Why Construction Workers are Getting Electrocuted

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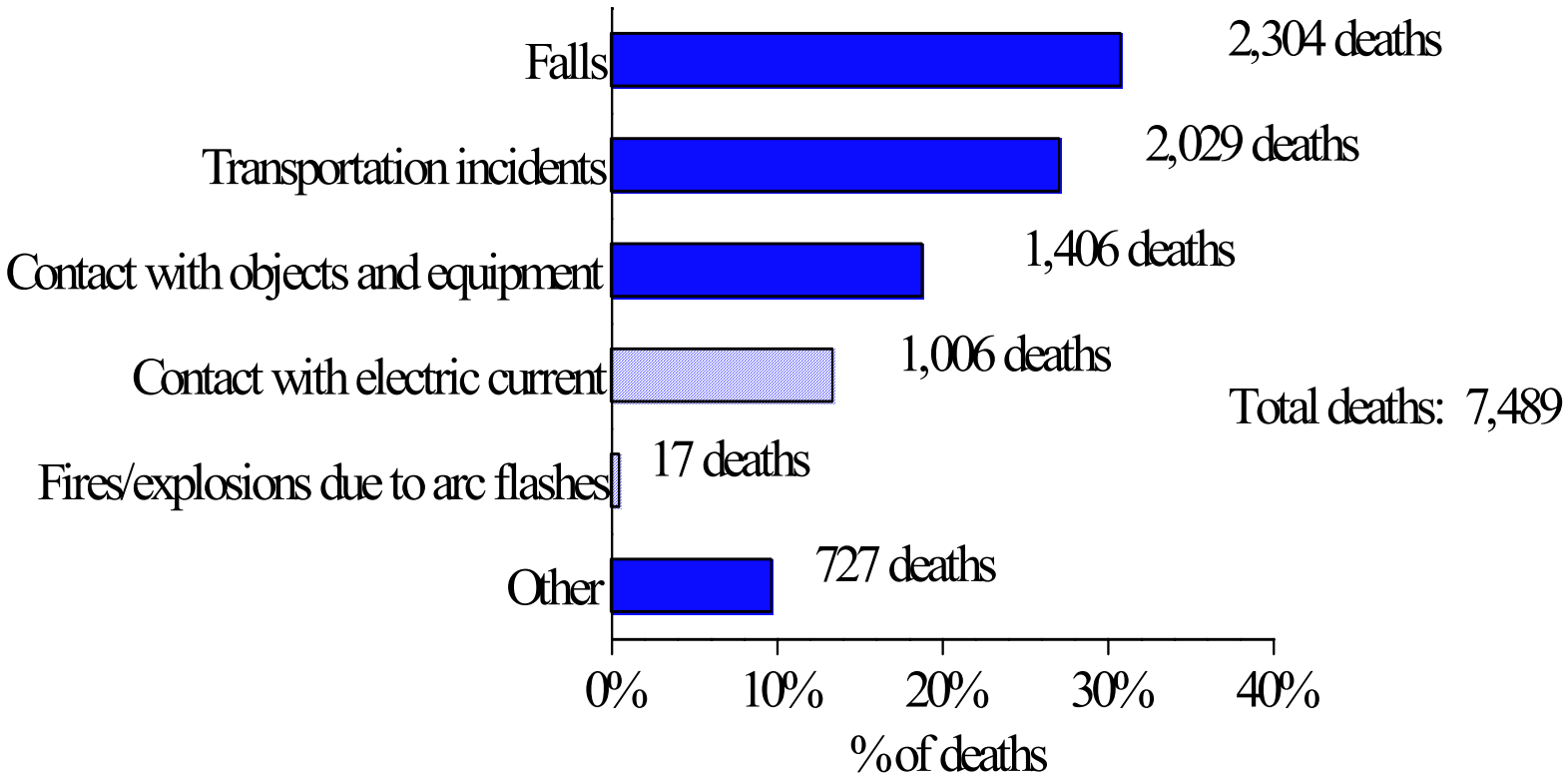
Causes of Death in Construction, 1992-98

