

Electrical Safety When Working with Contractors

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AVO
TRAINING INSTITUTE
A Subsidiary of Mississippi

Keeping People Safe from Electrical Hazards for Over 50 Years



Introduction

- ▶ **Contractors and their employees, who work on:**
 - **Host facilities**
 - **New construction sites**
- ▶ **Contractors must understand:**
 - **The hazards of electricity**
 - **OSHA 29 CFR 1926 for Construction**
 - **OSHA 29 CFR 1910 for General Industry**
 - **NFPA 70E *Standard for Electrical Safety in the Workplace***
 - **Electrical safety requirements, procedures, and responsibilities that pertain to their respective job assignments.**

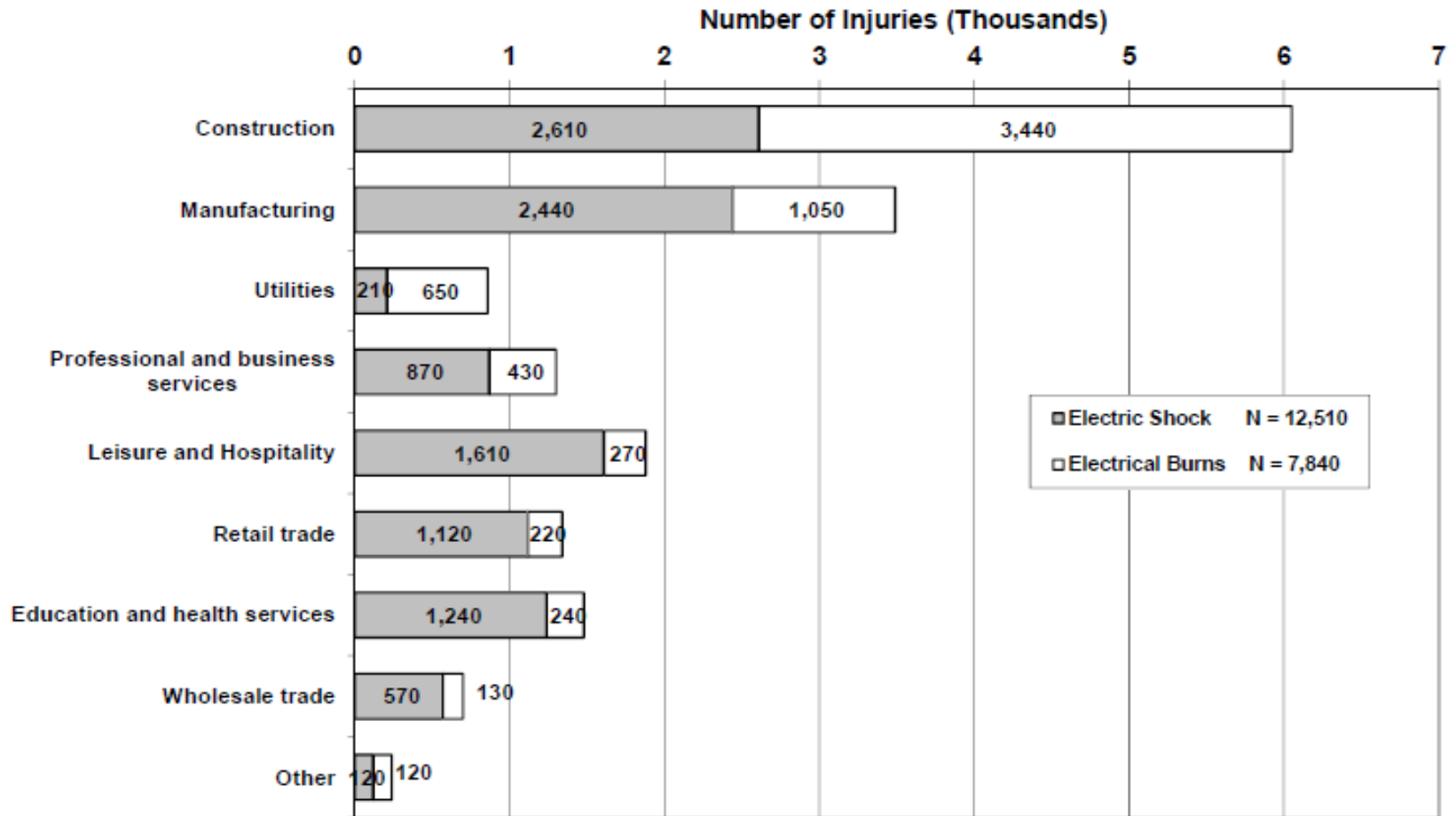
Introduction

- ▶ **The requirements for safe work practices includes:**
 - **Safe approach and working distances**
 - **Required personal protective equipment**
 - **Additional electrical shock prevention such as:**
 - **GFCI requirements for use on constructions sites**
 - **Temporary wiring restrictions**
 - **OSHA and NFPA 70E multi-employer relationship requirements between the contractor and the host employer**

Electrical Hazards

- ▶ **Hazards of electricity include:**
 - **Electrical shock**
 - **Electrical arc flash**
 - **Electrical arc blast**

Nonfatal Electrical Injuries, Private Industry, by Nature of Injury (Shocks, Burns), 2003-2010



Compiled by the Electrical Safety Foundation International using data from the BLS SOII, 2003-2010

