



ELECTRICAL TRANSMISSION & DISTRIBUTION PARTNERSHIP

10-HOUR OSHA TRAINING COURSE

Student Handout

Version 05.07.12

PARTNERSHIP

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	Electrical Transmission & Distribution Partnership 10-Hour OSHA Training Course	
Introduction to OSHA		

Objectives

The OSHA Training Institute (OTI) developed this training module with the intent that all attendees have an understanding of the roles and purpose of the Occupational Safety and Health Administration (OSHA). OSHA also desires that each effected employee have an understanding of the OSHA regulations that apply to the work they may perform. Upon successful completion of this training module, you should be able to:

Define the acronym “OSHA”

- i) Occupational Safety and Health Administration

Explain the role of OSHA

- i) “ To assure safe and healthful working conditions for working men and women; by authorizing enforcement of the standards developed under the Act; by assisting and encouraging the States in their efforts to assure safe and healthful working conditions; by providing for research, information, education, and training in the field of occupational safety and health; and for other purposes.”ⁱ

Define “Occupational Safety and Health Standard”

- i) The term "occupational safety and health standard" means a standard which requires conditions, or the adoption or use of one or more practices, means, methods, operations, or processes, reasonably necessary or appropriate to provide safe or healthful employment and places of employment.

Explain where to locate OSHA standards

- i) Code of Federal Regulations (CFR)
- ii) Internet at www.osha.gov
- iii) Local area OSHA office

List at least three (3) employer responsibilities required by the OSH Act

- i) Provide a safe and healthy workplace free from recognized hazards
- ii) Provide training for workers
- iii) Maintain a record of occupational injuries and illnesses
- iv) Cooperate with Compliance Health and Safety Officers (CHSO) during workplace inspections
- v) Post workplace information such as the OSHA poster and recordable incident summaries

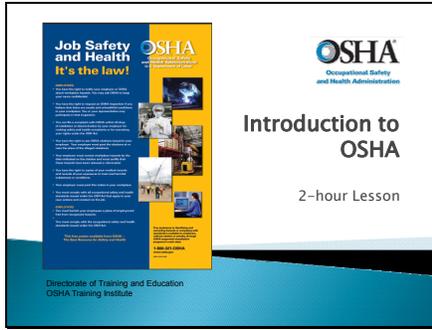
List at least three (3) worker rights & responsibilities afforded by the OSH Act

- i) Follow employer's workplace safety and health policies and procedures
- ii) Wear and use required safety equipment
- iii) Report hazardous conditions in the workplace to the employer
- iv) Notify OSHA of hazardous conditions in the workplace that were reported to the employer but were not corrected

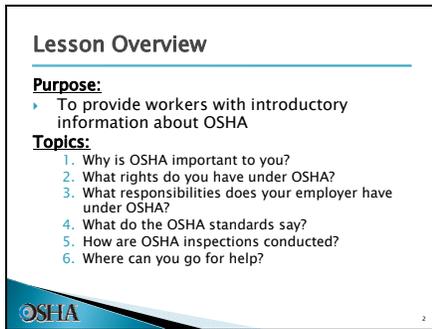
Explain where to find additional information about OSHA

- i) Regional OSHA office
- ii) www.osha.gov
- iii) www.osha.gov/as/opa/worker/index.html (workers' page)
- iv) The Code of Federal Regulations (CFR's)

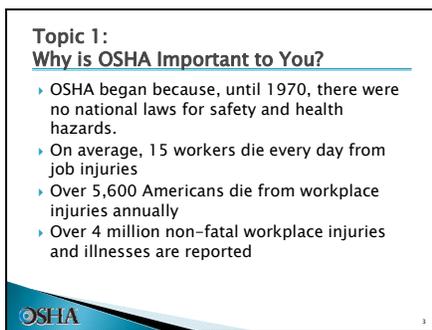
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Discussion Questions 

- ▶ When, during your work experience, did you first hear about OSHA?
- ▶ What did you think about OSHA then?
- ▶ What do you think OSHA's job is?

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Group Activity: FAT/CAT Report

 **Handout #1: Weekly Fatality/Catastrophe Report** 

- ▶ Each group reviews the handout and selects an incident to discuss
- ▶ Have full class share what they discussed in the groups



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History of OSHA

- ▶ OSHA stands for the Occupational Safety and Health Administration, an agency of the U.S. Department of Labor
- ▶ OSHA's responsibility is worker safety and health protection
- ▶ On December 29, 1970, President Nixon signed the OSH Act
- ▶ This Act created OSHA, the agency, which formally came into being on April 28, 1971



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Topic 2:
What Rights Do You Have Under OSHA?

- ▶ You have the right to:
 - A safe and healthful workplace
 - Know about hazardous chemicals
 - Information about injuries and illnesses in your workplace
 - Complain or request hazard correction from employer
 - Training
 - Hazard exposure and medical records
 - File a complaint with OSHA
 - Participate in an OSHA inspection
 - Be free from retaliation for exercising safety and health rights



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Worker Rights

 **Handout #2:
OSHA Poster** 

- ▶ Have you seen this poster at your place of work?
- ▶ Creation of OSHA provided workers the right to a safe and healthful workplace



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Your Right to...
Safe & Healthful Workplace

- ▶ The creation of OSHA provided workers the right to a safe and healthful workplace. 
- ▶ Section 5(a)(1) of the OSH Act states: "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 his employees."



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Your Right to...

Complain or Request Corrections

- ▶ Workers may bring up safety and health concerns in the workplace to their employers without fear of discharge or discrimination, as long as the complaint is made in good faith.
- ▶ OSHA regulations [29CFR 1977.9(c)] protect workers who complain to their employer about unsafe or unhealthful conditions in the workplace.



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Your Right to...

Training

- ▶ Workers have a right to get training from employers on a variety of health and safety hazards and standards that employers must follow.
- ▶ Some required training covers topics such as, lockout-tagout, bloodborne pathogens, noise, confined spaces, fall hazards in construction, personal protective equipment, along with a variety of other subjects.



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Your Right to...

Examine Exposure & Medical Records

- ▶ 1910.1020: right to examine & copy records
- ▶ Examples of toxic substances and harmful physical agents are:
 - Metals and dusts, such as, lead, cadmium, and silica.
 - Biological agents, such as bacteria, viruses, and fungi.
 - Physical stress, such as noise, heat, cold, vibration, repetitive motion, and ionizing and non-ionizing radiation.



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Your Right to...

File a Complaint with OSHA

- ▶ Workers may file a complaint with OSHA if they believe a violation of a safety or health standard, or an imminent danger situation, exists in the workplace.
- ▶ Workers may request that their name not be revealed to the employer.
- ▶ If a worker files a complaint, they have the right to find out OSHA's action on the complaint and request a review if an inspection is not made.



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Your Right to...

Participate in an OSHA Inspection

- ▶ Employee representative can accompany OSHA inspector
- ▶ Workers can talk to the inspector privately.
- ▶ Workers may point out hazards, describe injuries, illnesses or near misses that resulted from those hazards and describe any concern you have about a safety or health issue.
- ▶ Workers can find out about inspection results, abatement measures and may object to dates set for violation to be corrected.



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Your Right to...

Be Free From Retaliation

- ▶ Workers have the right to be free from retaliation for exercising safety and health rights.
- ▶ Workers have a right to seek safety and health on the job without fear of punishment.
- ▶ This right is spelled out in Section 11(c) of the OSH Act.
- ▶ Workers have 30 days to contact OSHA if they feel they have been punished for exercising their safety and health rights.



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Questions for Review 

- › What does an MSDS tell you?
- › What are some worker rights related to injury and illness reporting?
- › Name some standards or hazards where workers must be trained.

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Topic 3: What Responsibilities Does Your Employer Have Under OSHA?

- › Provide a workplace free from recognized hazards and comply with OSHA standards
- › Provide training required by OSHA standards
- › Keep records of injuries and illnesses
- › Provide medical exams when required by OSHA standards and provide workers access to their exposure and medical records
- › Not discriminate against workers who exercise their rights under the Act (Section 11(c))
- › Post OSHA citations and abatement verification notices
- › Provide and pay for PPE

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Employers are Required to:

KEEP RECORDS OF INJURIES AND ILLNESSES

REPORTING AND RECORDING CHECKLIST

Employers must:

- ✓ Report each worker death
- ✓ Report each incident that hospitalizes 3 or more workers
- ✓ Maintain injury & illness records
- ✓ Inform workers how to report an injury or illness to the employer
- ✓ Make records available to workers
- ✓ Allow OSHA access to records
- ✓ Post annual summary of injuries & illnesses

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Questions for Review 

- ▶ Give an example of a reason why OSHA would conduct an inspection at your workplace.
- ▶ What are the types of OSHA violations?

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**Topic 6:
Where Can You Go For Help?**

- ▶ Sources within the workplace/worksite
- ▶ Sources outside the workplace/worksite
- ▶ How to file an OSHA complaint

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Sources Within the Workplace/Worksite

- ▶ Employer or supervisor, co-workers and union representatives
- ▶ Material Safety Data Sheet (MSDS) for information on chemicals
- ▶ Labels and warning signs
- ▶ Employee orientation manuals or other training materials
- ▶ Work tasks and procedures instruction

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Sources Outside the Workplace/Worksite

- ▶ OSHA website: <http://www.osha.gov> and OSHA offices (you can call or write)
- ▶ Compliance Assistance Specialists in the area offices
- ▶ National Institute for Occupational Safety and Health (NIOSH) – OSHA’s sister agency
- ▶ OSHA Training Institute Education Centers
- ▶ Doctors, nurses, other health care providers
- ▶ Public libraries
- ▶ Other local, community-based resources



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How to File an OSHA Complaint

 **Handout #11: Identifying Safety and Health Problems in the Workplace** 

- ▶ Review handout to become more aware of workplace hazards
- ▶ Discuss if anyone has discovered safety and/or health problems in the workplace/site



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Filing an OSHA Complaint

- ▶ Download the OSHA-7 form from OSHA’s website
- ▶ File the complaint online
 - Workers can file a complaint
 - A worker representative can file a complaint
- ▶ Telephone or visit local regional or area offices to discuss your concerns
- ▶ Complete the form – be specific and include appropriate details
- ▶ OSHA determines if an inspection is necessary
- ▶ Workers do not have to reveal their name



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	Electrical Transmission & Distribution Partnership 10-Hour OSHA Training Course	
Electrical Safety		

Objectives

The OSHA Strategic Partnership (OSP) developed this training module with the intent that all employees have an understanding of the OSHA regulations and safe work practices that apply to electrical safety and work activities they may perform. Upon successful completion of this training module, the attendee should be able to:

Describe the causal factors & types of injuries that may result from an unintentional electrical contact

- i) Industry statistics
- ii) Second points of contact
- iii) Electrocutation
- iv) Severe burns
- v) Secondary injuries such as falls from heights
- vi) Arc blast and radiant heat injuries

Explain the difference between types of electrical workers

- i) Qualified vs. non-qualified electrical workers

Define approach distance as it relates to work in proximity to energized parts for qualified and non-qualified workers

- i) OSHA tables from CFR 29 §1926 and §1910
- ii) Approach distance for non-qualified workers

Given a voltage, demonstrate the ability to determine the minimum approach distance for qualified workers based on the OSHA tables