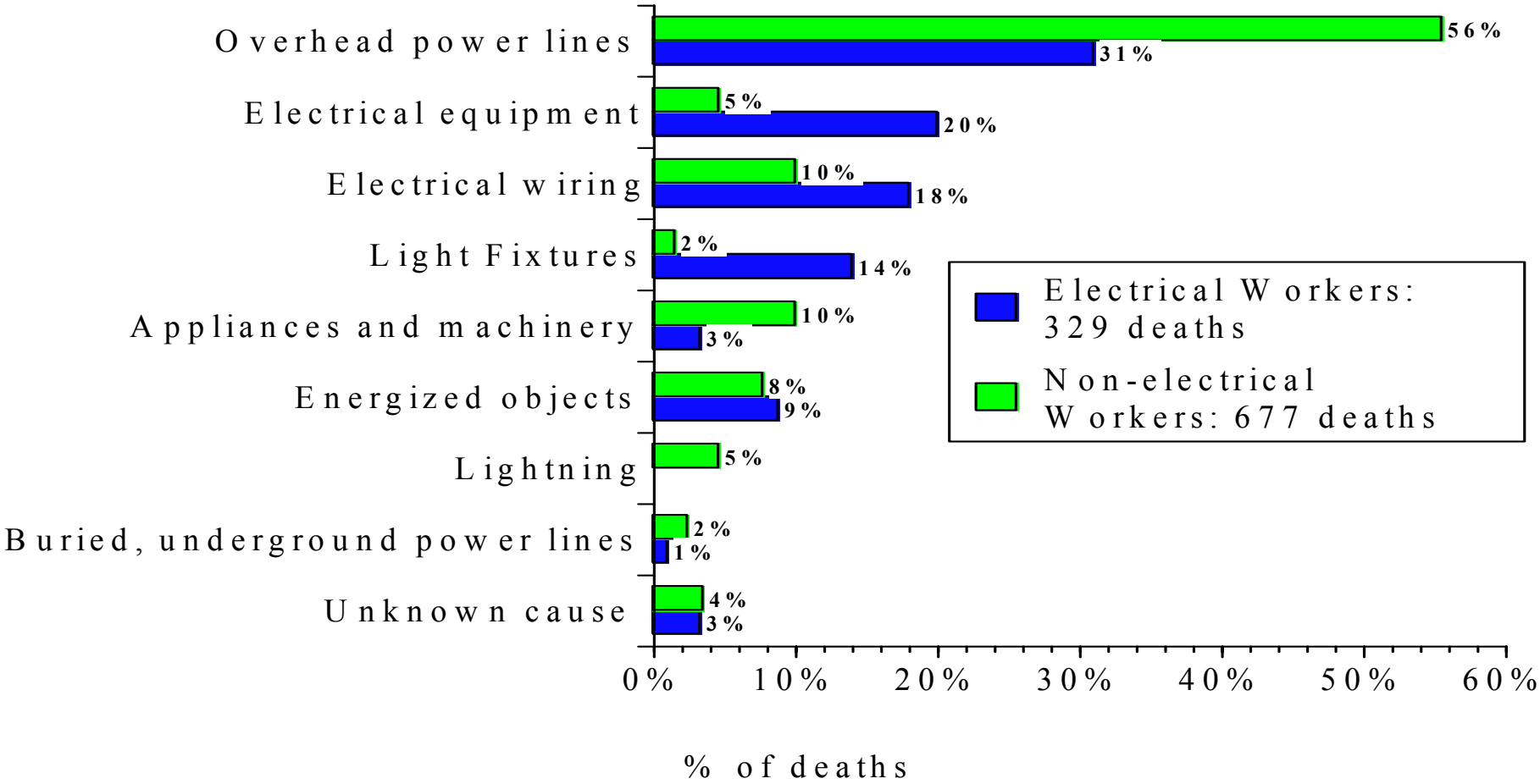


Source: U.S. Bureau of Labor Statistics data

Types of Electrical Injury

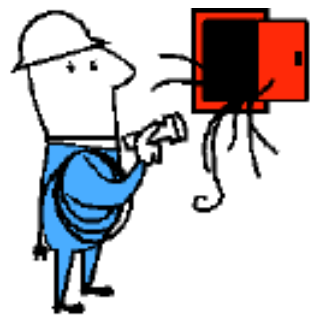
- Electrical Shock
- Electrical Burns
- Arc-Flash Burns
- Arc Blast
- Falls
- Fire

Causes of Construction Electrocutions, 1992-98



Source: U.S. Bureau of Labor Statistics data

Over half of electrocutions of electrical workers were due to working on or near live parts



Electrocutions Among Electrical Workers from Direct Contact with Electrical Equipment, 1992-98

- **Electrical equipment (68 deaths)**
  - electrical control panels (16 deaths)
  - switching gear (14 deaths)
  - transformers (13 deaths)
  - circuit breakers/fuse holders (8 deaths)
  - junction boxes (5 deaths)
  - other (12 deaths)
- **Electrical wiring (59 deaths)**
- **Light fixtures (29 deaths)**
  - 3/4 building light fixtures
  - others: airport runway lights

    neon signs, street lights

Source: U.S. Bureau of Labor Statistics data, 1992-98

Other Causes of Electrocutions of Electrical Workers , 1992-98

- **Contact with energized objects (29 deaths)**
  - accidentally cutting energized wires (10 deaths)
  - energizing wires by contact with energized wires (7 deaths)
  - deliberately cutting or stripping energized wires (5 deaths)
- **Contact with live parts of appliances and machinery (11 deaths)**
- **Contact with overhead power lines (102 deaths)**

Source: U.S. Bureau of Labor Statistics data, 1992-98

Contributing Factors to Electrocutions of Electrical Workers

- Lack of proper personal protective equipment
- Lack of insulated tools
- Working from aerial lifts (33 deaths)