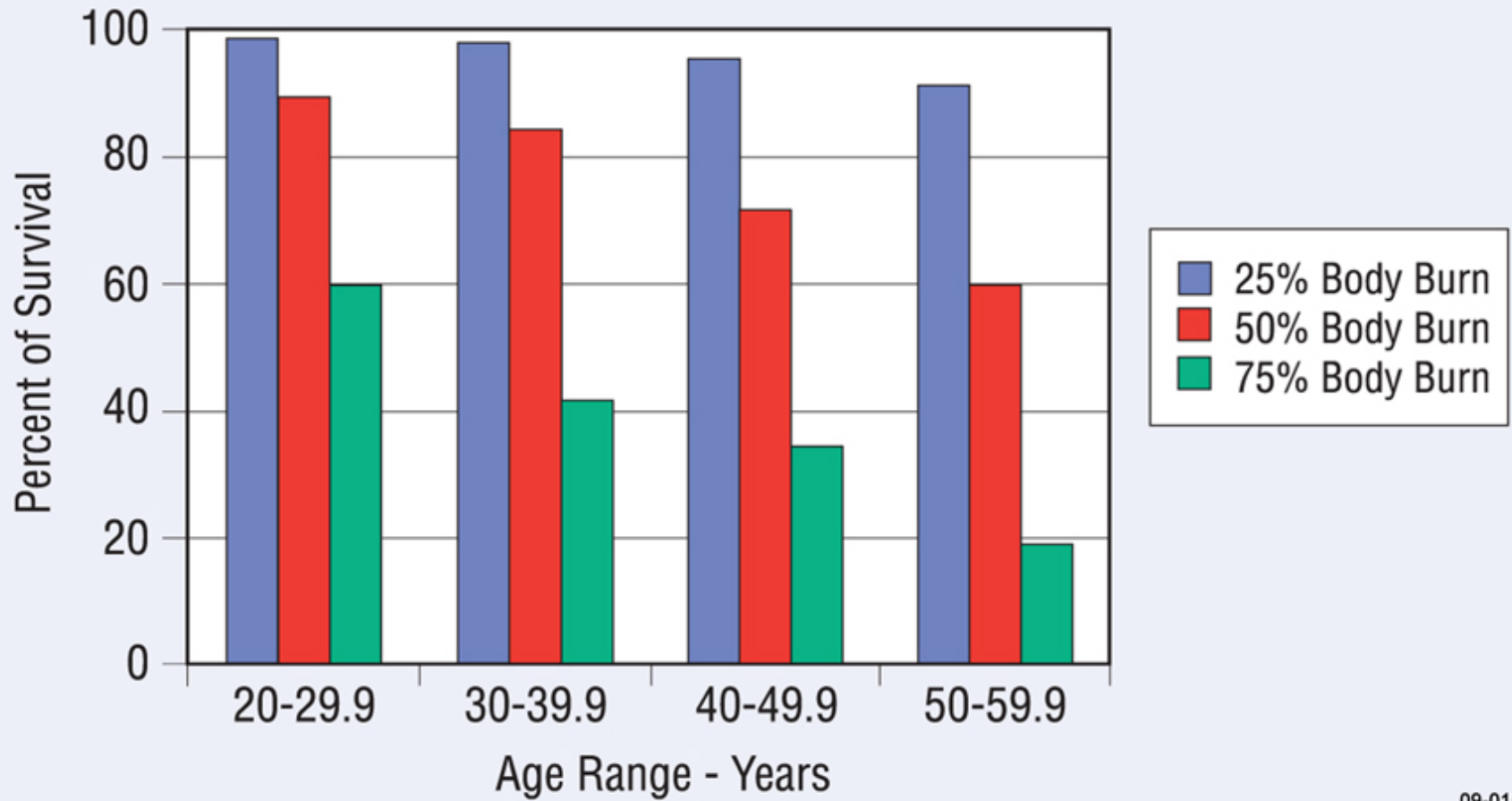
Electrical Hazards

- ▶ **Electrical Shock (Shock Hazard Analysis)**
 - Shock caused by a difference in potential across the body
 - Severity of shock depends on several factors:
 - Resistance of the body (wet or dry skin or work conditions makes a difference)
 - Circuit voltage (50-volts and higher is hazardous)
 - Amount of current flowing through the body ($I = E/R$)
 - Current path through the body
 - Area of contact
 - Duration of contact

Electrical Hazards

- ▶ **Electrical Arc Flash** (Arc Flash Hazard Analysis)
 - **Phase-to-phase, phase-to-neutral, phase-to-ground**
 - **Arc temperatures can reach 35,000°F**
 - **Three different issues with an arc:**
 - **Temperature**
 - ▶ 174°F @ 0.1 sec. – curable burn (2nd degree)
 - ▶ 203°F @ 0.1 sec. – incurable burn (3rd degree)
 - **Incident energy**
 - ▶ 1.2 cal/cm² – onset of 2nd degree burn
 - ▶ 10.7 cal/cm² – onset of 3rd degree burn
 - **Blast or explosion**

Burn Injury - Probability of Survival



Electrical Hazards

▶ Electrical Arc Blast

- Available short-current is the primary contributor
 - Copper vaporizing expands 67,000 times
(1 cubic inch of copper = 1.44 cubic yards of vapor)
- The pressures from an arc are developed from two sources:
 1. The expansion of the metal in boiling and vaporizing
 2. Heating of the air by passage of the arc through it
- Referred to as electrical arc blast or explosion

Safe Approach and Working Distances

- ▶ **Cranes and other boom type equipment**
 - **Working near overhead power lines**
 - **Results in fatalities and serious injuries**
 - Bureau of Labor Statistics (BLS)
 - 444 fatalities involving contact with overhead power lines occurred between 2006 and 2010
 - Essential to develop of an effective overhead power line safety program

Safe Approach and Working Distances

- ▶ A job/task analysis should be performed to identify:
 - Specific work tasks that may be performed
 - Qualification requirements for personnel
 - Required approach distances that must be maintained
 - Appropriate controls to prevent step and touch potentials
 - The electrical safety program should also outline:
 - Appropriate engineering and administrative controls
 - Safe work practices
 - Personal protective equipment requirements
 - Specific training requirements to review all identified hazards, along with required abatement strategies