- i) OSHA tables from CFR 29 §1926 and §1910

Define the OSHA requirements for a qualified electrical worker

- i) Describe the safety related work practices
- ii) Determine energized parts from non-energized parts
- iii) Determine nominal voltage
- iv) Determine minimum approach distance
- v) Explain emergency procedures

Describe methods to care for and inspect rubber insulating equipment, fiberglass reinforced plastic (f.r.p.) live-line tools, portable electrical tools, and cord sets

- i) Procedures for pre-use inspection of rubber insulating gloves, sleeves, blankets, and line hose
- ii) Proper use of line-cover material with an emphasis on second points of contact
- iii) Procedures for material storage near energized sources
- iv) Care, use, and inspection of cord set for temporary power and GFCI use

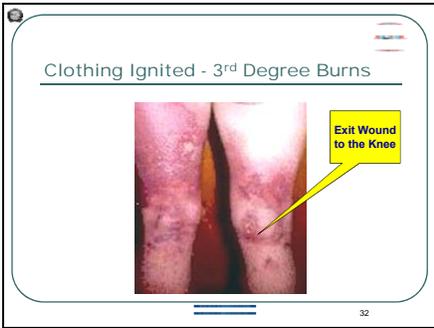
Explain where to find additional information about working safely around energized parts

- i) Regional OSHA office
- ii) www.osha.gov
- iii) The Code of Federal Regulations (CFR's)

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Arc Flash Hazards

- Arc-blasts occur from high-amperage currents arcing through air



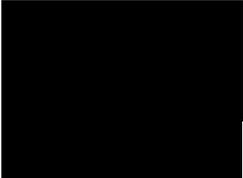
www.electricsubstationsafety.com

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Arc Flash Hazards

- 60,000 amp, phase to ground fault



www.electricsubstationsafety.com

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Protective Clothing

- Workers exposed to flames or arcs must not wear clothing that will increase the severity of an injury



www.electricsubstationsafety.com

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Minimum Approach Distances

- Key to working safely !!
 - Two distances: Qualified & Unqualified personnel
 - Distance of arm fully extended & conductive material in hand
 - Recognize hazards when working in proximity to exposed live parts

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Minimum Approach Distance

- Ensures that workers do not approach or take any conductive object closer to the energized parts as set forth in the OSHA tables
- Changes in the weather have been factored into the minimum approach distances
- ***The closest distance an employee is permitted to approach an energized or a grounded object***

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The Standards

- No employee shall be permitted to approach or take any conductive object without an approved insulating handle closer to exposed energized parts than shown in Table V-1, unless:
 - *The employee is insulated or guarded from the energized part (gloves or gloves with sleeves rated for the voltage involved shall be considered insulation of the employee from the energized part), or*
 - *The energized part is insulated or guarded from him and any other conductive object at a different potential, or*

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Second Point of Contact

- Secure your work area
- Eliminate second point of contact hazards



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Second Point of Contact

- Secure work area both above and BELOW the work area



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Second Point of Contact

- Only class "A" aerial lift trucks will give a warning of boom leakage
- If the boom can contact an energized phase, cover the phase



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Proper Care & Storage

- Rubber insulating equipment and hot line tools must be stored in a manner that they cannot be damaged



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Proper Care & Storage

- Rubber insulating equipment and hot line tools must be stored in a manner that they cannot be damaged



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Insulation Equipment

- Link sticks should be used between winch lines and energized conductors
- Increases the level of safety provided
- Provides back-up protection

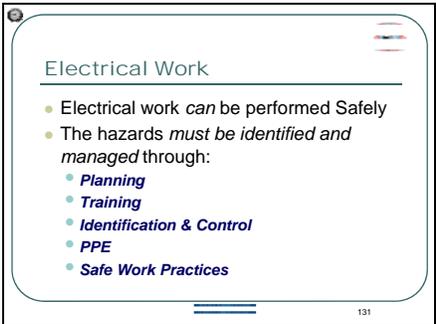


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	Electrical Transmission & Distribution Partnership 10-Hour OSHA Training Course	
Personal Protective Grounding		

Objectives

The OSHA Strategic Partnership (OSP) developed this training module with the intent that all employees have an understanding of the OSHA regulations that apply to the power transmission and distribution industry. Listed below are the instructional objectives of this training module. Upon successful completion of this training module, the attendee should be able to:

Define the three basic properties of electrical theory

- i) Voltage, current, and resistance

Discuss the reasons for installing temporary protective grounds

- i) To provide a low resistance, high current capacity path to ground so that in the event of a fault or accidental re-energization, protective devices can de-energize the circuit

Discuss the various ways a circuit or part can become unintentionally re-energized

- i) Induction, switching errors, capacitive and inductive reactance, back-feed, equipment failure, vehicle accidents (collisions with support structures)

Discuss both step and touch potential

- i) Define the hazards
- ii) Explain how each occurs
- iii) Describe some of the protective measures

Discuss terms associated with temporary protective grounding and bonding

Discuss grounding and bonding equipment selection and performance

Discuss steps to de-energize a system or circuit

- i) Discuss the requirements of 1910.269(m)
- ii) Discuss methods of obtaining clearance based on OSHA and host employer requirements
- iii) Discuss methods and tools used to test for absence of potential
- iv) Discuss methods to install and remove temporary grounding equipment

Discuss various methods to establish an equal potential work zone

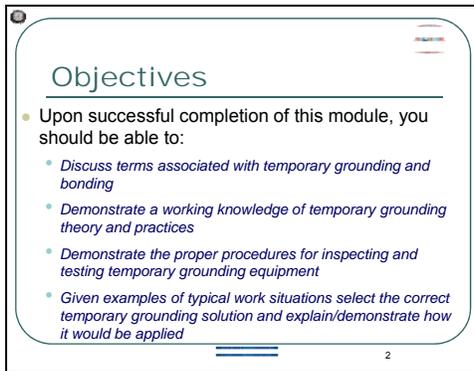
- i) View examples of equal potential work zones created by the use of temporary protective grounding equipment, bonding equipment, grounding mats, and cluster brackets

View various digital photographs of actual work situations and give an opinion as to whether the picture depicts a safe or at risk scenario, and explain the reasoning for that determination

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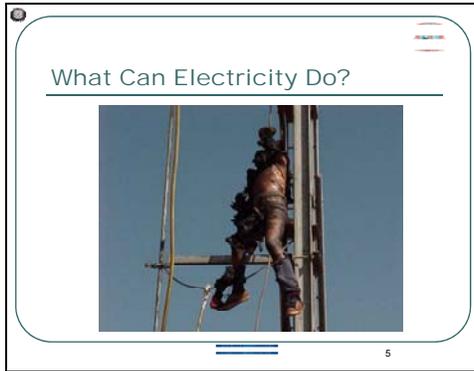
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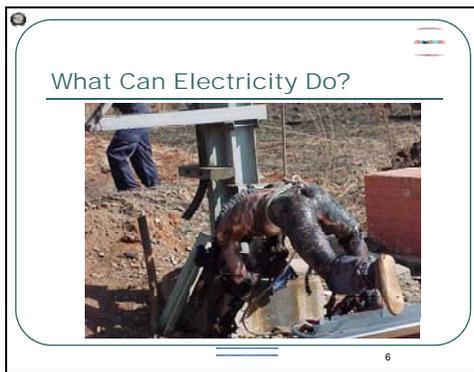
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How Electricity Can Harm You

- **Effects on Your Body**
 - Nervous system effects
 - Heart fibrillation can occur at 75 to 100 mA at 60 Hz.
 - Fibrillation means the heart is twitching and there is no blood flow to the body.
 - The heart can be damaged because it is in the path:
 - Hand to hand
 - Hand to foot



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Dalziel's Table

Body Effect	Gender	60 HZ AC
Slight sensation at point(s) of contact	Men	.4 mA
	Women	.3 mA
Threshold of bodily perception	Men	1.1 mA
	Women	0.7 mA
Pain with voluntary muscle control maintained	Men	9 mA
	Women	6 mA
Pain with loss of voluntary muscle control	Men	16 mA
	Women	10.5 mA
Severe pain and breathing difficulty	Men	23 mA
	Women	15 mA
Possible heart fibrillation after 3 seconds	Men	100 mA
	Women	100 mA



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The End Result of Not Working Safely With Electricity

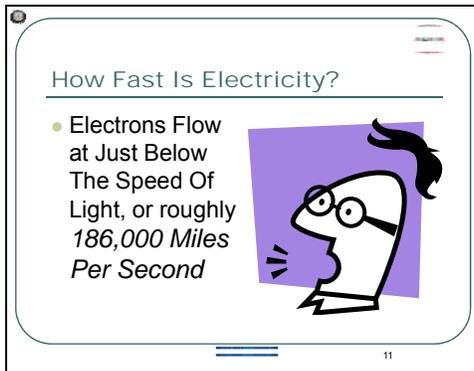


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Basics of Electricity

- **Current**
 - The unit of current is the ampere (amp).
 - Electrical current will not flow unless it has a complete path (circuit) that returns to its source (generator, battery, transformer).



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Basics of Electricity

- **Voltage**
 - The unit of voltage is the volt
 - Another word for voltage is "potential."



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Basics of Electricity

- **Resistance**
 - Unit of resistance is the ohm
 - Measured with an Ohm meter
 - The more resistance, the less current flows



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How Can It Happen?
How can a circuit become unintentionally energized?

- Switching Errors/Live Line Contact
- Capacitive Reactance
- Electro-statically/Electro-magnetically induced voltages
- Unexpected back-feed sources
- Lightning strikes
- Vehicle Accidents
- Equipment Failure

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Shunt Reactor Malfunction



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Switching Errors

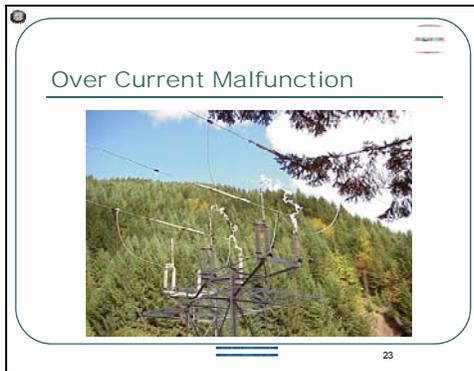


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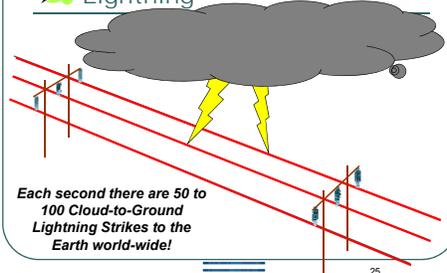


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 **Lightning**

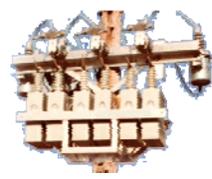


Each second there are 50 to 100 Cloud-to-Ground Lightning Strikes to the Earth world-wide!

