

Advanced Photovoltaic Systems

SIERRA COLLEGE

Welcome!

Energy Instructor

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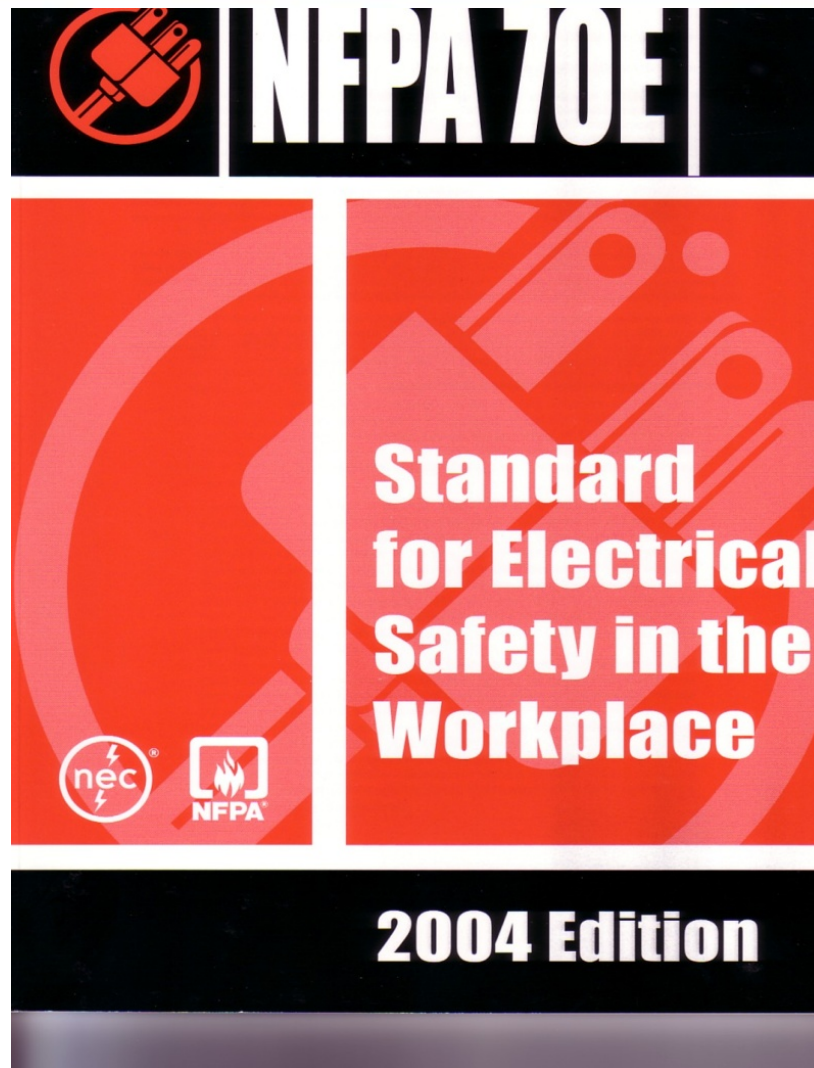
Lesson Plan - Class 1

- Welcome
- Course Overview
- Syllabus and Calendar
- Ground Rules
- Introductions
- Resources
- Safety Refresh
- Class Lab Project

Electrical Safety in the Workplace

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- NEC – National Electric Code NFPA 70
- OSHA 1910 and 1926
Subparts S and K Relate to Electricity
- NFPA 70E – Electrical Safety in the Workplace

Some Statistics

- 286 Fatalities and 4,100 cases of lost time due to electrical shock or electrical burns each year from 1992-1998
 - 98% of the fatalities due to electrical shock
 - 38% injuries were due to flash burns
- 113 electrocutions in 2004
- Financial costs can be staggering
 - Can exceed \$13 Million for one incident