Safe Approach and Working Distances

- ▶ Crane operators and riggers
 - Not electrically qualified
 - Do not recognize the electrical hazards associated with working near overhead power lines
 - There are many who think the overhead lines are “telephone wires” instead of overhead power lines with several thousand volts of electricity flowing through them

Safe Approach and Working Distances

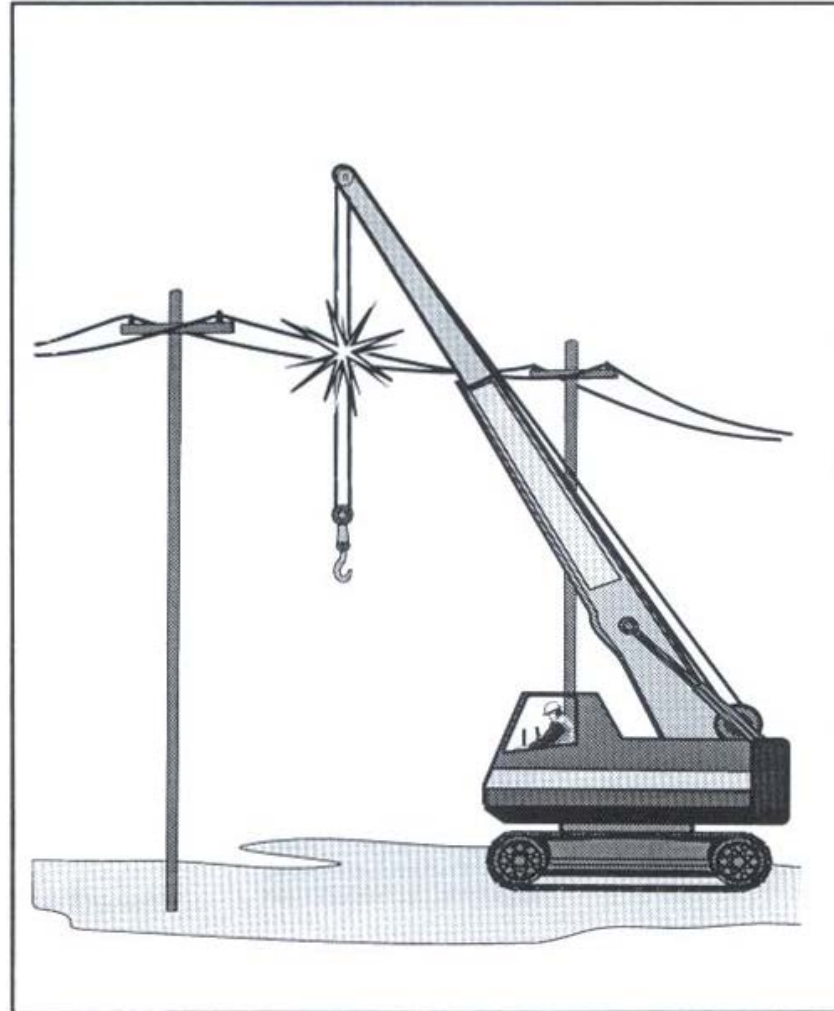
▶ OSHA requirements for equipment and unqualified persons:

- *If work is to be performed near overhead lines, the lines shall be deenergized and grounded, or other protective measures shall be provided before work is started.*
- *If protective measures, such as guarding, isolating, or insulating, are provided, these precautions shall prevent employees from contacting such lines directly with any part of their body or indirectly through conductive materials, tools, or equipment.*