- Working in attics or above drop ceilings (16 deaths)

Insulated Tools

Over half of electrocutions of non-electrical workers were due to contact with overhead power lines

Causes of Electrocutions Among Non-Electrical Workers, 1992-98

- **Overhead power lines (376 deaths)**
- **Electrical wiring (69 deaths)**
- **Appliances/machinery/power tools (68 deaths)**

  air-conditioners (22 deaths)

  portable lights (11 deaths)

  power tools (7 deaths – 5 involved electric drills)

  welding units (7 deaths)

  other home appliances (6 deaths)

  pumps (5 deaths)

Source: U.S. Bureau of Labor Statistics data, 1992-98

More Causes of Electrocutions of Non-Electrical Workers, 1992-98

- **Contact with energized objects (52 deaths)**
  - Metal ladders (11 deaths)
  - Metal pipes (5 deaths)
  - Accidentally cut live wire (5 deaths)
- **Electrical equipment (31 deaths)**
  - electrical control panels (10 deaths)
  - transformers (5 deaths)
- **Lightning (31 deaths)**
- **Buried, underground power lines (16 deaths)**
- **Light fixtures (10 deaths)**
- **Unknown (24 deaths)**

Source: U.S. Bureau of Labor Statistics data, 1992-98

Contributing Factors to Electrocutions of Non-Electrical Workers

- Working under houses or in basement crawlspaces (27 deaths)
- Contact with water (20 deaths)
- Defective extension or power cords (15 deaths)
- Working in attics or above drop ceilings (9 deaths)

Danger of "Low Voltage"

- **120/240 volts**
  - 1/8 of all construction worker electrocutions
- **Total low voltage (600 volts or less)**
  - 1/3 of electrical worker electrocutions
  - 1/4 of non-electrical worker electrocutions

