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# NFPA 70E Requirements

## The Dangers of Arc Flash

The following PowerPoint Presentation is intended to be a high-level executive overview summarizing the dangers of an arc flash event. We hope the information is helpful. Please contact us if you would like any additional information.

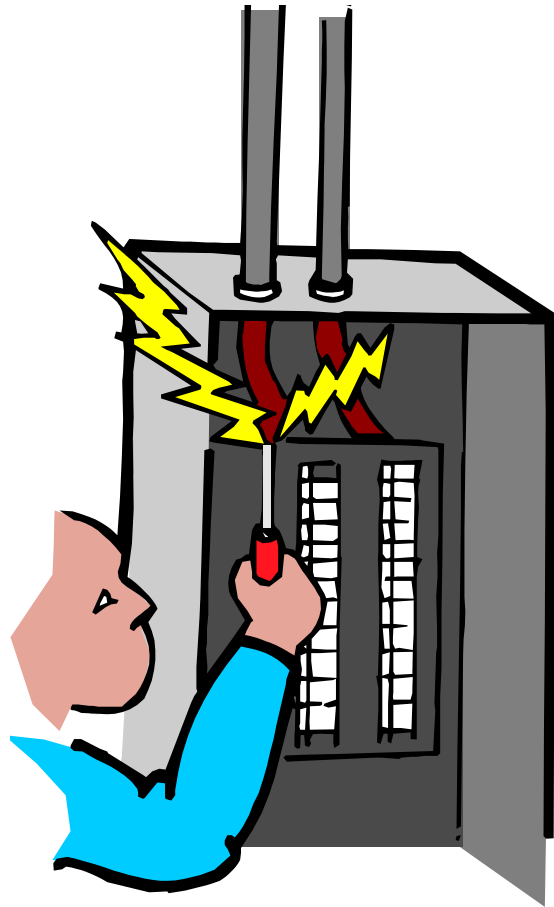
# Representative List of Clients



Georgia-Pacific



# Arc Flash Overview





# Arc Flash Defined

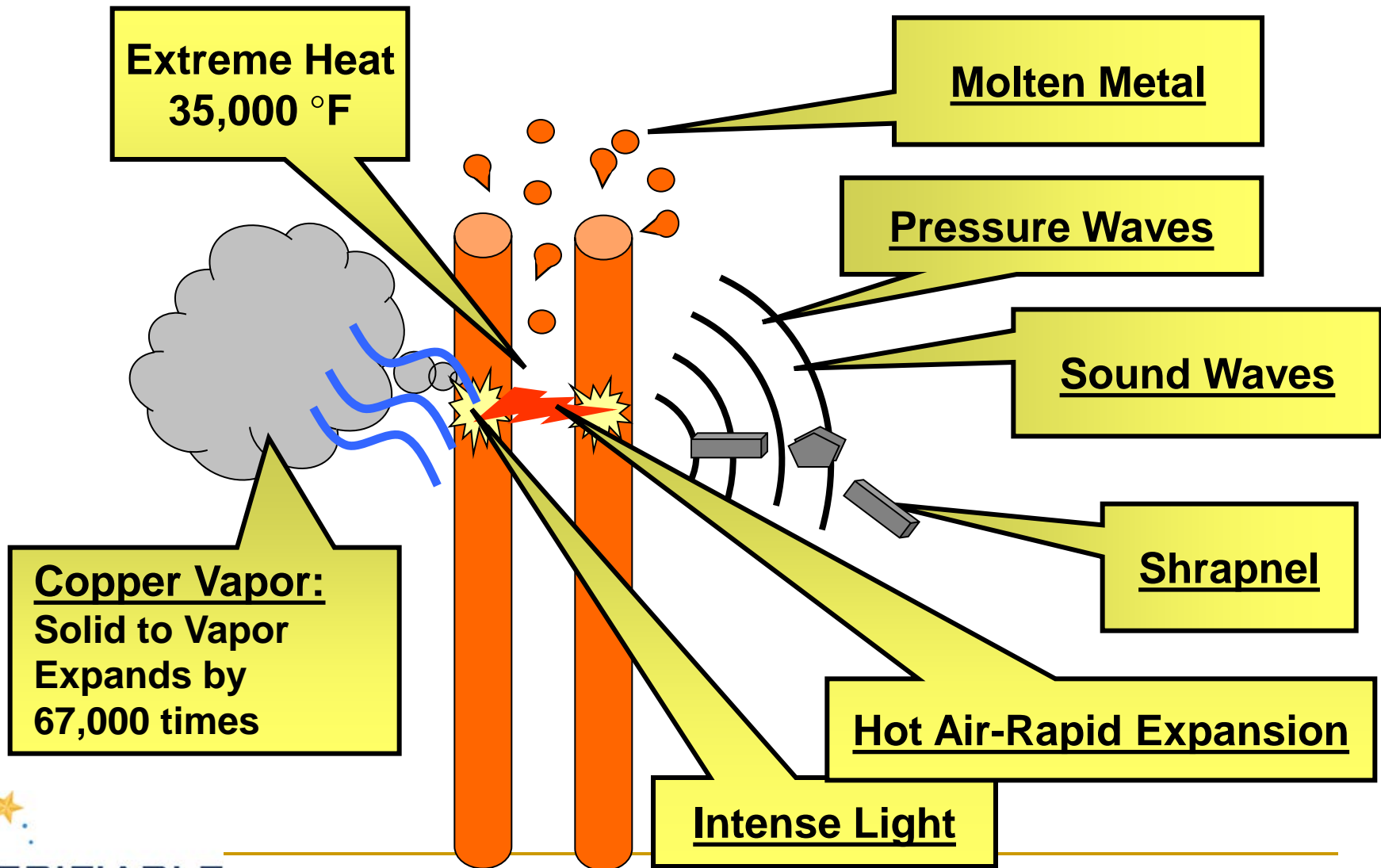
- The energy released during an arcing fault
  - Occurs when current flows through a medium that is not intended to conduct electrical current (e.g. air).
  - OSHA says “An arc flash is a phenomenon where a flashover of electric current leaves its intended path and travels through the air from one conductor to another, or to ground. The results are often violent and when a human is in close proximity to the arc flash, serious injury and even death can occur.”