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Capacitive Reactance

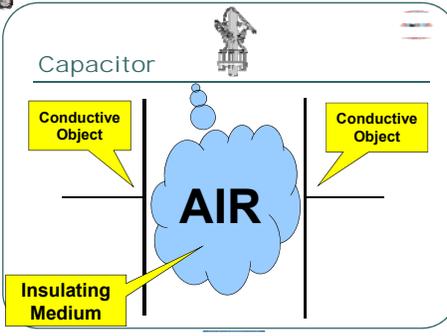


- What is a capacitor?
 - Two conductive objects separated by a dielectric (insulating) medium

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Capacitor



Conductive Object

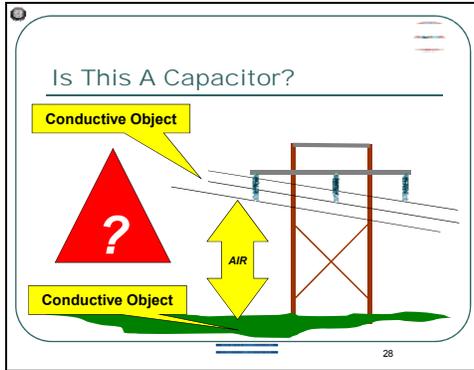
Conductive Object

AIR

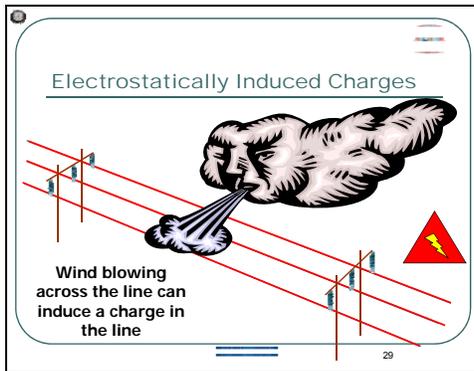
Insulating Medium

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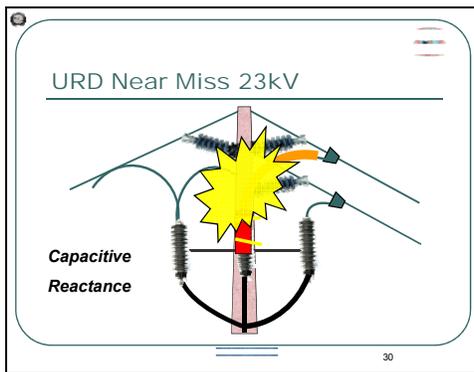
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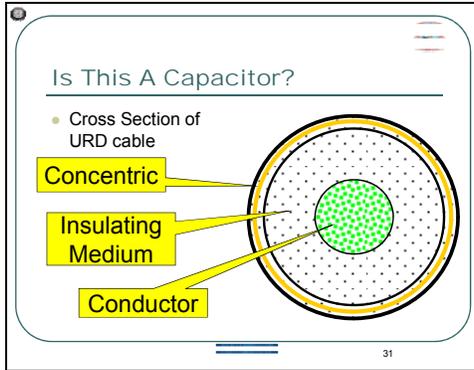
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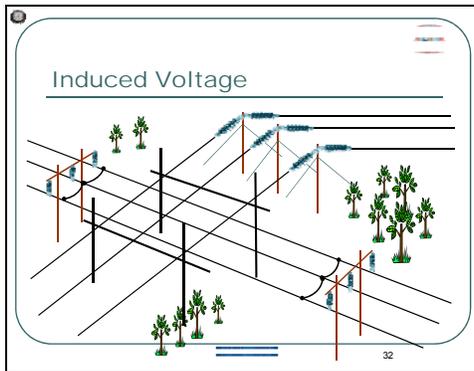
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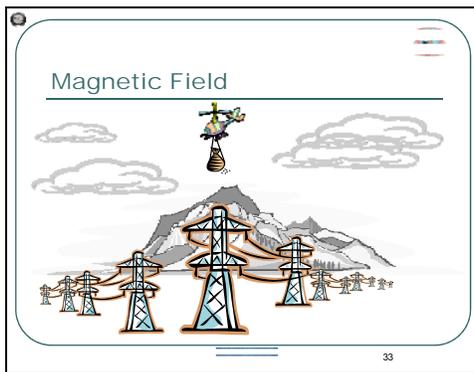
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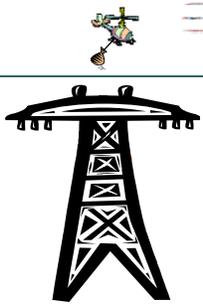
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The Effect

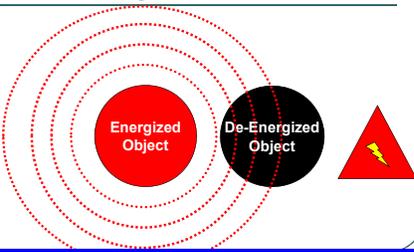
- Some will bounce out of the tower
- Some will make it through the tower



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Electro-Magnetic Induction



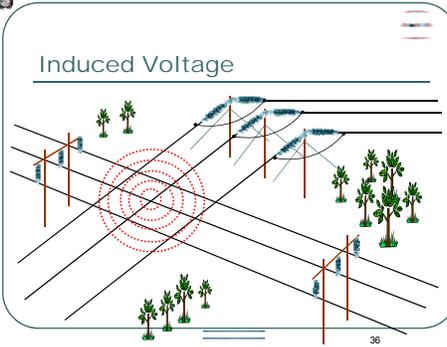
Energized Object

De-Energized Object

The De-energized line is energized through magnetic field coupling

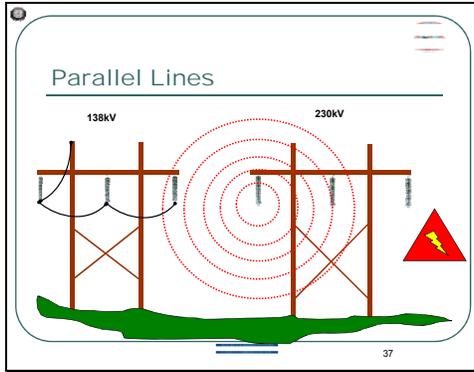
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Induced Voltage

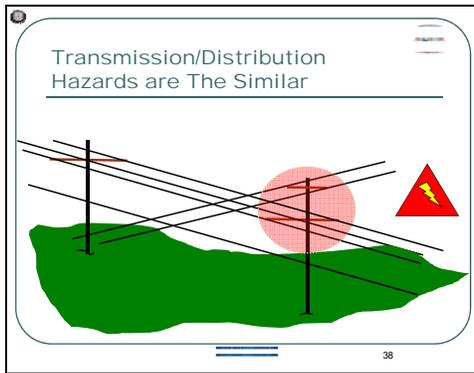


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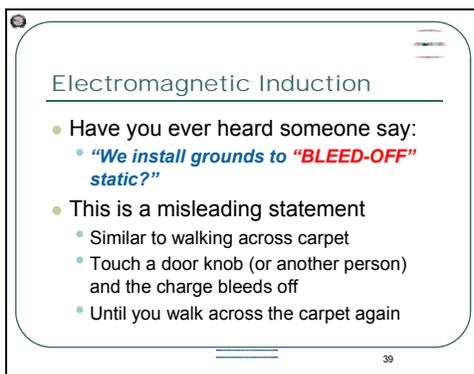
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Static

- Static is defined as:
 - a. *Having no motion; being at rest; quiescent*
 - b. *producing stationary charges*
- When you install grounds, the induced voltage is no longer static
- *You have a current flow!*

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Remember

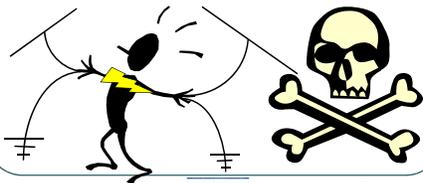
The current will continue to flow as long as the voltage source and a potential difference remains

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Safe Work Practices

- DO NOT GET IN SERIES WITH TWO DIFFERENT POTENTIALS!!



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Auto Accident

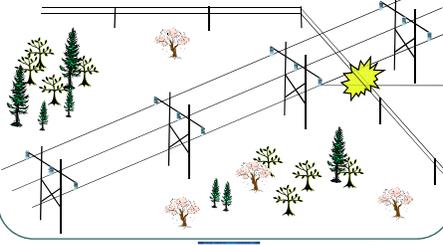
- Pole strikes can cause an unintentional contact between circuits



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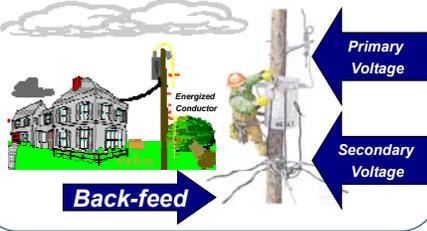
Equipment Failure



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Generator

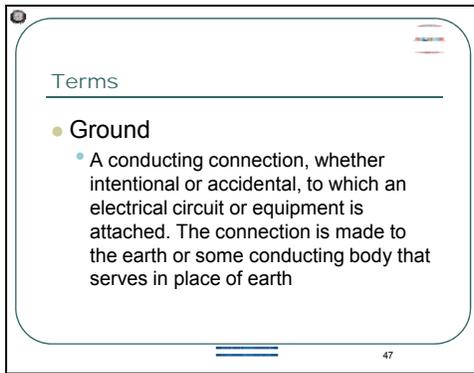


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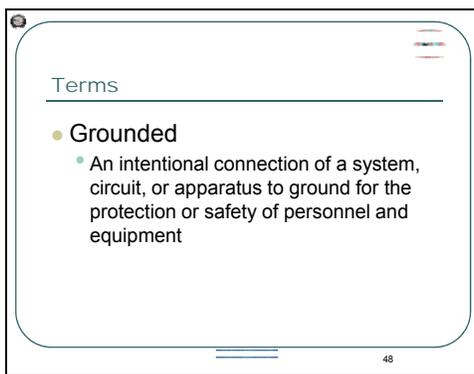
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Terms

- **Fault Current**
 - The current that can flow in a circuit as a result of an undesired phase to phase or phase to ground fault



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Terms

- **Fault Current**
 - The amount of current depends on line voltage and impedance.
 - The degree of hazard depends on how much current and how long the exposure.

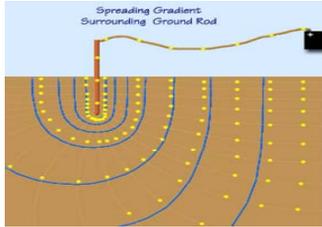


50

Slide 51

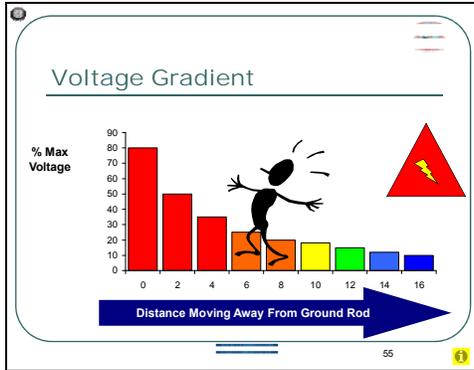
Terms

Spreading Gradient Surrounding Ground Rod



51

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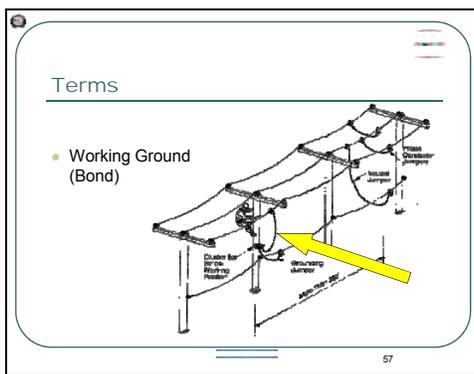
Slide 56

Terms

- **Personal Protective Grounds**
 - Combines working grounds and personal grounds in a way that reduces the potential voltage difference (across the worker) to a safe level.