Source: U.S. Bureau of Labor Statistics data, 1992-98

Electrical Injuries Requiring Emergency Department Treatment

- **Study of 3,359 Washington, DC construction workers treated in George Washington University Emergency Department between 11/1/90 and 12/31/98**
- **61 (1.8%) of ED-treated injuries were electrical injuries**

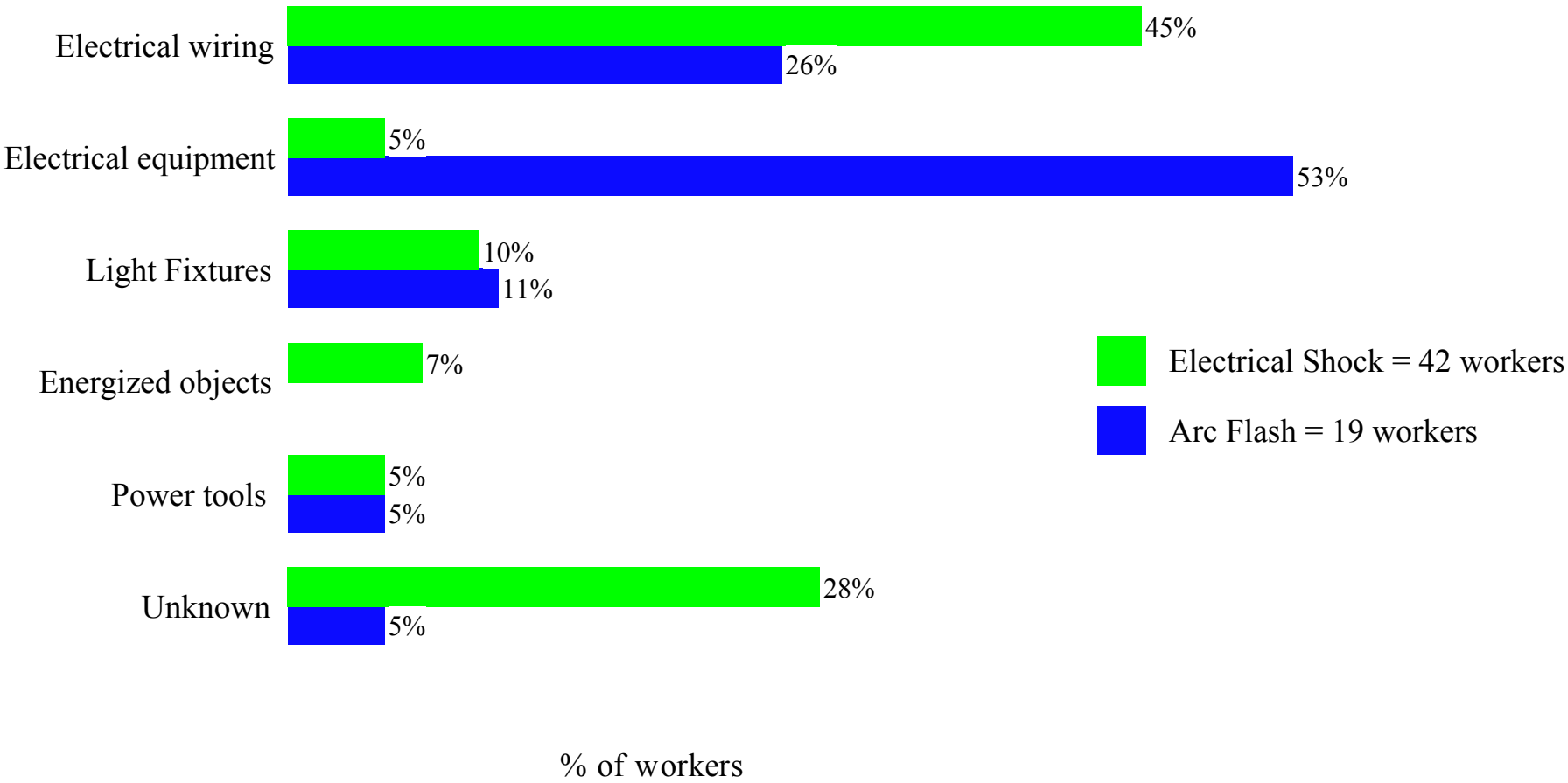
Source: GWU Construction Workers Surveillance Program, 1992-98