Consequences of an Arc-Flash Incident

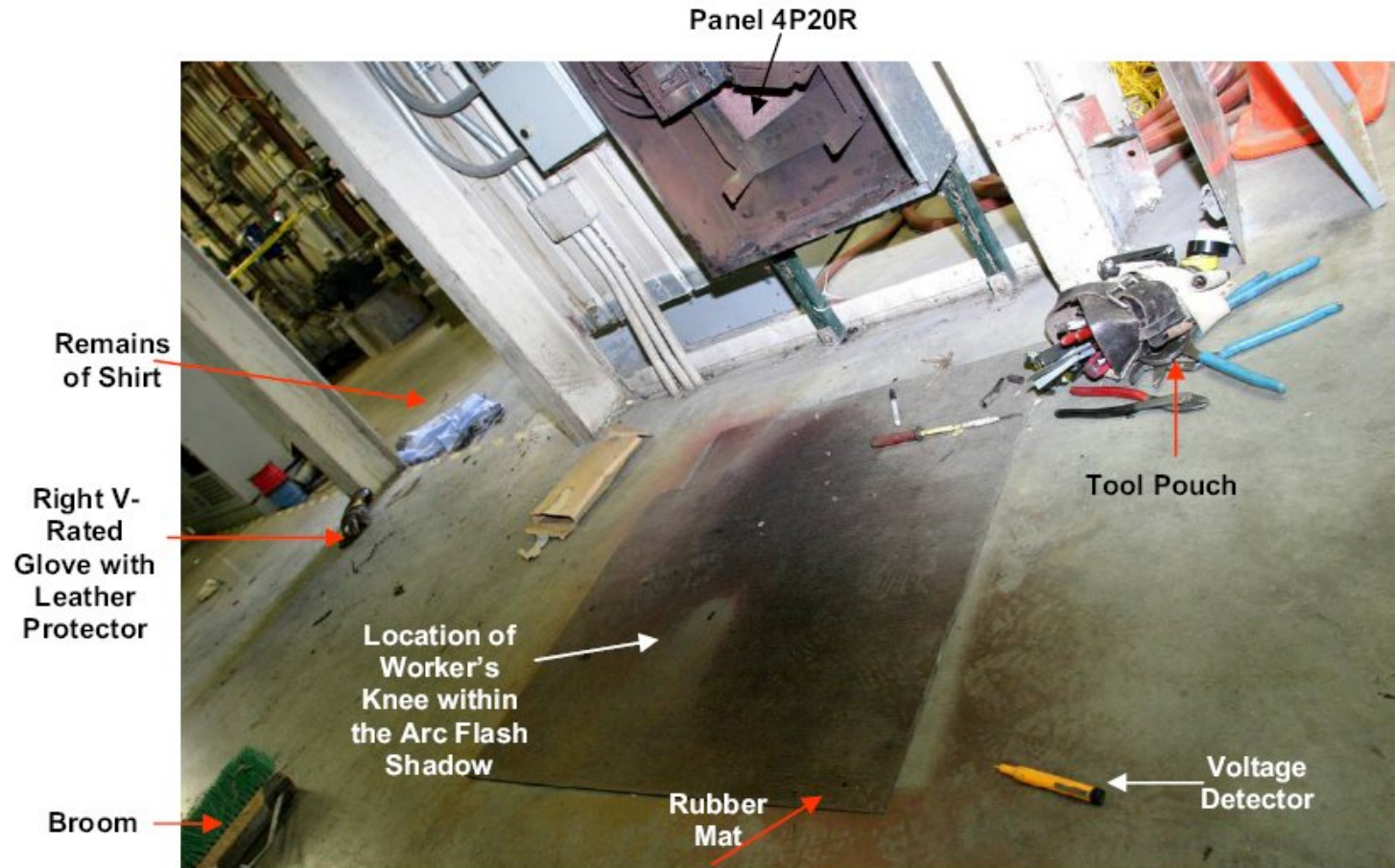


Figure 2-3. The insulating mat with the outline of BSE-1's knee in the arc flash shadow