56

Slide 57



Slide 58

Terms

- **Equipotential Zone**
 - Temporary protective grounds and bonds placed at such locations and arranged in such a manner as to prevent each employee from being exposed to hazardous differences in electrical potential



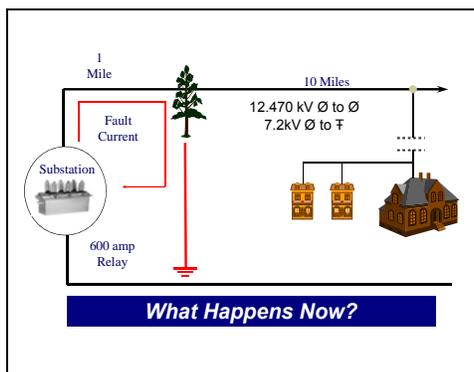
58

Slide 59

*Equal Potential
How It Works*



Slide 60



Slide 61

Protective Systems
Fuses



- If the circuit is protected by a fused cut-out, the fuse will heat up and the cut-out door will drop open and de-energize the circuit/equipment.

61

Slide 62

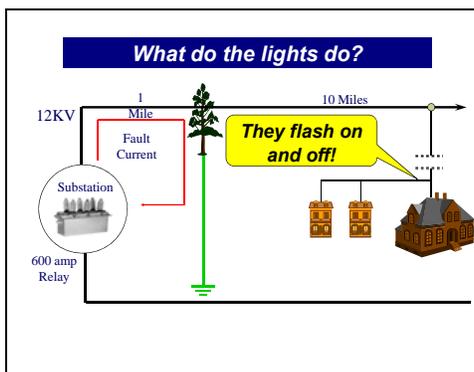
Protective Systems
Re-closer/Breaker



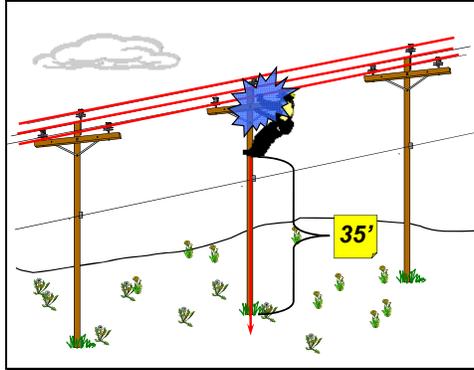
- The recloser/breaker will open
- After a pre-determined time, the re-closer will close

62

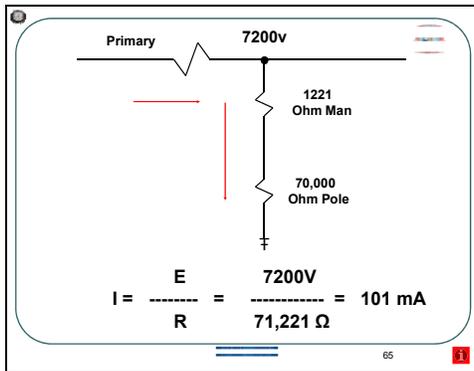
Slide 63



Slide 64



Slide 65



Slide 66

Dalziel's Table

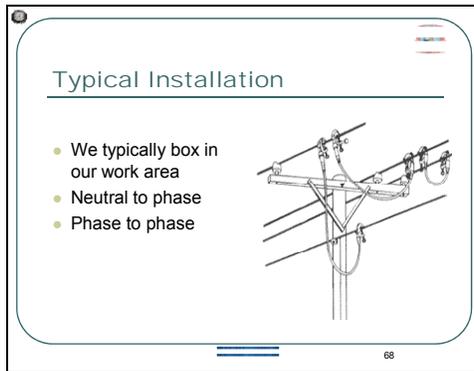
Body Effect	Gender	60 HZ AC
Slight sensation at point(s) of contact	Men	.4 mA
	Women	.3 mA
Threshold of bodily perception	Men	1.1 mA
	Women	0.7 mA
Pain with voluntary muscle control maintained	Men	9 mA
	Women	6 mA
Pain with loss of voluntary muscle control	Men	16 mA
	Women	10.5 mA
Sever pain and breathing difficulty	Men	23 mA
	Women	15 mA
Possible heart fibrillation after 3 seconds	Men	100 mA
	Women	100 mA

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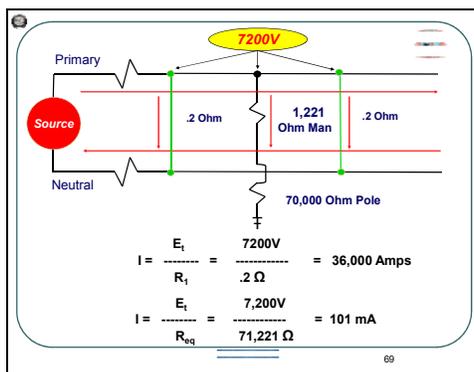
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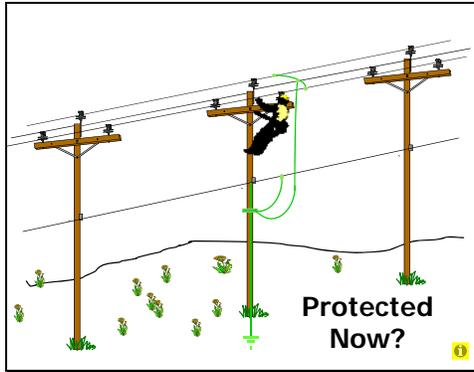
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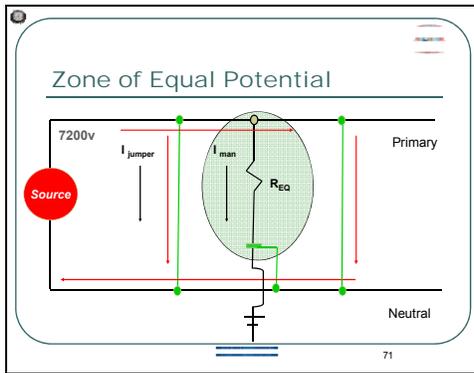
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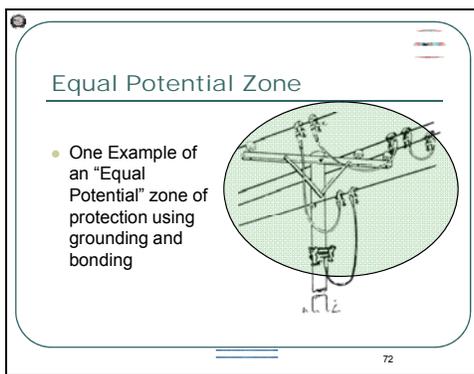
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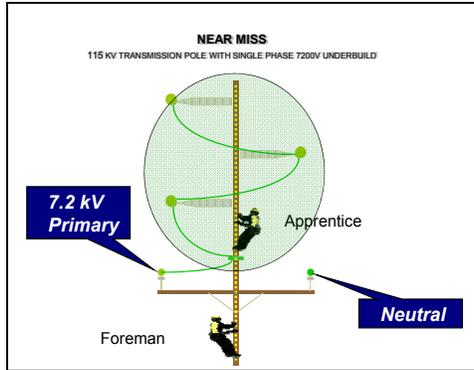
Slide 71



Slide 72



Slide 73



Slide 74

Maintain The Zone

- Lineman touched the winch line and the conductor at the same time
- The line truck was outside the zone of protection

The illustration shows a line truck on the ground with a winch line extending up to a worker on a transmission tower. The worker is touching both the winch line and a conductor. The truck is positioned outside the safety zone of the tower.

Slide 75

Grounding For Protection Of Employees

- De-energized lines and/or equipment must be grounded unless the installation of a ground is impractical or the installation of a ground would create a greater hazard"

The photograph shows a utility pole with a worker on top. The worker is positioned near the top of the pole, and the ground is visible at the base.

Slide 76

Grounding For Protection Of Employees

- New construction, new lines or equipment may be considered deenergized and worked as such where:
 - The lines or equipment are grounded, or
 - The hazard of induced voltages is not present, and
 - adequate clearances or other means are implemented to prevent contact with energized lines or equipment and the new lines or equipment.



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Slide 77

Grounding For Protection Of Employees

- **Is It De-energized?**
- **Only When it is:**
 - *Removed from sources of electrical potential*
 - *Tested with an Approved Device*
 - *Grounded*



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Slide 78

Grounding For Protection Of Employees

- **De-Energized**
 - **Clearance**
 - **Lock Out**
 - **Tagged**



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Slide 79

Grounding For Protection Of Employees

- Lock Out
 - lock the device



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Slide 80

Danger Tag

- Tag the device
 - Works in conjunction with a lock



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Slide 81

Grounding For Protection Of Employees

- Test - Verify
 - Use only approved instruments
 - Test, verify tester, retest

Note: Voltage Indicating Meters are the preferred testing instrument



81

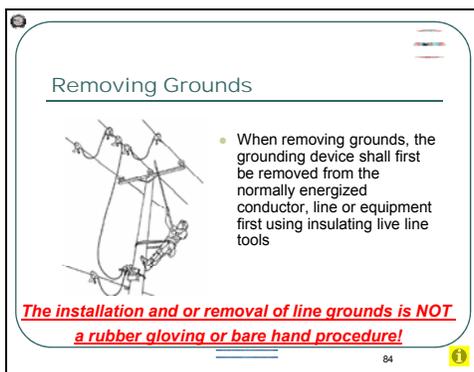
Slide 82



Slide 83



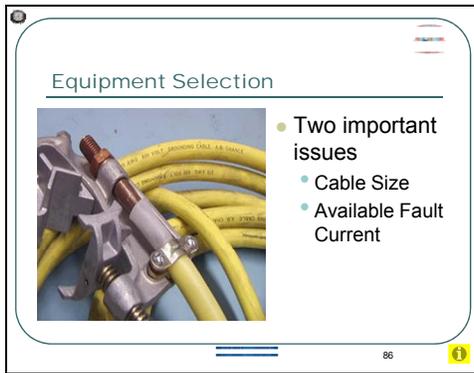
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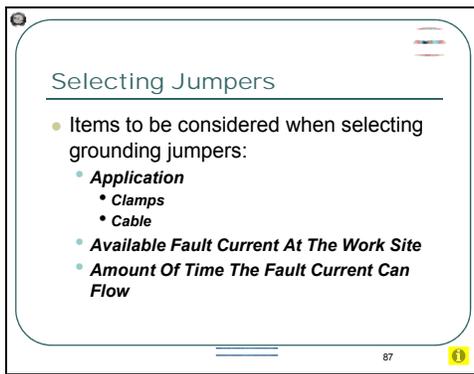
Slide 85



