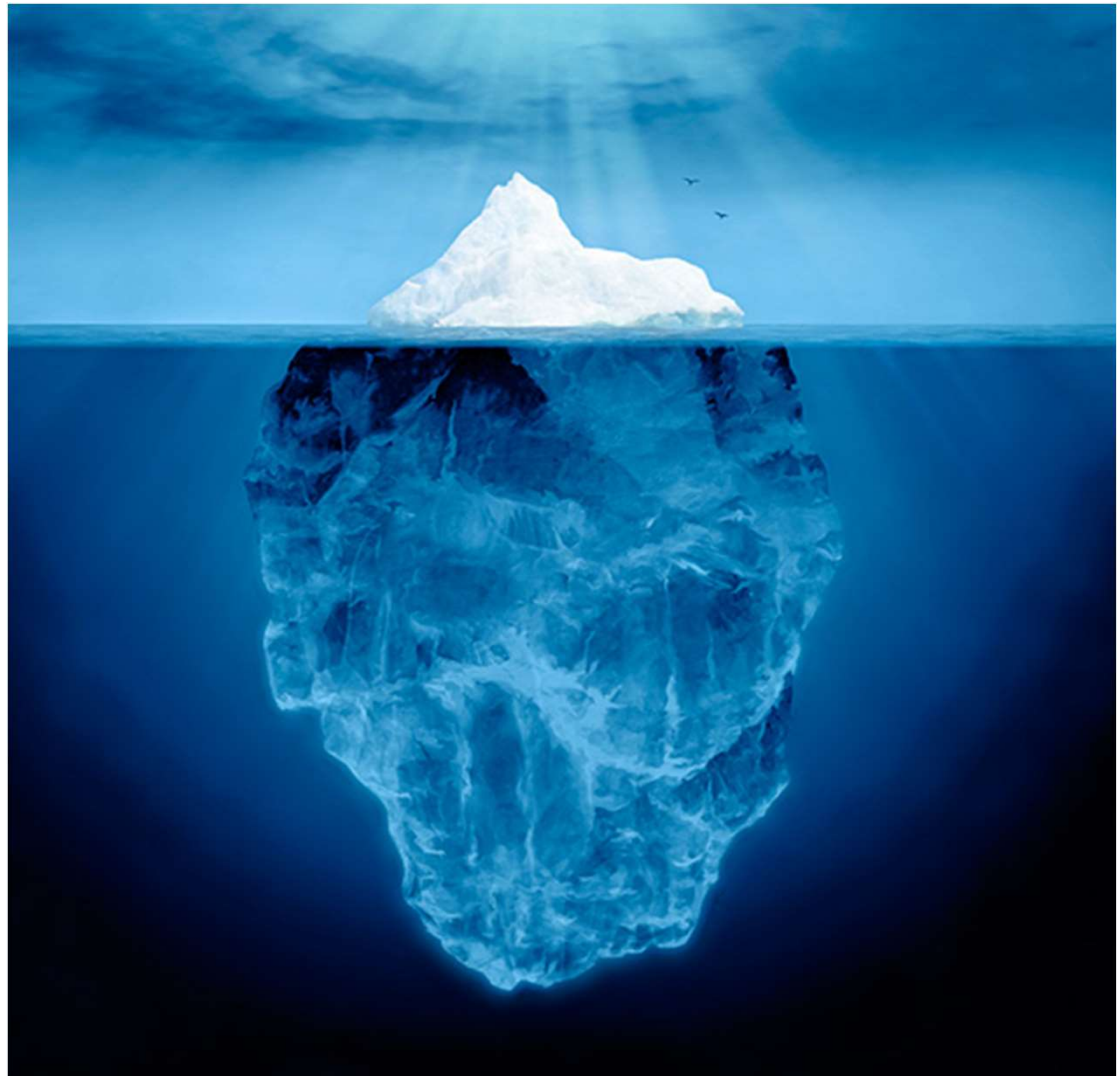
Lost Productivity & Quality

Insurance Premiums

Damage to Public Image

Potential OSHA Fines

Opportunity Costs



Sources: International Association of Oil & Gas Producers, Liberty Mutual Safety Index
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NFPA 70E 2021 Edition



- OSHA enforces NFPA 70E under 1910.132 and 1910.335.