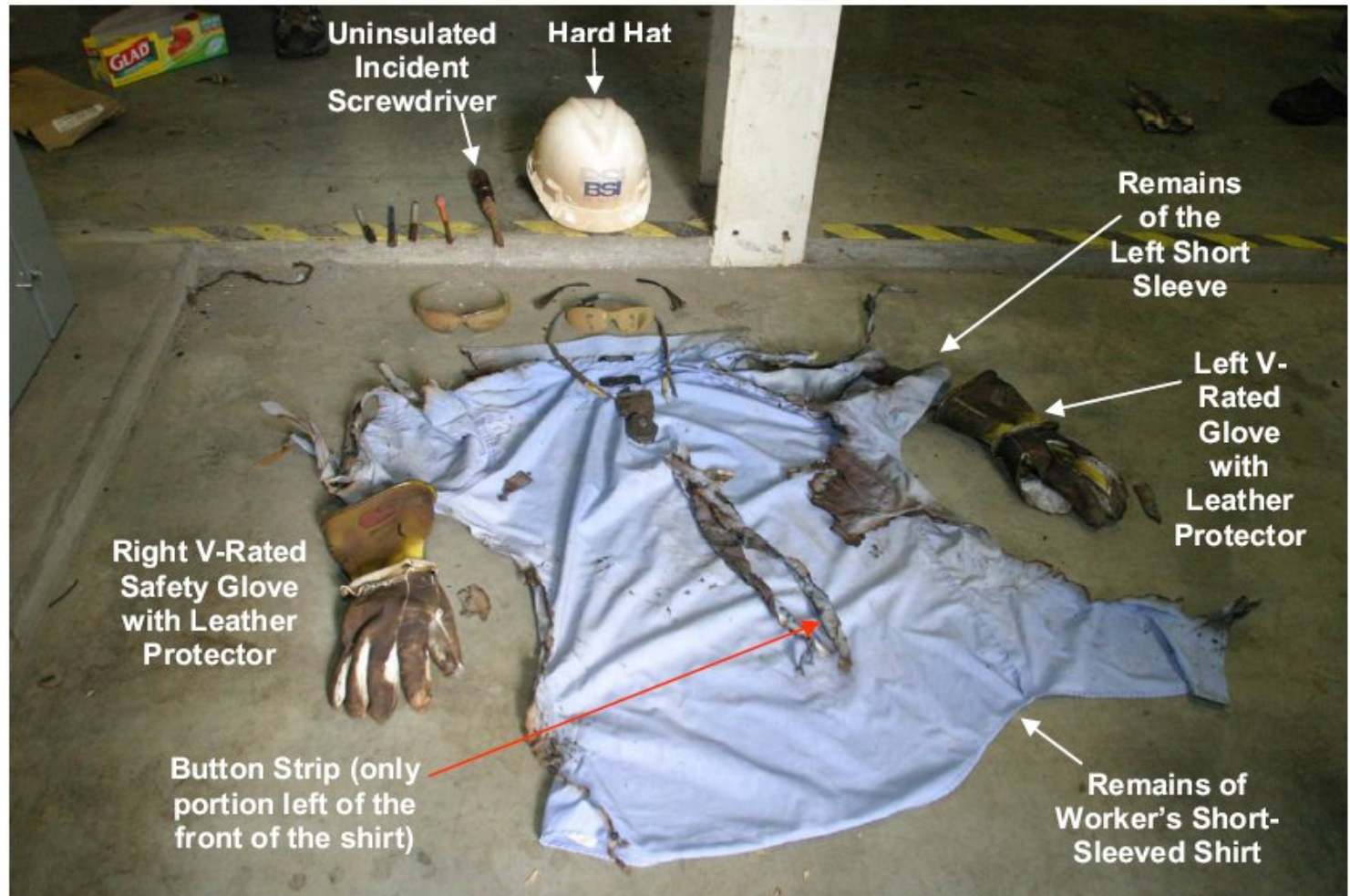


Figure 2-6. BSE-1's burned shirt and his flash-damaged PPE and tools

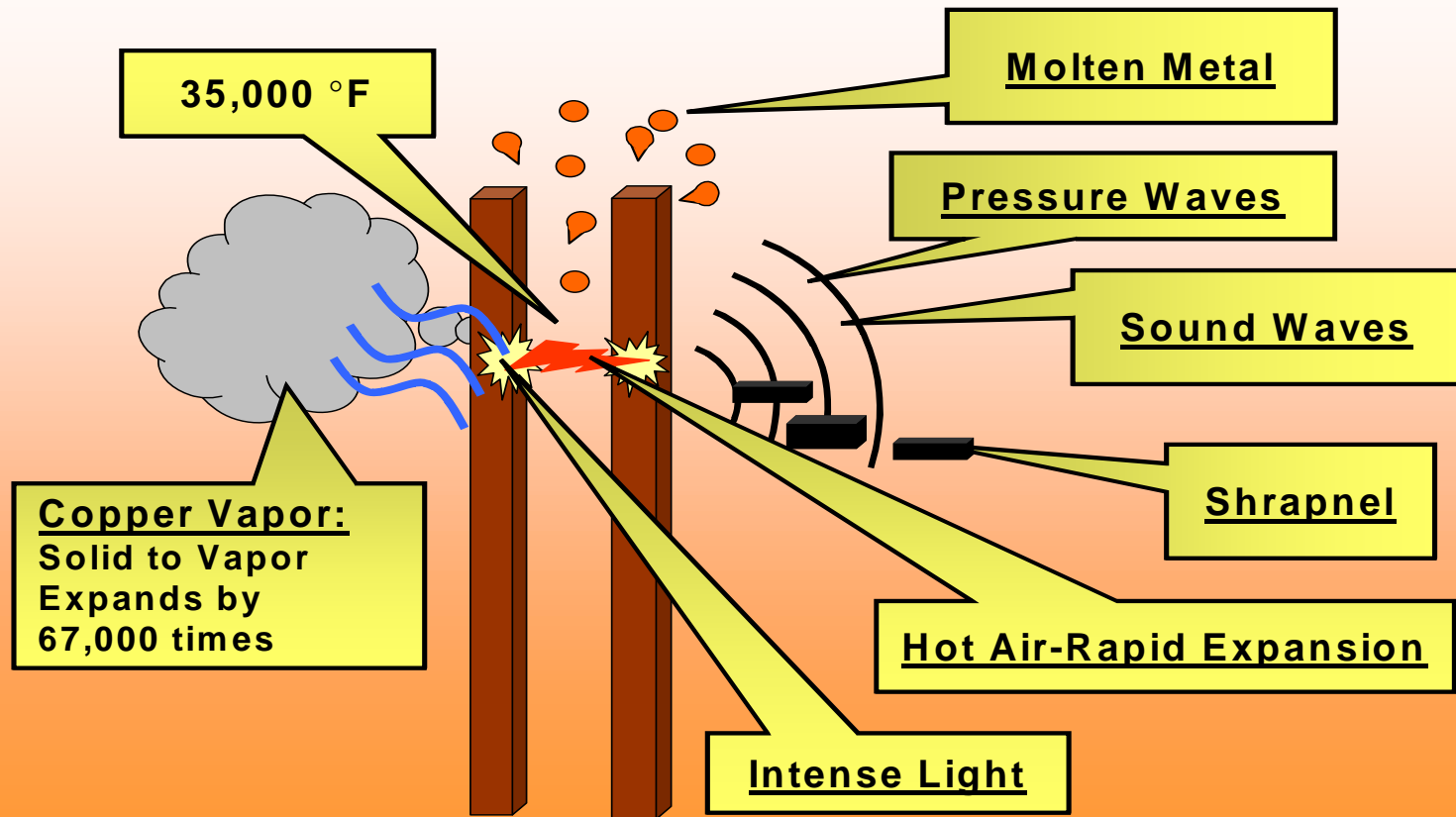
Hazards of Electricity

- Electric Shock and Electrocution
 - Electric Current through Body – Electrocution and Burns
- Arc-Flash
 - Burns due to high heat and molten metal
 - Fire Ignition
- Arc-Blast
 - Hearing loss due to blast explosion
 - Lacerations/Punctures from blast debris
 - Percussion force
 - Explosion

Arc-Flash

- Electric current passes through air, between a “Hot” conductor and ground, or between “Hot” conductors
- Temperatures can reach 35,000 °F
- Exposure can easily cause skin burns & ignite clothing
- Clothing or PPE that Burns and Melts is a Real Problem

Electrical Arc



Mitigation of Electrical Hazards

- Work De-Energized
- Engineer Out the Hazard
- Follow Electrical Safe Work Practices
 - Employ Lockout/Tagout of Hazardous Electrical Energy Sources
 - Use Voltage Insulating PPE and Equipment
 - Use PPE for Arc-Flash Protection
 - Use Ground Fault Circuit Interrupters

Safe Work Practices

- Should be pretty intuitive
 - Be Alert
 - Use Common Sense
 - No blind reaching. If view is obstructed, you cannot work on live parts.
 - Illumination must be provided
 - Conductive articles (jewelry, clothing) shall not be worn

Wear and Care of PPE

- Wear Cotton
- Avoid Scratching Eye Protection
- No Bleach or Fabric Softeners
- Wear Clothing Loose, rather than Tight
- Layering Increases Protection
- Dry is Better than Wet

Safe Work Practices

- Plan for Emergencies
 - Know how to de-energize Quickly
 - Be prepared to pull classmate free with an Insulated Rescue Hook
 - Have the Means Available to Contact Emergency Personnel
 - (916) 660-7120; extension 7120 on Rocklin campus
 - (916) 781-6200 or (916) 225-3255 on RG campus
 - Know CPR & Where AED's are located