Slide 86



Slide 87



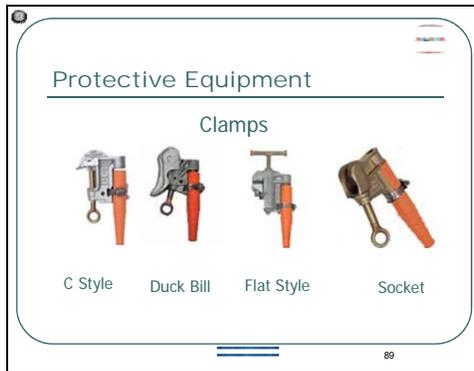
Slide 88

Maximum Fault Current Capability
for Grounding Cables

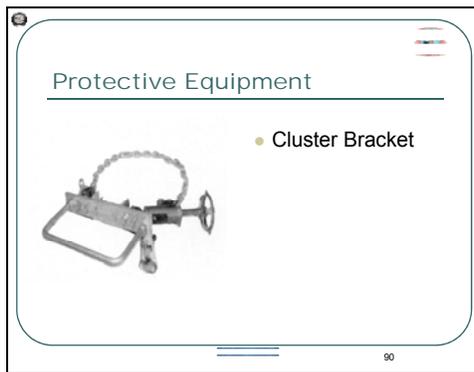
Cable Size	Clearing Time	RMS Amperes
#2	15 Cycles	17,000
	30 Cycles	13,000
1/0	15 Cycles	26,000
	30 Cycles	20,000
2/0	15 Cycles	33,000
	30 Cycles	26,000
4/0	15 Cycles	53,000
	30 Cycles	41,000

ASTM F-855 88

Slide 89



Slide 90



Slide 94

Hazards of Coiled Cable

- Each loop in the coil produces it's own magnetic field.
- These fields impress a counter electro-motive force (EMF) on the other coils
- *The result is a higher resistance to flow!*

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Slide 95

Hazards of Coiled Cable

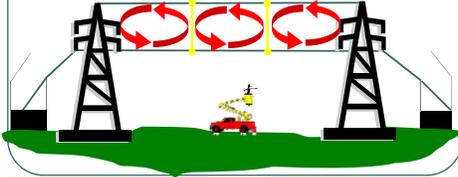


95

Slide 96

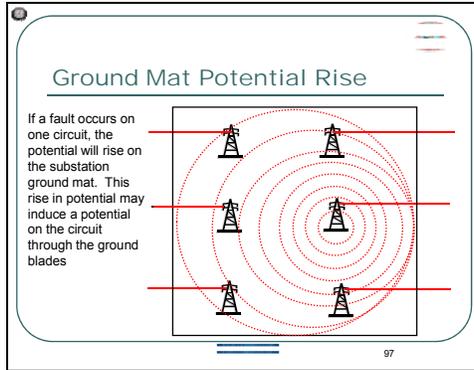
Ground Blades on Switches

Circulating Voltage
Series "Loop" Circuit

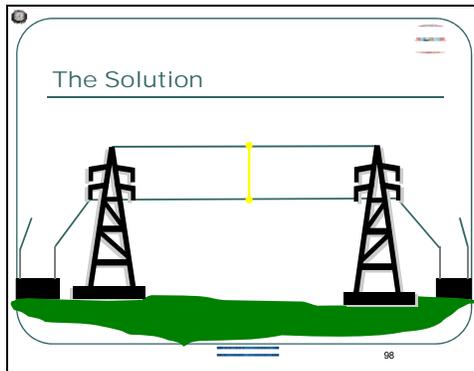


96

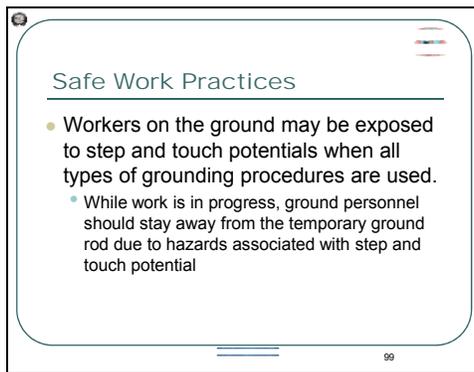
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Slide 98



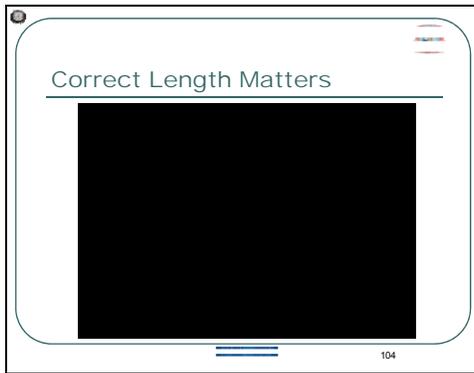
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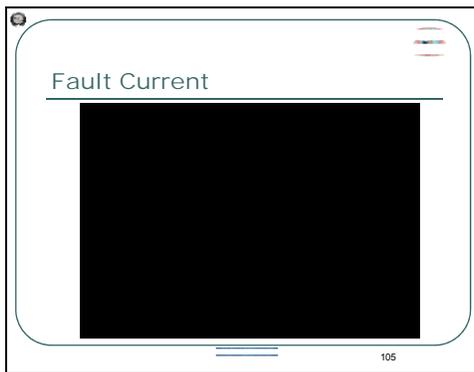
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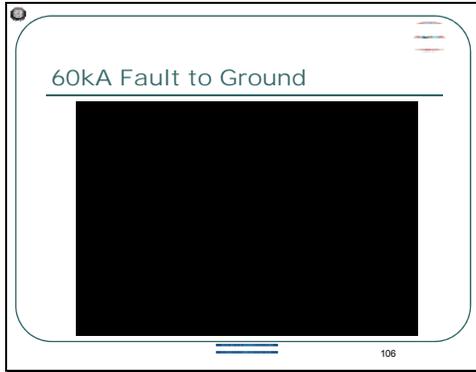
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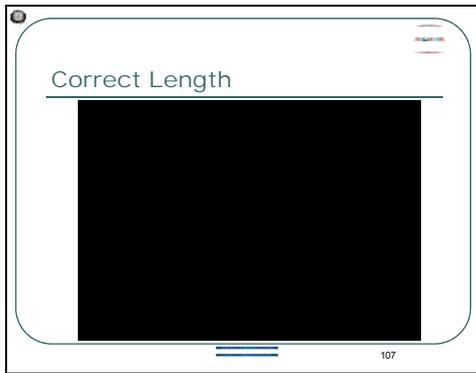
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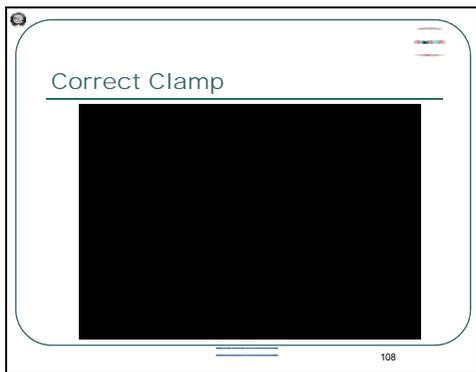
Slide 106



Slide 107



Slide 108



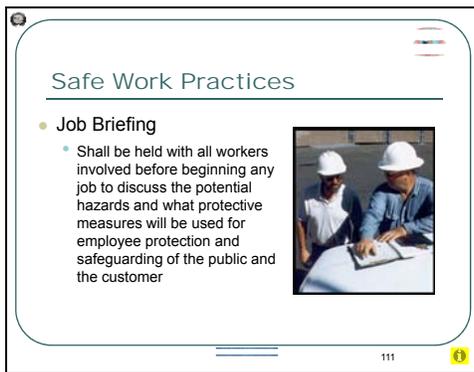
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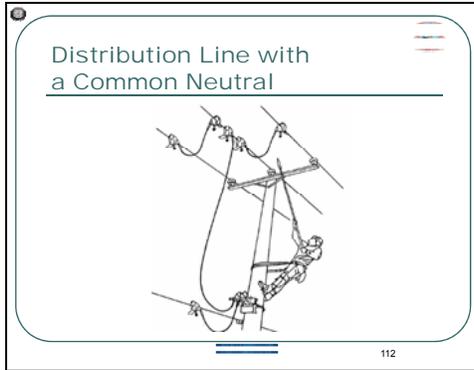
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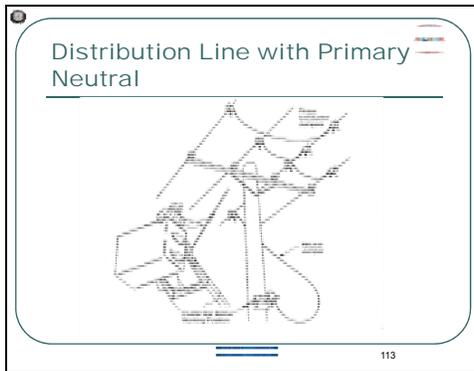
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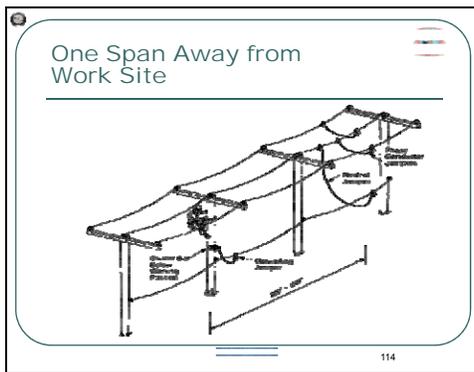
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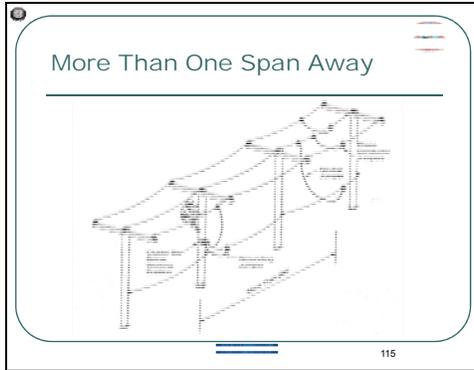
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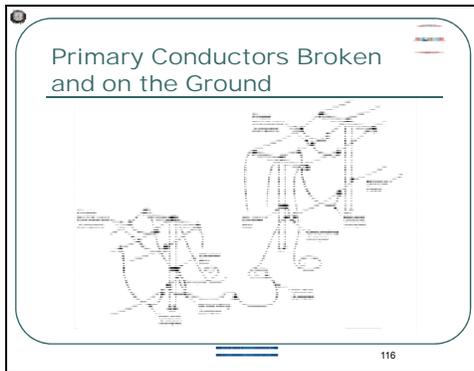
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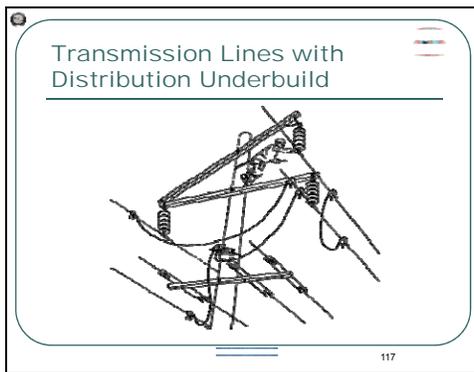
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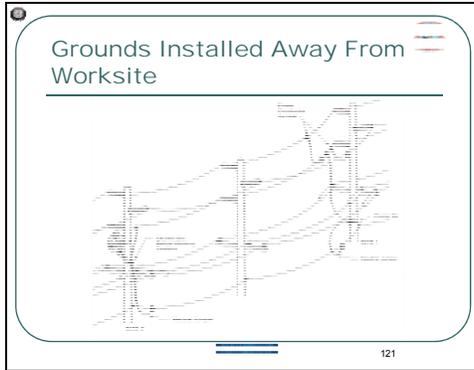
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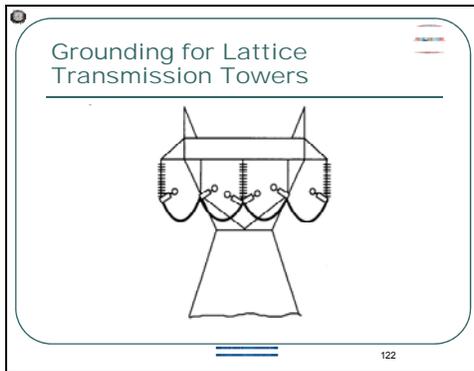
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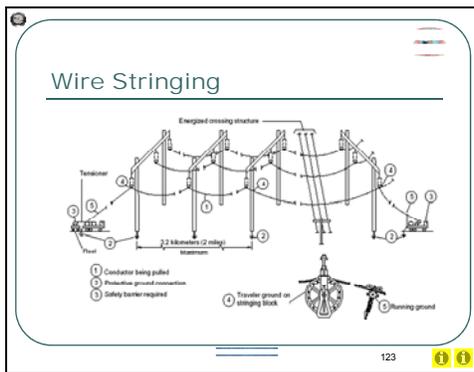
Slide 121