Safe Approach and Working Distances

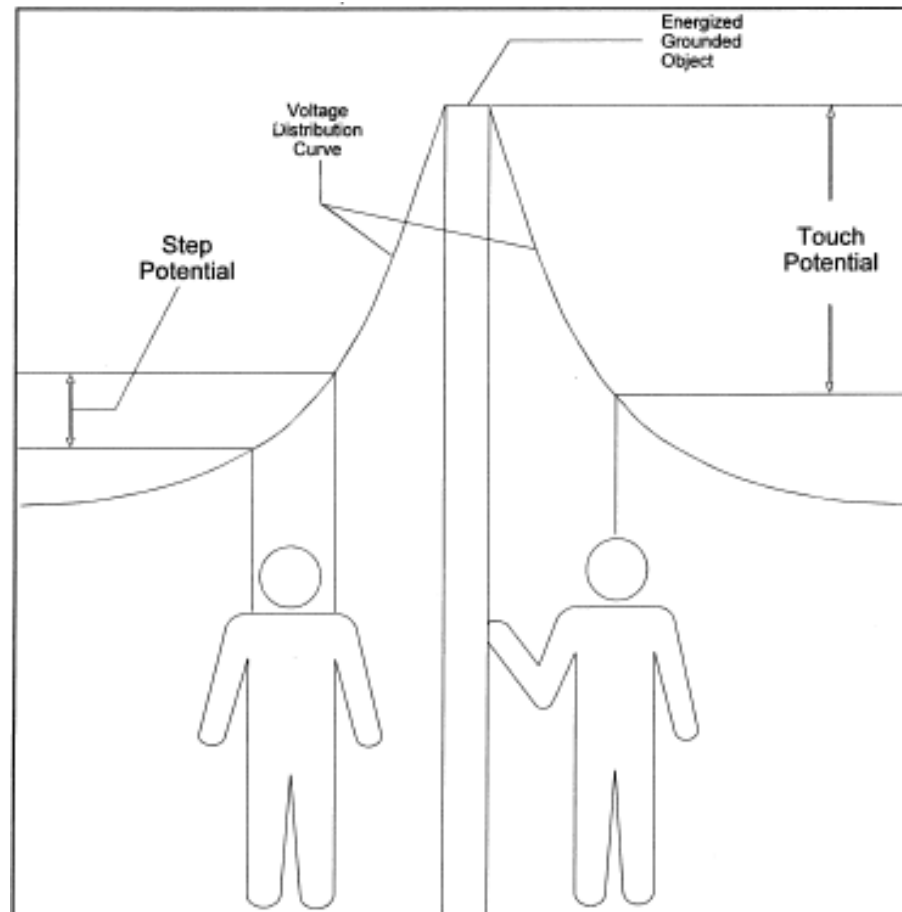
- *Any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines shall be operated so that a clearance of:*
 - *10 ft. (305 cm) of voltages up to 50kV is maintained*
 - *If the voltage is higher than 50kV, the clearance shall be increased 4 in. (10 cm) for every 10kV over that voltage.*
- **These working clearances also apply to unqualified persons**

Crane Making Contact with Overhead Power Line



Crane Making Contact with Overhead Power Line

- ▶ Another issue is step and touch potential



Personal Protective Equipment (PPE)

- ▶ OSHA 1910.132, General Requirements for Personal Protective Equipment, paragraph (d)(1):
“The employer shall assess the workplace to determine if hazards are present, or are likely to be present, which necessitates the use of Personal Protective Equipment (PPE). If such hazards are present, or likely to be present, the employer shall “select, and have each employee use, the type of PPE that will protect the affected employee from the hazards identified in the hazard assessment.”

Personal Protective Equipment (PPE)

- ▶ **Hazard assessment completed**
- ▶ **PPE selected**
 - **OSHA 1910.137 for shock protection PPE**
 - **NFPA 70E, Article 130 for arc rated PPE**
- ▶ **Training on all PPE required by the hazard assessment**
 - **OSHA 1910.132(f)**
 - *When PPE is necessary;*
 - *What PPE is necessary;*
 - *How to properly don, doff, adjust, and wear PPE;*
 - *The limitations of the PPE; and*
 - *The proper care, maintenance, useful life, and disposal of PPE*