Electrical Injuries Requiring Emergency Department Treatment

- **ED-Treated Electrical Injuries**
  - 20% (12/61) of ED-treated electrical injuries required hospitalization (compared to 3.4% of all injuries)
  - 66% (40/61) of ED-treated workers were electrical workers
- **Types of Electrical Injury Requiring ED Treatment**
  - 60% (25/42) of **electrical shock** injuries involved electrical workers
  - 79% (15/19) of **arc flash** injuries involved electrical workers

Source: GWU Construction Workers Surveillance Program, 1992-98

Causes of Electrical Injuries Requiring Emergency Department Treatment



Source: GWU Construction Workers Surveillance Program, 1992-98

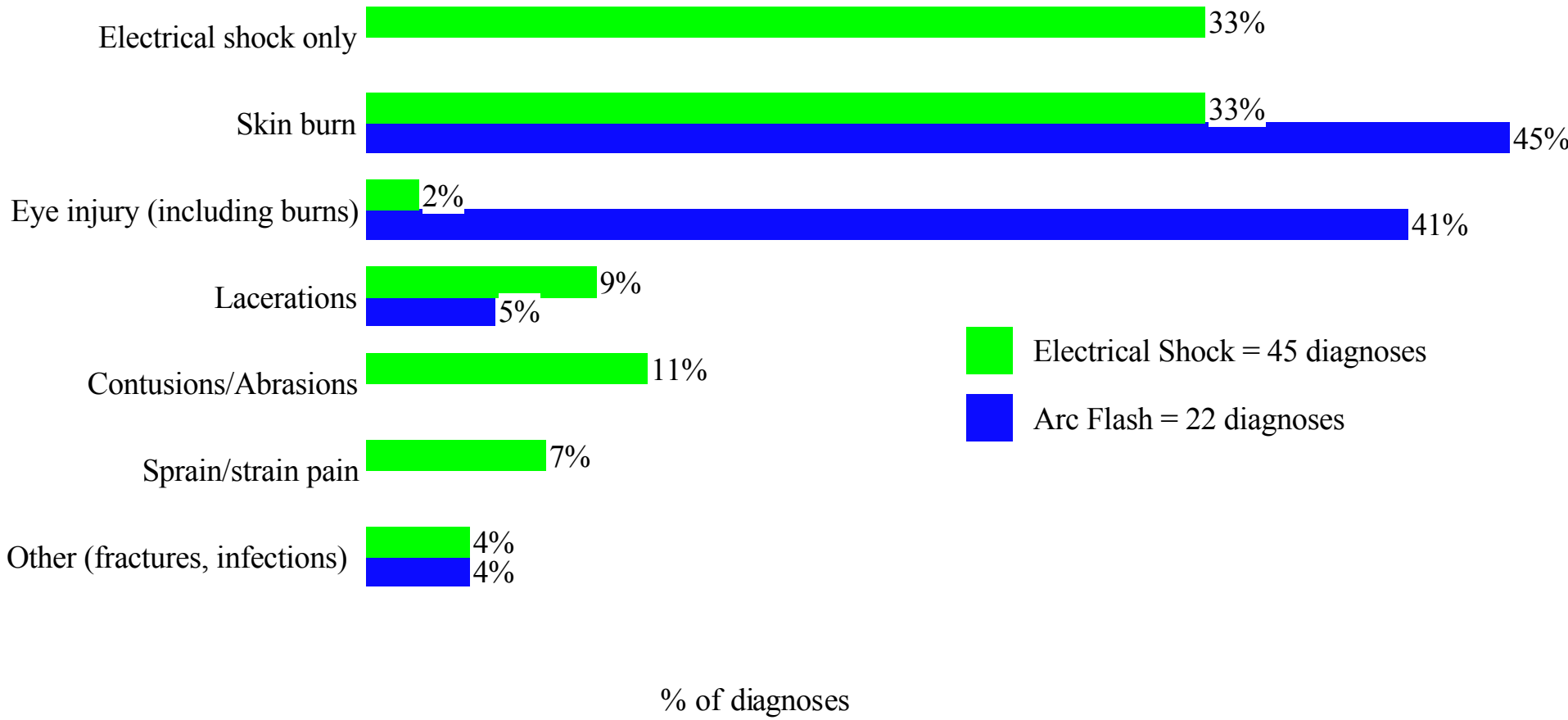
Falls from Ladders As a Result of Electrical Injury