# What Is An Arc Flash?



Arc Resistant Switchgear Undergoing  
Test For an Arcing Fault.

# Arcing Short Circuit



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# Arc Flash Injuries

- Burns
- Respiratory System Damage
- Vision Damage
- Hearing Damage
- Skin Penetration from Flying Debris

Injuries will occur based on the intensity of the heat generated by an electrical arc incident. The level of damage is dependent upon:

- Power of the Arc (Incident Energy)
- Distance of the Worker from the Arc
- Time Duration of the Arc Exposure

# Electric Shock & Burn

Over 4,000 nonfatal electrical shock accidents occur each year.



Cost of treatment can exceed \$1,000,000/case. Does not include litigation fees or process loss.

Treatment can require years of rehabilitation. Victim may never return to work or retain quality of life.

National Safety Council:

300 fatalities each year due to electrocution.

Many of those while servicing equipment 600V or under.



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The following slides show the chronological progression of an arc flash engulfment of an employee.

The progression is recorded by cycle in the 60Hz electrical cycle.

This test was performed by IEEE.

Each slide represents approximately 1 cycle



During the first cycle, the arc releases significant energy including light and heat...



At 2 cycles, vapor and debris can be seen.



At 3 cycles, the pressure and sound waves begin to move the worker.



At 4 cycles, the equipment and worker are engulfed in flame.



At 5 cycles smoke rises from the fire.



At 6 cycles the fault is cleared, but the damage is already done.







# Flash Hazard Analysis

- ❑ Occupational Safety and Health Administration (OSHA)
  - General Duty Clause
    - ❑ “Each employer shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to employees.”
    - ❑ Used to cite employers who fail to abide by NFPA 70E
  - If OSHA investigates an arc flash incident, they are investigating a company’s adherence to NFPA 70E.

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# OSHA Fines - Failure to Comply with 70E

- PAI Industries:

\$55,800 “...for not ensuring machinery could not accidentally start up during maintenance and servicing...”

# OSHA Fines - Failure to Comply with 70E

- Nissin Brake Inc.

\$53,000 for “allowing employees to adjust and bypass safety guards when entering a machine for servicing or maintenance” and “lack of safe-practices training associated with electrical shock and arc flash hazards and failure to provide personal protective equipment to employees who worked with electrical equipment.”

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## OSHA Fines - Failure to Comply with 70E

- McAfee Electric – Oconee Fall Line Technical College:

\$51,000 “A worker was injured while attempting to connect new wiring with existing wiring that was still powered. OSHA issued a willful citation for allowing employees to work close to live electrical circuits without personal protective equipment. A willful violation is one committed with intentional, knowing or voluntary disregard for the law's requirements, or with plain indifference to worker safety and health.”

# OSHA Fines - Failure to Comply with 70E

- Nichiha USA Inc.

\$138,600 for “repeat violations... including failing to provide workers with training to understand the purpose and function of the energy control program when performing servicing and maintenance on equipment, and not using a group lockout procedure for each worker to prevent equipment startup.”

# The Warning Label



# WARNING

VERIFIABLE RESULTS (864) 201-0980

## **Arc Flash and Shock Risk Appropriate PPE Required**

### **FLASH PROTECTION**

Flash Hazard 18" 7.7 cal/cm<sup>2</sup>

Flash Protection Boundary: 56 in

Glove Class: 00

FR SHIRT & PANTS OR FR COVERALL, SAFETY GLASSES, HARD HAT, FACE SHIELD, BALACLAVA, HEARING PROTECTION, LEATHER GLOVES OR RUBBER GLOVES WITH LEATHER PROTECTORS & LEATHER FOOTWEAR ARC RATING TO MATCH INCIDENT ENERGY

**PDP EDP**

### **SHOCK PROTECTION**

Shock Hazard: 480 VAC

Limited Approach: 42 in

Restricted Approach: 12 in

# The Danger Label



# DANGER

VERIFIABLE RESULTS (864) 201-0980

**NO SAFE PPE EXISTS**

**ENERGIZED WORK PROHIBITED**

## FLASH PROTECTION

Flash Hazard 18"  $44 \text{ cal/cm}^2$

Flash Protection Boundary: 162 in

Glove Class: 00

NO ENERGIZED WORK ALLOWED!

## SHOCK PROTECTION

Shock Hazard: 240 VAC

Limited Approach: 42 in

Restricted Approach: 12 in

**PANEL WRP**



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# Recommendations

- ❑ Gap Assessment at Random Sites (Short Term)
- ❑ Arc Flash Assessment at all Sites (Long Term)
- ❑ Training for Qualified Personnel (Immediate)