Personal Protective Equipment (PPE)

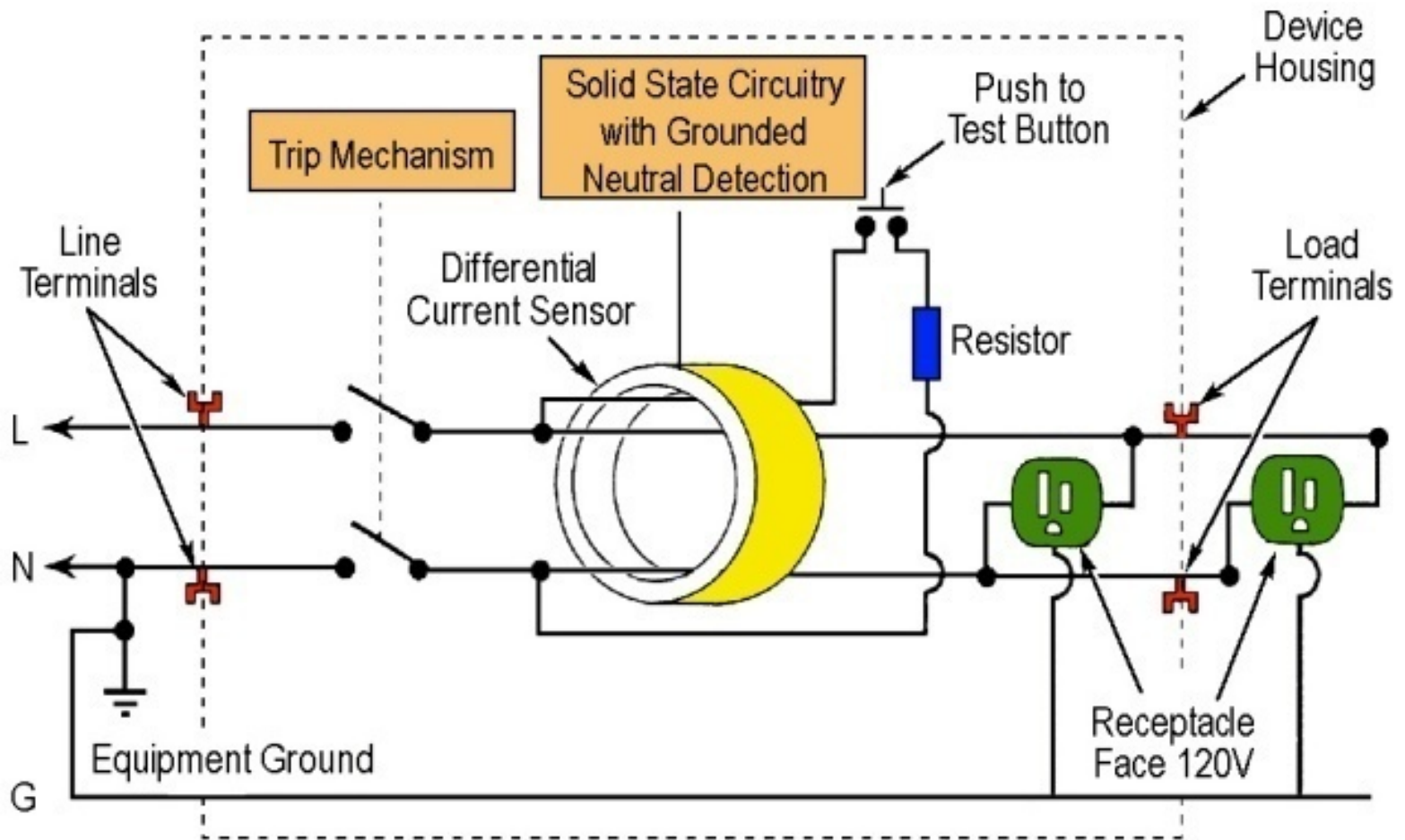
- ▶ OSHA requires protection from the hazards of electricity in 1910.335(a)(2)(ii):
 - *“Protective shields, protective barriers, or insulating materials shall be used to protect each employee from shock, burns, or other electrically related injuries while that employee is working near exposed energized parts which might be accidentally contacted or where dangerous electric heating or arcing might occur.”*