How NFPA 70E works with other Standards

Installing the electrical system in accordance with *NFPA 70®*, *National Electrical Code®* (*NEC®*);

- Maintaining the electrical system in accordance with NFPA 70B, *Recommended Practice for Electrical Equipment Maintenance* (in the absence of the specific manufacturer's instructions); and
- Following the safety policies, procedures, and process controls identified in *NFPA 70E*

Evolution of NFPA 70E

1979 – Part I

1981 – Part II

1983 – Part III

1988 – Minor revisions

1995 – Limits to approach &
arc are introduced

2000 – Use of PPE

2004 – Safe Work practices

2009 – Chpt 4 deleted

2012 – FR to AR

2015 – How stakeholders
evaluate electrical risk

2018 – introduces human
factors, such as human error

2021 – Minor Revisions



Sources: NFPA 70E, 2018 Edition, pages 1-5

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Arc Flash Risk Assessment

130.5 Page 26

A. General

1. To identify arc flash hazards
2. To estimate the likelihood of occurrence of injury or damage to health and the potential severity of injury or damage to health.
3. To determine if additional protective measures are required, including the use of PPE.

F. Arc Flash PPE

1. The incident energy analysis method
2. Arc flash PPE category method

Requirements Summary

Site Risk Assessment

- Must be completed every 5 years or if equipment changes have been made

Training

- NFPA 70E Arc Flash Training for all employees who work with over 50v and is done every 3 years. First Aid, CPR and AED Training is also required every two years.

PPE / FRC

- Must provide correct PPE and FRC

Warning Labels

- Updated Labels must be on all equipment that poses an Arc flash risk (3 phase)

Electrical Safety Program (ESP)

- Needs to be reviewed and updated every 3 years

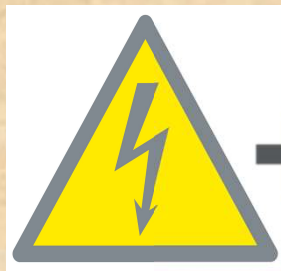
WHAT NEEDS LABELS?

PAGE 29 103.5 (G)





NFPA 70E Requirements for Safety



Arc
Rated
Clothing



Head
Protection



Hand
Protection

=



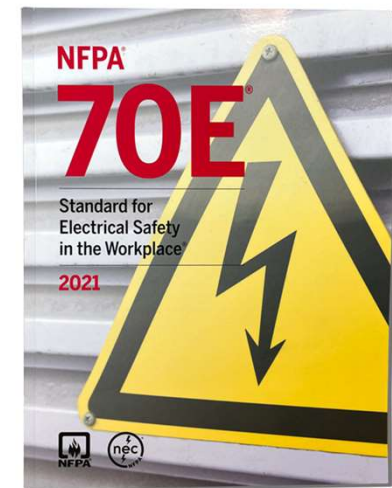
AED



CPR/AED
Training

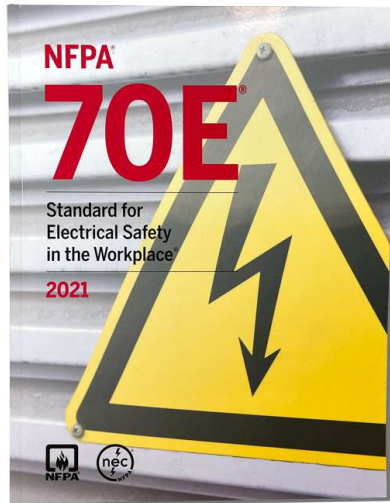


NFPA 70E
Training



**Comprehensive
NFPA 70E
Solution**

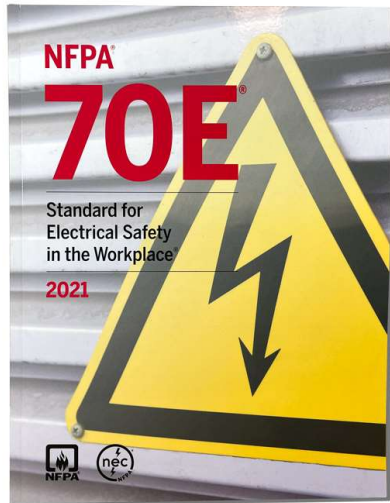
2021 Changes



- Article 110:

Some requirements in Article 110 have been reorganized for a more logical progression, including moving general principles of lockout/tagout from Section 120.2 and general principles of an electrically safe work condition and energized work requirements from Section 130.2. New subsection 110.5(K) requires that an employer's electrical safety program include a policy on establishing an electrically safe work condition.

2021 Changes



Article 130

Sections 130.1 and 130.2 have been rewritten to accommodate the relocation of information from former Sections 130.2(A) to 110.3 and to keep the focus of Article 130 on requirements related to work involving electrical hazards.