- **36% (15/42) of ED-treated electrical shock injuries resulted in falls from ladders**

- **5% (1/19) of ED-treated arc flash injuries resulted in falls from ladders**

Source: GWU Construction Workers Surveillance Program, 1992-98

Diagnoses from Emergency Department Treatment of Electrical Injuries



Source: GWU Construction Worker Surveillance Program, 1992-98

Controlling Electrical Hazards

Precautions for Electricians

- **Get training as qualified person**

  "One familiar with the construction and operation of the equipment and the hazards involved"
- **De-energize and lock out or tag out equipment**
- **Isolate other exposed live parts**
- **Use proper PPE & insulated tools**
- **Have a permit system for working live**

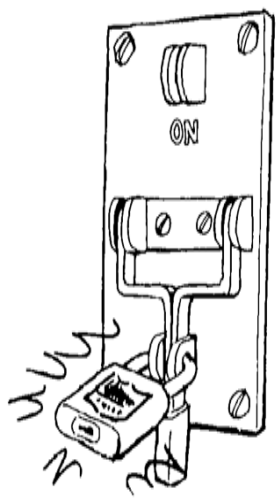
To De-Energize
or
Not to De-Energize

Reasons for Working Live

- **De-energizing creates additional or greater hazards**
  - interruption of life-support systems
  - deactivation of emergency alarm systems
  - shutdown of ventilation equipment for hazardous locations
- **De-energizing is infeasible**
  - testing of live circuits
  - work on circuits that are part of a continuous process

Barriers to Lockout/Tagout

- Schedule pressure
- Refusal of owner to allow power to be shut off
- Peer pressure B especially new journeymen
- Safety culture B AElectricians work live@
- Lack of awareness of danger, especially low voltage
- Lack of training on lockout/tagout
- Other trades don=t want power shut off



Live Work Permit

- **Date and time covered by the permit**
- **Why live work will be done**
- **Who will perform the work**
- **Tasks to be performed**
- **Personal protective equipment to be worn**
- **Other precautions**
  - insulated tools
  - insulated barriers for nearby live parts
  - warning signs
- **Have owner sign off on working live**

Precautions for Non-Electricians

- Get electrical safety training
- Check for:
  - overhead power lines
  - buried, underground power lines
  - other live circuits
- Make sure temporary wiring has GFCIs
- Lock out/tag out equipment to be worked on
- Only qualified persons may work on electrical wiring and equipment
- Check cords and equipment for damage

As You Work

- In wet, damp, or hazardous locations use tools or equipment designed and labeled for such areas
- Keep metal ladders, pipes, etc. away from live circuits or power lines
- Make sure electric systems, machinery and power tools are grounded or double insulated
- Use extension cords marked for hard or extra-hard usage
- Protect cords from damage

Further Information on Construction Safety and Health

Electronic Library of Construction Safety and Health (eLCOSH):

www.elcosh.org

The Center to Protect Workers' Rights

www.cpwr.com

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