Slide 122



Slide 123



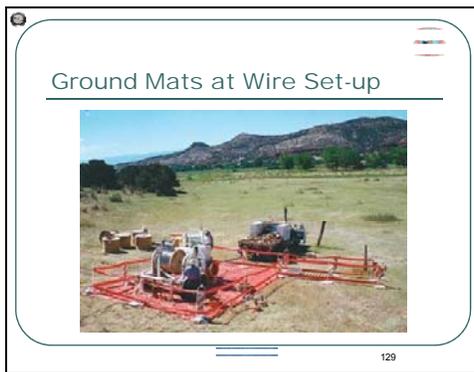
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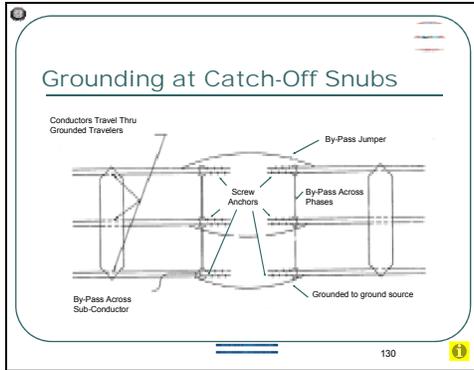
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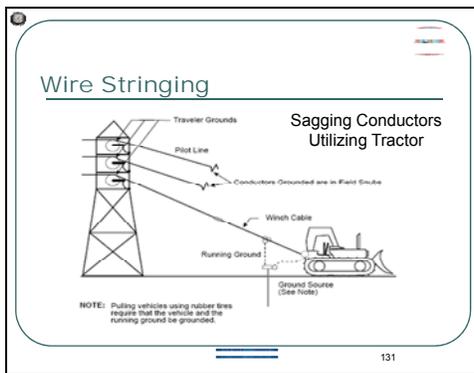
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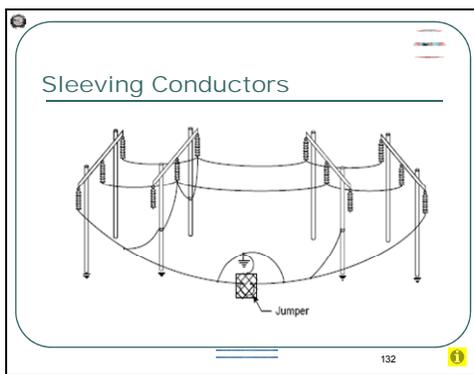
Slide 130



Slide 131



Slide 132



Slide 136

Ground Mats For Equipment Operations

- Ground mats used to provide a zone of equal potential for workers that are touching the equipment while their feet are on the ground



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Slide 137

Ground Mat For URD Work

- Ground mats used to provide a zone of equal potential for performing work on pad mounted apparatus



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Slide 138

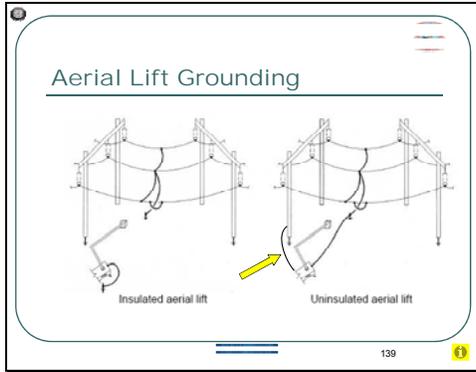
Vehicle Grounding

- Connection points for vehicle grounds
 - to system neutral (or)
 - To a grounded structure (or)
 - To a cluster bracket attached to the structure (or)
 - To a driven or portable screw type ground



138

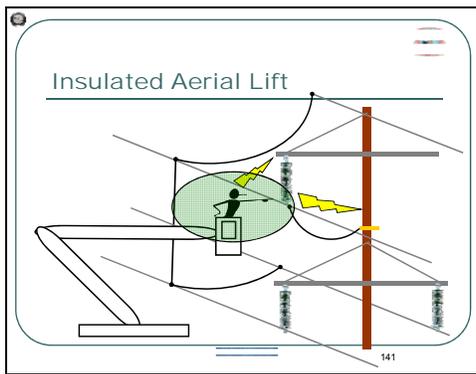
Slide 139



Slide 140



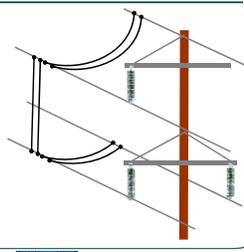
Slide 141



Slide 142

Parallel Ground Sets

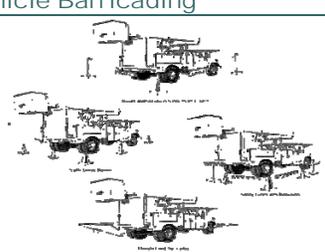
- Determine the current carrying capacity of a single ground
- Multiply by 2
 - Reduce by 10% if restrained
 - Reduce by 20% if unrestrained



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Vehicle Barricading

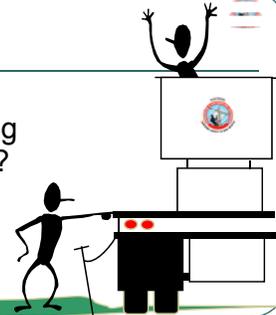


143

Slide 144

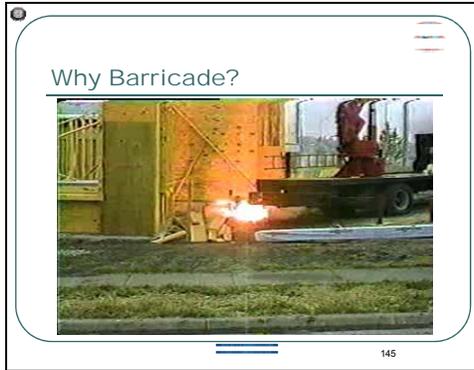
Barricade

• Why is Barricading Important?

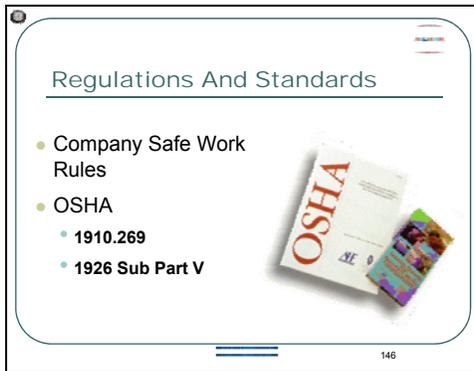


144

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Slide 146



Slide 147



Slide 148



Slide 149



Slide 150



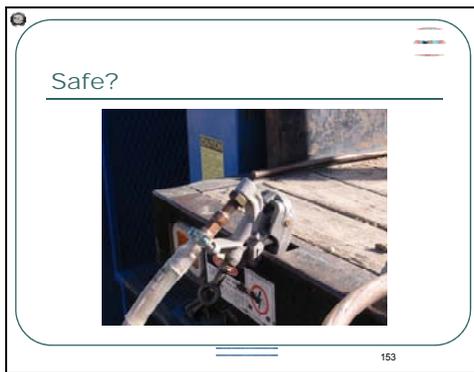
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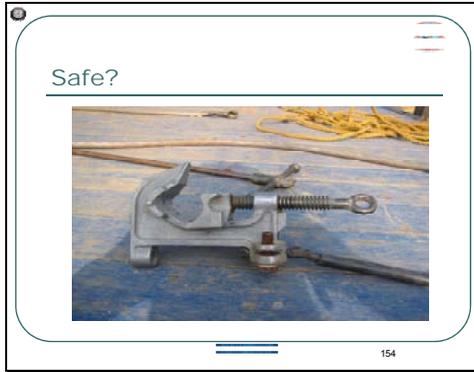
Slide 152



Slide 153



Slide 154



Slide 155



Slide 156



Slide 157



Slide 158



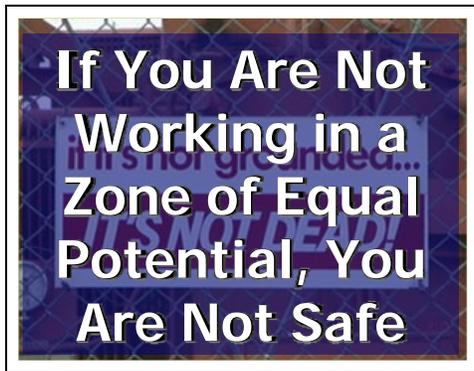
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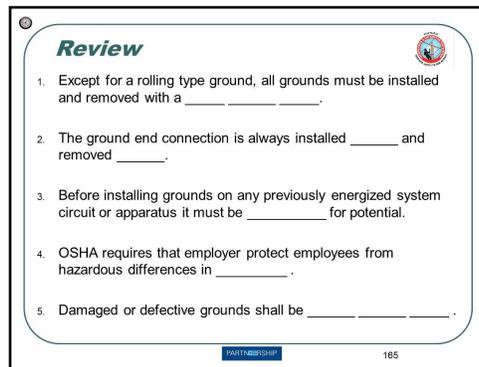
Slide 163



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Slide 165



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	Electrical Transmission & Distribution Partnership 10-Hour OSHA Training Course	
Lifting and Rigging		

Objectives

The OSHA Strategic Partnership (OSP) developed this training module with the intent that all employees have an understanding of the OSHA regulations and safe work practices that apply to lifting and rigging and other work activities they may perform. Upon successful completion of this training module, the attendee should be able to:

Define the main causes of crane incidents

- i) Contact with overhead power-lines
- ii) Over-turn of the machine
- iii) Falls from the machine
- iv) Mechanical failure

Explain the role of the competent person as it pertains to inspecting lifting and rigging equipment

- i) All lifting and rigging shall be inspected before use by a competent person
- ii) Defective/damaged equipment shall be immediately removed from service

Explain the need for pre-planning prior to performing lifting/rigging operations

- i) Support surface/soil considerations
- ii) Swing radius of cranes
- iii) Location of power systems and use of an observer
- iv) Determine load weights and center-of-gravity
- v) Load handling
- vi) Load calculations
- vii) Safe rigging practices