2021 Changes

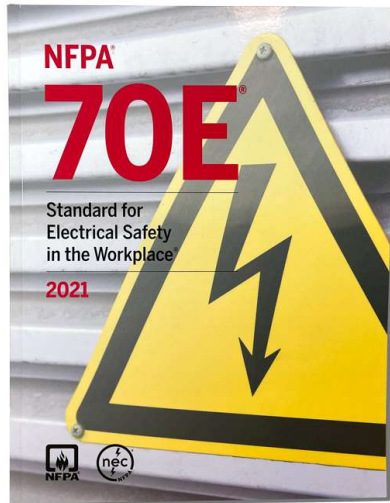
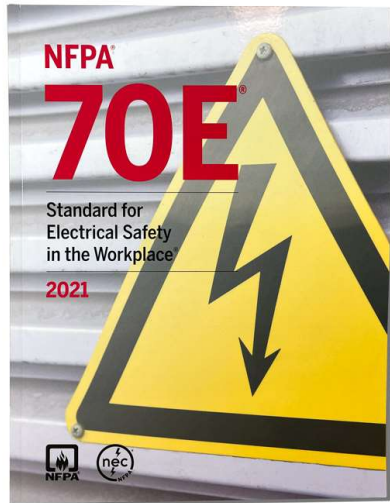


Table 130.5(C):

Revisions have been made to Table 130.5(C), which can be used to help estimate the likelihood of occurrence of an arc flash incident, including a new entry for the initial circuit breaker or switch operation and again after maintenance, as each has a higher likelihood of an arc-flash event.

2021 Changes



Section 350.9

Energy thresholds for electrical equipment and systems in laboratories have been revised to accurately reflect the data in the Informational Note's resource document, and the capacitive circuit threshold has been deleted to prevent duplication and potential confusion with new Article 360.

Article 360

This new article on the safety-related requirements for capacitors has been added.

2021 PPE Categories – 130.7(C)(15)(c)



1

AR Shirt (4 cal/cm²)
AR Pant (4 cal/cm²)
Arc-Rated Face shield

Hard Hat
Voltage-Rated Gloves
Leather Gloves
Leather Footwear
Safety Glasses or Goggles
Hearing Protection



2

AR Shirt (8 cal/cm²)
AR Pant (8 cal/cm²)
(or FR Coverall of 8 cal/cm²)
FR Balaclava (8 cal/cm²)
Arc-Rated Face shield

Hard Hat
Voltage-Rated Gloves
Leather Gloves
Leather Footwear
Safety Glasses or Goggles
Hearing Protection



3

AR System (25 cal/cm²)

Hard Hat
Voltage-Rated Gloves
Leather Gloves
Leather Footwear
Safety Glasses or Goggles
Hearing Protection



4

AR System to (40 cal/cm²)

Same as PPE 3



CATEGORY 2 REQUIRED PPE

Also fulfills NFPA 70E
requirement of Category 1



- ✓ Safety glasses or goggles
- ✓ Hearing protection (inserts)
- ✓ Insulated rubber gloves with leather protectors
- ✓ EH heavy-duty leather footwear
- ✓ Arc rated long sleeve shirt/coverall (8.0 ATPV or higher)
- ✓ Arc rated long pants/coverall (8.0 ATPV or higher)
- ✓ Hard hat with Arc rated face shield and balaclava

CATEGORY 4 REQUIRED PPE

Also fulfills NFPA 70E
requirement of Category 3



- Arc rated coveralls
- Arc rated (40 cal) Arc Flash suit jacket
- Arc rated (40 cal) Arc Flash suit pants
- Arc rated (40 cal) Arc Flash suit hood



Daily wear
vs.
Task Wear



FRC Standards for Outerwear and Undergarments – Page 31

NFPA 70E 130.7 (c)(9)(b)- Outer Layers

Garments worn as outer layers over arc-rated clothing, such as jackets high **visibility apparel**, or rainwear, shall also be made from arc-rated material.

NFPA 70E 130.7 (c)(9)(c)- Underlayers

Melttable fibers such as acetate, nylon, polyester, polypropylene, and spandex shall not be permitted in fabric underlayers (An incidental amount of elastic used on non-melting fabric underwear or socks shall be permitted).