Fall Protection

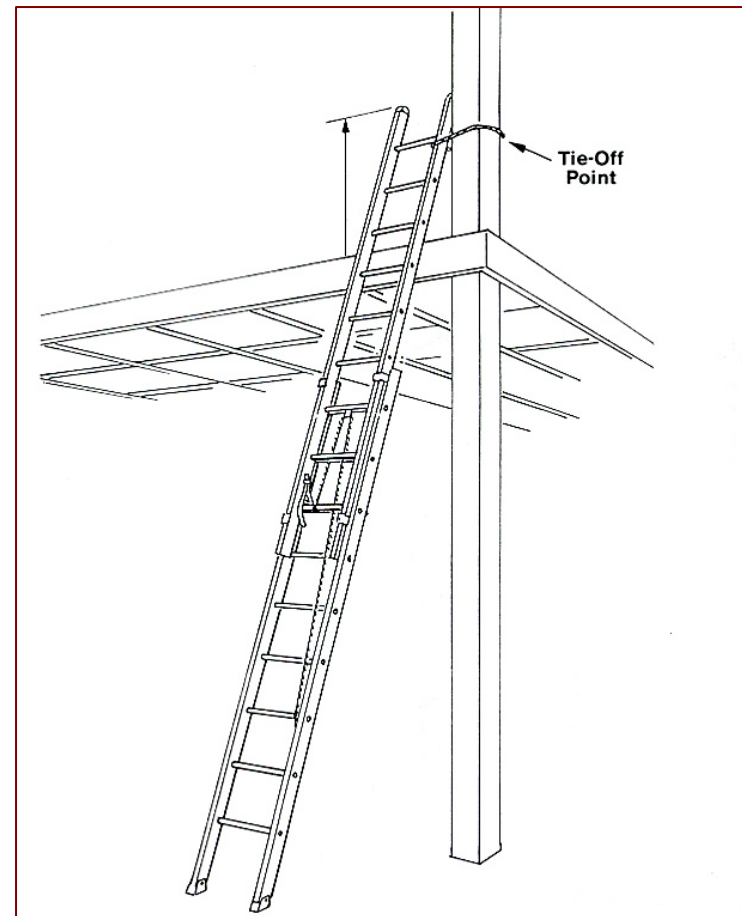
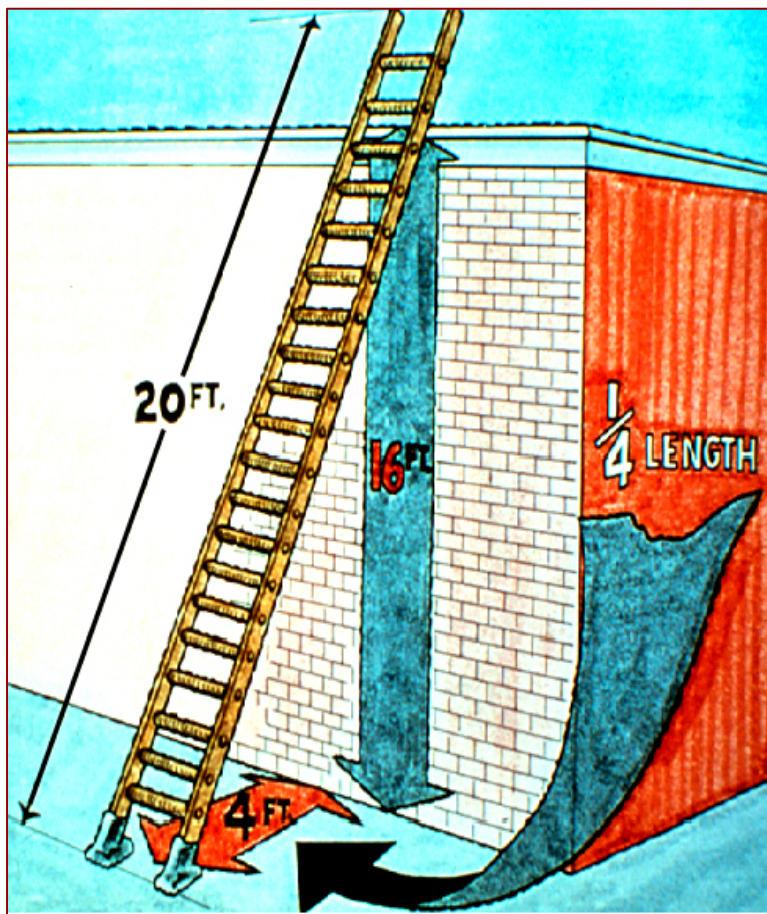
- What's wrong in this picture?



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Fall Protection

- What are these pictures telling us?



Fall Protection

- Some relevant numbers
 - 6ft Fall protection required for work above this height
 - 39in to 45in Guard rails top height – open floors & platforms
 - 3 ½ in Toe guard minimum height – platforms
 - 30ft Maximum distance for safety nets
 - 19in Max vertical break without ladder or stairway
 - 30in Max stairway height without handrail
 - 30° to 50° Allowable stairway rise/run angle
 - 20in Stairway platform space beyond door swing

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Have a Safe Day!