Explain removal criteria for rigging hardware

- i) Broken strands, broken stitches, missing labels, kinks, birdcage, core displacement
- ii) Evidence of heat damage and/or wear
- iii) Cracks, nicks, gouges, deformation, bending, twisting

Explain safe methods of manually lifting, carrying, and maneuvering loads

- i) Plan the lift
- ii) For heavy or awkward loads, get help or use a machine/hand-truck/dolly when possible
- iii) Keep the load close
- iv) Bend at the knees, not the waist
- v) Lift with the legs
- vi) Avoid twisting at the waist
- vii) Clear travel path
- viii) Firm grip on load

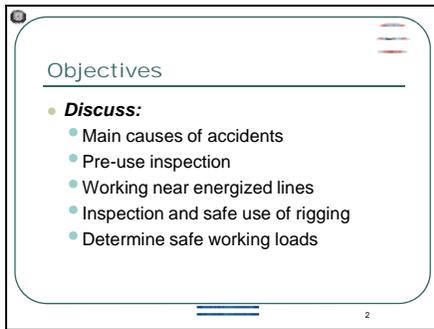
Explain lift truck safety

- i) Training and retraining requirements
- ii) Inspection
- iii) Load travel
- iv) parking

Slide 1



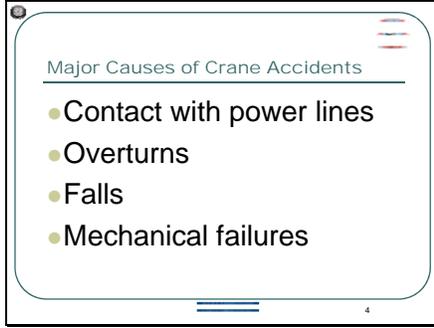
Slide 2



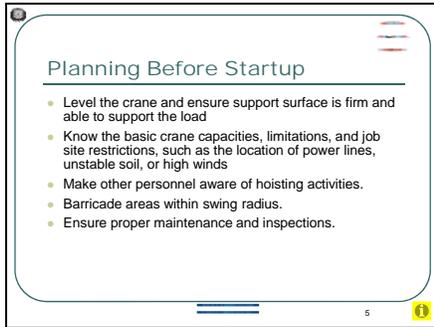
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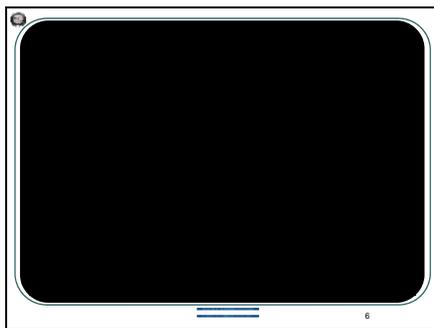
Slide 4



Slide 5



Slide 6



Altec video clip

Slide 7

Competent Person

- The competent person must inspect all machinery and equipment prior to each use, and during use, to make sure it is in safe operating condition.
- If it needs fixing, take it out of service and don't use it until it is fixed

7

Slide 8

Use of an Observer

- **Must Not** be Given Other Responsibilities
- **Must Have** Clear View:
 - Horizontal Clearance: Stand to the Side of the Equipment and Below the Line
 - Vertical Clearance: Stand to the Side of the Equipment
- For Horizontal Clearance, Mark Off the Line Clearance Distance on the Ground with Caution Tape



8

Slide 9

Load Charts

- Load charts **must** be visible to the operator
- Lifting equipment **cannot** be operated beyond its rated capacity

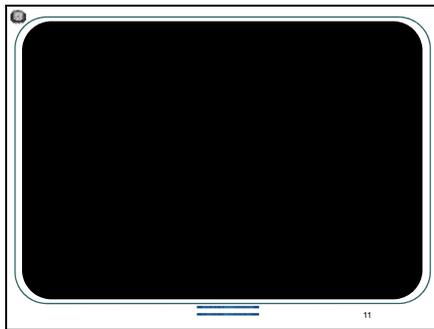


9

Slide 10



Slide 11



Stephen's Crane Incident video clip

Slide 12

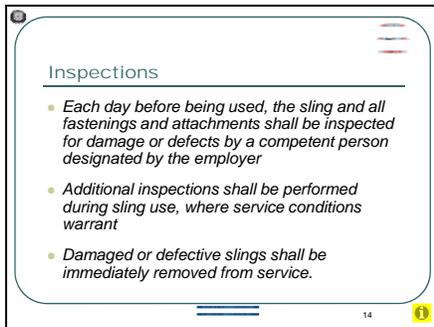


Big Blue video clip

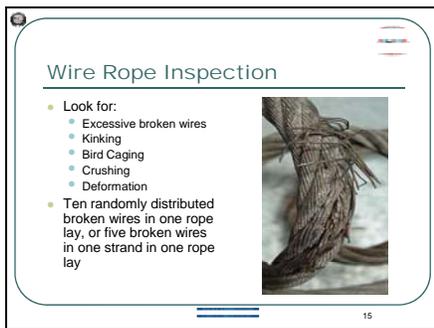
Slide 13



Slide 14



Slide 15



Slide 22

Web Sling Inspection

- Synthetic web slings
Will be immediately removed from service if any of the following conditions are present:
 - Acid or caustic burns
 - Melting or charring of any part of the sling surface;



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Slide 23

Web Sling Inspection



- Snags, punctures, tears or cuts
- Broken or worn stitches

23

Slide 24

Shackle Inspection

- Look for:
 - Wear of more than 10% in the pin
 - Wear of more than 10% in the bow section
 - Any Unusual Bends
 - Any Change in Shape
 - Cracks or Sharp Nicks
 - Modifications



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Slide 28

Chain Slings



- Alloy steel chain slings shall have permanently affixed durable identification stating size, grade, rated capacity, and reach

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Slide 29

Snatch Block Inspection



- LUBRICATION
- PIN WEAR
- LATERAL WOBBLE
- FLANGE WEAR

29

Slide 30

Load Hook Periodic Inspection



- Normal Service
 - Yearly
- Heavy Service
 - Semiannually
- Severe Service
 - Quarterly

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Slide 34

Rigging Equipment

- **Lifting Factors**
 - Size, weight, and center of gravity of the load
 - The number of sling legs
 - The angle the sling makes with the horizontal line
 - The rated capacity of the sling
 - Previous care and usage of the sling

Slide 35

Rigging Equipment

- **Estimating the weight of the load**
 - Check shipping papers
 - Check name plates and labels
 - Ask the equipment manufacturer
 - Use industry standard tables and charts
 - Estimate the weight using weights of similar loads, Stay within 50% of cranes rated capacity when using load weight estimates

Slide 36

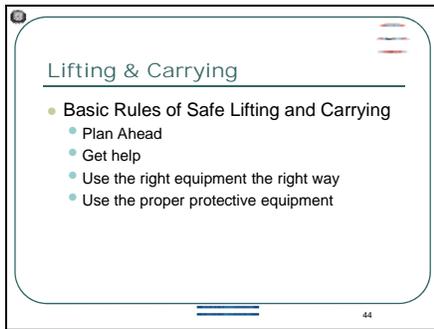
Rigging Equipment

- **Working Rules for Slings**
 - **Never** exceed the rated capacity
 - **Never** use a damaged sling
 - **Never** shorten with knots, bolts, or other devices
 - **Always** protect slings from sharp edges of the load
 - **Always** keep hands and fingers clear of slings under tension

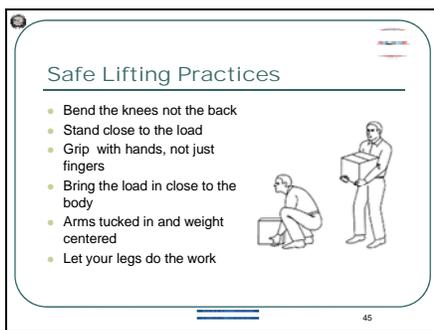
Slide 43



Slide 44



Slide 45



Slide 46

Lifting & Carrying

- How to Lift and Carry Safely
 - Carrying
 - Make sure you can see where you're going
 - Move slowly with small steps
 - Don't twist the body – change direction with your feet
 - Try not to lift the load above shoulder level
 - Unloading, same as lifting



46

Slide 47

Material Handling Equipment

- Moving a Load
 - Lean in the direction your moving
 - Minimize walking backwards
 - Walk don't run
 - On down hill keep load under control
 - Pushing is easier than pulling



47

Slide 48

Forklift Safety

- Do's and Don'ts of Forklifts
 - Inspect daily
 - Refuel or recharge only in designated areas
 - Keep loads low and balanced, tilt back slightly
 - Keep wide loads centered



48

Slide 49

Forklift Safety

- Do's and Don'ts of Forklifts
 - On slopes travel with load up hill
 - Drive in reverse, if vision is blocked (except uphill)
 - Back out slowly and check behind you after unloading
 - Park on flat surfaces with forks tilted forward and lowered; block wheels if on a slope



49

Slide 50

Forklift Safety

- Do's and Don'ts of Forklifts
 - Don't carry people unless forklift is equipped to do so
 - Don't overload the forklift
 - Don't travel with forks raised if empty
 - Observe basic driving safety rules



50

Slide 51

Questions for Review

1. What are the 4 main causes of crane accidents?
2. Sling angle effects sling capacity? **True or False**
3. What are some removal criteria for wire rope?
4. You should always lift with your _____.
5. When you park a lift truck the forks should be _____ and _____.

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	Electrical Transmission & Distribution Partnership 10-Hour OSHA Training Course	
	Personal Protective Equipment	

Objectives

The OSHA Strategic Partnership (OSP) developed this training module with the intent that all employees have an understanding of the OSHA regulations and safe work practices that apply to personal protective equipment and other work activities they may perform. Upon successful completion of this training module, the attendee should be able to:

Explain the employee-training requirements in regards to P.P.E. care, use, and inspection

Describe at least two methods of employee protection other than P.P.E.

- i) Engineering controls
- ii) Administrative controls
- iii) Work Practice controls
- iv) Worker rotation

Explain the employer responsibilities regarding P.P.E.

- i) Survey the workplace for hazards
- ii) Train workers
- iii) Provide P.P.E.

Explain employer responsibilities regarding job briefings

- i) Conducted by the employee in charge
- ii) Requires a discussion take place
- iii) Discuss company/customer/site specific issues

Explain employee responsibilities regarding P.P.E. use

- i) Inspect
- ii) Wear
- iii) Keep clean
- iv) Request a replacement when needed

Explain some of the workplace hazards that may prompt the use of P.P.E.

- i) Electrical
- ii) Falling objects
- iii) Eye/face hazards-flying particles and/or projectiles
- iv) Respiratory exposure (Silica dust)
- v) Hand/foot hazards

Explain methods to identify P.P.E.