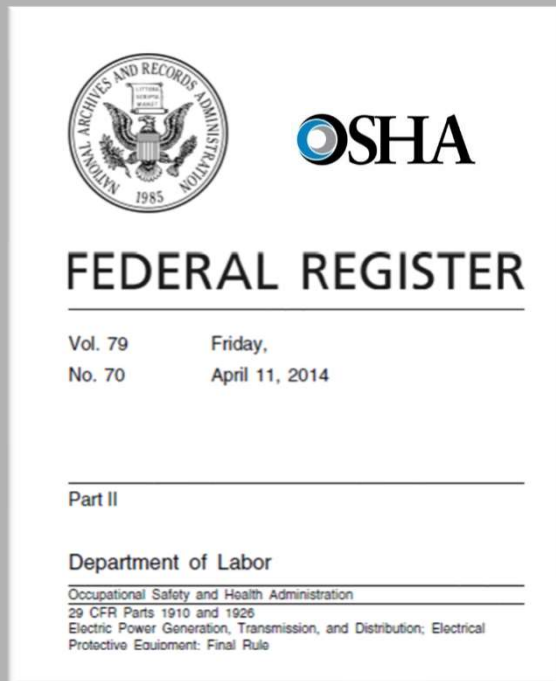
Arc Rated Clothing Proper Use

- Always the outermost layer
- All natural, non-melting undergarments
- Clean, no flammable contaminants
- Repaired correctly and removed from service when needed





Important Considerations



“The OSH Act and the PPE standards at 1910.132 and 1926.96 make the employer, not the employee, responsible for the care and maintenance of PPE.”

“If employers rely on home laundering of the clothing, they must train their employees in proper laundering procedures and techniques, and employers must inspect the clothing on a regular basis to ensure that it is not in need of repair or replacement.”

“The Agency is not prohibiting home laundering of FR and arc-rated clothing. However, to comply with 1910.132 or 1926.95, employers cannot simply instruct employees to follow manufacturers’ instructions.”

Care & Maintenance

Inspection

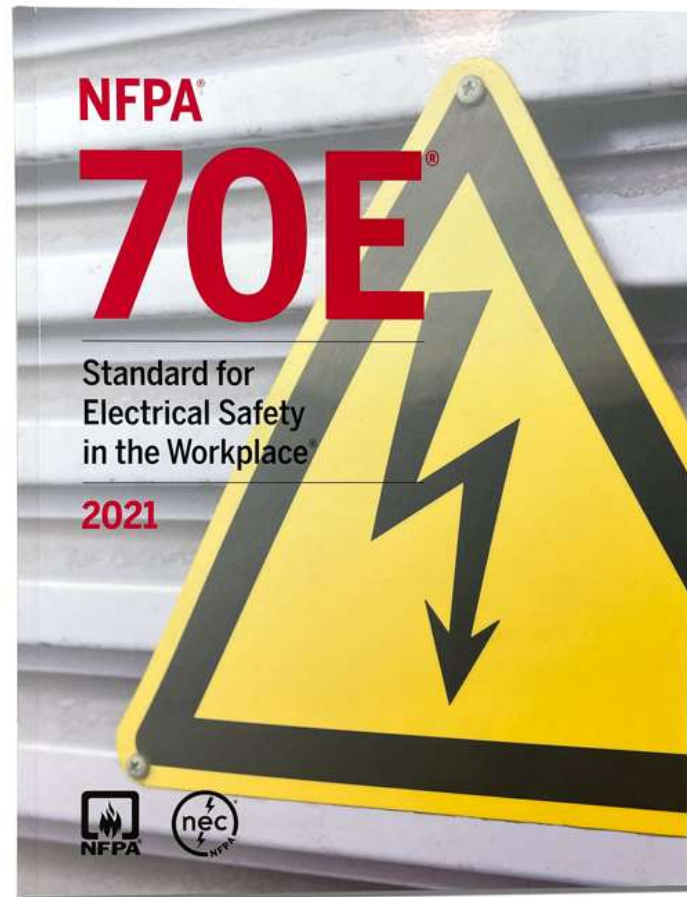
Manufacturers
Instructions

Storage

Cleaning, Repairing, and
Affixing Items.

Key word is SHALL!

See details on Page 32



Before You Home Launder...

Do not use:

- chlorine bleach
- hydrogen peroxide
- starch
- fabric softeners
- pretreatment products

Use soft water

Launder home and arc
rated garments
separately.



Retail Inspired Arc Rated Apparel



CINTAS®

Hand, Head & Body Protection Programs



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02/05/2014

www.Bandicam.com

Resolution: 1

The Hilgeman Group Accident Investigation File #418

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Conclusions & Next Steps

Set a meeting with
leadership

Present/Discuss changes

Take action

Make improvements

Train & re-train

Revisit Electrical Safety with
every NFPA 70E Revision



Thank You!



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