Ground-Fault Circuit-Interrupters (GFCI)

▶ **GFCI should be used with:**

- Hand-held, cord- and plug-connected equipment
- **Extension cords**
- This would also include the use of:
 - Vacuum cleaners
 - Floor buffers
 - Similar cleaning equipment used in commercial and industrial facilities
- GFCI's used in all wet and damp locations, construction sites, and other high-risk areas

GFCI Circuitry



Ground-Fault Circuit-Interrupters (GFCI)

- ▶ **GFCIs are required by:**
 - OSHA 1910.304(b)(3) *Ground-fault circuit interrupter protection for personnel*
 - **National Electrical Code (NEC) Section 590.6**
Ground-fault protection for personnel

Multi-Employer Relationship

- ▶ The OSH Act of 1970 requires the employer (Contractor or Host) to provide a safe and healthful workplace for every working man and woman.
- ▶ The OSH Act, Section 5 requires each employer to 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 his employees and requires the employer to comply with occupational safety and health standards promulgated under the OSH Act.

Multi-Employer Relationship

- ▶ Electrical hazards present a risk for injuries and fatalities to everyone who may be exposed to them. This would include:
 - The on-site (host) employer's employees
 - Contractors and their employees
 - Any other outside service personnel working on the host employer's facility
 - Applies to **new construction sites**

Multi-Employer Relationship

- ▶ Host employer. *An employer who operates and maintains an electric power generation, transmission, or distribution installation covered by this section and who hires a contract employer to perform work on that installation.*
- ▶ Contract employer. *An employer who performs work covered by this section for a host employer.*

Multi-Employer Relationship

- ▶ Employers on multi-employer worksites share responsibility for workplace safety
- ▶ OSHA CPL 02-00-124, *Multi-Employer Citation Policy, December 10, 1999*
 - *On multi-employer worksites (in all industry sectors), more than one employer may be citable for a hazardous condition that violates an OSHA standard.*

Multi-Employer Relationship

- ▶ OSHA's *Multi-Employer Citation Policy* states that citations are normally issued to:
 - The employer who creates the hazard
 - The employer who has the authority, by contract or practice, to ensure that the hazardous condition is corrected
 - The employer who has the responsibility for correcting the hazard

Multi-Employer Relationship

- ▶ NFPA 70E, Section 110.1, *Relationships with Contractors (Outside Service Personnel, and So Forth)*
- ▶ **OSHA 29 CFR 1910.269(a)(3) *Information transfer***
- ▶ **OSHA 29 CFR 1926.950(c) *Information transfer***
- ▶ All of these require a meeting between the Host and the Contractor
- ▶ **NFPA 70E, Section 110.1(C) requires the meeting to be documented**

Summary

- ▶ Contractors and their employees must understand:
 - The hazards of electricity
 - Electrical Shock
 - Electrical Arc Flash
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 - OSHA 29 CFR 1926 for Construction
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Summary

- ▶ They must understand the requirements for safe work practices, which include:
 - Safe approach and working distances
 - Required personal protective equipment
 - Additional electrical shock prevention such as:
 - GFCI requirements for use on constructions sites
 - Temporary wiring restrictions
 - OSHA and NFPA 70E multi-employer relationship requirements between the contractor and the host employer

Summary

- ▶ Overhead power lines
 - They can become “out of sight and out of mind”
 - Effective overhead power line safety program must:
 - Identify work tasks that may be performed near overhead power lines
 - Develop appropriate controls
 - Provide regular training

??? Questions **???**

Electrical Safety When Working with Contractors

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