- i) Z-87 for glasses
- ii) Type E hard hats
- iii) Filter cartridge type for respirators
- iv) dBA rating for ear protection
- v) ASTM system for rubber goods

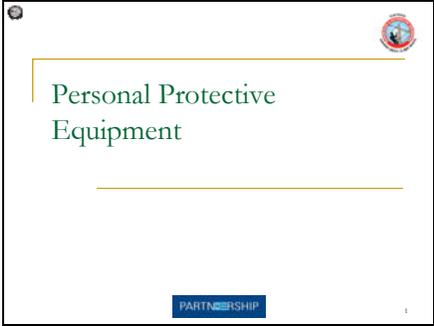
Explain how to field test rubber gloves and sleeves

- i) Air test
- ii) ozone checking
- iii) Punctures
- iv) Tears
- v) Cuts
- vi) Cracks
- vii) Deformation
- viii) UV and/or chemical damage

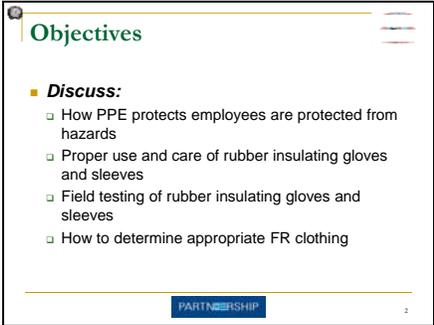
Explain the hazards and protective measures/equipment associated with exposure to electrical arcs

- i) Protective clothing
- ii) OSHA's requirements for apparel
- iii) Injuries from electrical burns
- iv) Arc Thermal Protective Value (ATPV)
- v) Thermal values of arcs in calories/cm²

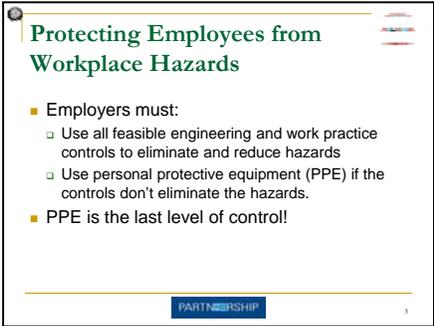
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Slide 2



Slide 3



Slide 4

Hierarchy of Control

- **Elimination**
 - controlling the hazard at source
- **Substitution (Work Practice)**
 - replacing one substance or activity with a less hazardous one
- **Engineering**
 - installing guards on machinery
- **Administration**
 - policies and procedures for safe work practices
- **Personal Protective Equipment**
 - respirators, ear plugs, rubber gloves & sleeves

PARTNERSHIP 4

Slide 5

Training

- **If employees are required to use PPE, train them:**
 - Why it is necessary
 - How it will protect them
 - What are its limitations
 - When and how to wear



PARTNERSHIP 5

Slide 6

Training

- **Additionally:**
 - How to identify signs of wear
 - How to clean and disinfect
 - What is its useful life & how is it disposed



PARTNERSHIP 6

Slide 7

Engineering Controls

If . . .
The work environment can be physically changed to prevent employee exposure to the potential hazard,

Then . . .
The hazard can be eliminated with an engineering control

PARTNERSHIP 7

Slide 8

Engineering Controls

- Initial design specifications
- Substitute less harmful material
- Change process
- Enclose process
- Isolate process
- Eliminate the hazard where possible

PARTNERSHIP 8

Slide 9

Work Practice Controls

If . . .
Employees can change the way they do their jobs and the exposure to the potential hazard is removed,

Then . . .
The hazard can be eliminated with a work practice control

PARTNERSHIP 9

Slide 10

Work Practice Controls -- Examples

PARTNERSHIP 10

Slide 11

Responsibilities

- **Employer**
 - Assess workplace for hazards
 - Provide PPE
 - Determine when to use
 - Provide PPE training for employees and instruction in proper use
- **Employee**
 - Use PPE in accordance with training received and other instructions
 - Inspect daily and maintain in a clean and reliable condition

PARTNERSHIP 11

Slide 12

Examples of PPE

Body Part	Protections
Eye	Safety glasses, goggles
Face	Face shields
Head	Hard hats
Feet	Safety shoes
Hands and Arms	Gloves
Body	Vests
Hearing	Ear plugs, muffs

PARTNERSHIP 12

Slide 13

Eye Protection

- Safety glasses must be ANSI approved and have side shields.
- There are three common types of eye and face protection:
 - Safety glasses
 - Goggles
 - Face shields



PARTNERSHIP 13

Slide 14

Head Protection



PARTNERSHIP 14

Slide 15

Causes of Head Injuries

- Falling objects such as tools
- Bumping head against objects, such as pipes or beams
- Contact with exposed electrical wiring or components



PARTNERSHIP 15

Slide 19

Respiratory Protection-Silica

- Silica:
 - Basic component of soil, sand, granite, and most other types of rock
- Effects:
 - Lung cancer
 - Bronchitis
 - Tuberculosis
 - Scleroderma



PARTNERSHIP 19

Slide 20

Respiratory Protection-Silica

- Sources of Exposure:
 - Sandblasting
 - Drilling rock & concrete
 - Masonry
 - Mining
- Preventing Silicosis:
 - Wet methods for cutting, chipping, drilling, sawing, grinding
 - Respirators
 - Do not eat, drink or smoke near silica dust
 - Wash hands and face before eating, drinking or smoking (away from exposure areas)



PARTNERSHIP 20

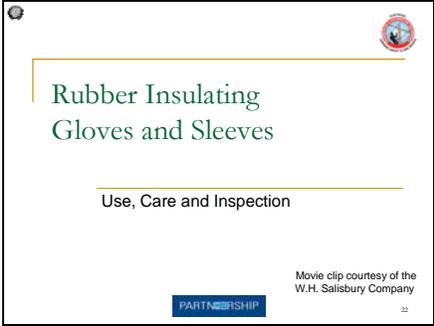
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When Must Foot Protection be Provided?

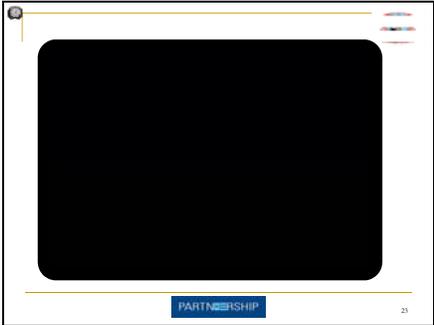
- When any of these are present:
 - Heavy objects such as barrels or tools that might roll onto or fall on employees' feet
 - Sharp objects such as nails or spikes that might pierce ordinary shoes
 - Molten metal that might splash on feet
 - Hot or wet surfaces
 - Slippery surfaces

PARTNERSHIP 21

Slide 22



Slide 23



Slide 24



Slide 28

At Risk Employees

- Line Workers
- Underground Cable Workers
- Electricians
- Substation Operators
- Switching Operators
- Power Generation Workers
- Meter Reader / Service People

PARTNERSHIP 28

Slide 29

Electric Arc Facts

- Typically Lasts Less Than 1 Second
- Extremely High Radiant Energy
- Explosive in Nature
- Can Ignite and/or Melt Everyday Clothing



PARTNERSHIP 29

Slide 30

OSHA 1910.269 (l) (6) (iii)

"The employer shall ensure that each employee who is exposed to the hazards of flames or electric arcs does not wear clothing that, when exposed to flames or electric arcs, could increase the extent of injury that would be sustained by the employee." A following note further requires:

"Note: Clothing made from the following types of fabrics, either alone or in blends, is prohibited by this paragraph, unless the employer can demonstrate that the fabric has been treated to withstand the conditions that may be encountered or that the clothing is worn in such a manner as to eliminate the hazard involved: acetate, nylon, polyester, rayon."

PARTNERSHIP 30

Slide 31

Electric Arc Hazards

- Electrocutation
- Clothing Igniting or Melting
- Clothing Breaking Open
- Heat from the Electric Arc
- Secondary Fire or Explosion

PARTNERSHIP 31

Slide 32

Understanding Electrical Hazards

- Electric Shock
 - Widely recognized hazard
 - Involves current flow through or on the body
- Burn Injury from Electric Arc
 - Not as well recognized
 - No contact required
 - Can be severe if clothing ignites or melt

PARTNERSHIP 32

Slide 33

Consequences of Electric Arcs

- Worker Injury
 - Second- and third-degree burns
 - Potentially fatal burns
- Equipment Damage
- Cost
 - Medical treatment
 - Lost productivity
 - Workers' compensation

PARTNERSHIP 33

Slide 37

Purpose of Flame-Retardant Clothing

- Minimize or Reduce Burn Injury
- Provide Escape Time
- Will not add to the severity of the injury



PARTNERSHIP 37

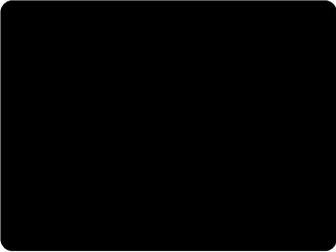
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Performance Requirements

- Will Not Ignite and Continue to Burn When Exposed to a High-Intensity, Short-Duration Electric Arc
- Resists Break Open During Electric Arc Exposure
- Insulates the Wearer from Heat
- Provides Permanent Flame Resistance

PARTNERSHIP 38

Slide 39



PARTNERSHIP 39

	Electrical Transmission & Distribution Partnership 10-Hour OSHA Training Course	
Job Briefings		

Objectives

The OSHA Strategic Partnership (OSP) developed this training module with the intent that all employees have an understanding of the OSHA regulations and best practices that apply to conducting pre-job briefings and other work activities they may perform. Upon successful completion of this training module, the attendee should be able to:

Explain when pre-job briefings should be conducted

- i) At the beginning of each job
- ii) If the crew make-up changes
- iii) If crew leadership changes
- iv) If the scope of the work changes
- v) If any change occurs that effects the safety of the workers and or the public

Explain the items to be discussed in the job briefing

- i) The work location
- ii) Emergency facilities and their location
- iii) The task
- iv) The steps to complete the task
- v) Roles of the individuals in completing the task
- vi) Hazards associated with the steps
- vii) Energy source controls
- viii) Protective measures

Explain employer responsibilities regarding job briefings

- i) Conducted by the employee in charge
- ii) Requires a discussion take place
- iii) Discuss company/customer/site specific issues

Explain employee responsibilities regarding job briefings

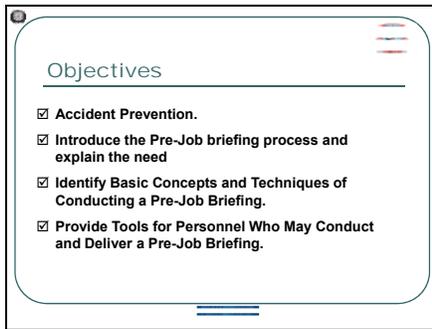
- i) Must participate
- ii) If unsure, ask questions
- iii) Adhere to the rules/standards/policies/safe work practices

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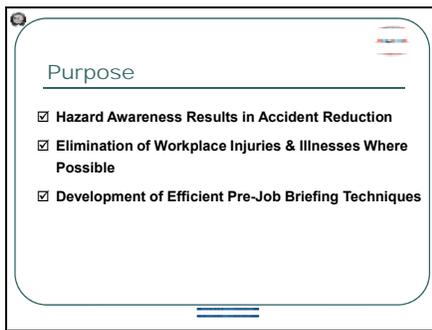
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Slide 2



Slide 3



Slide 4

Job Briefings

- Beginning of each job
- When a new employee joins the job
- When significant changes occur during course of work
- Document on Company form



Slide 5

Three Basic Steps

- *What are you going to do?*
 - List the task(s)
- *What can get you when you do it?*
 - List the hazards
- *How do we keep it from getting us?*
 - List the protective measures



Slide 6

Employer Requirements

- Ensure that the **employee in charge** conduct a job briefing with the employees involved before they start each job. The briefing shall cover at least the following subjects:
 - Hazards associated with the job
 - Work procedures involved
 - Special precautions
 - Energy source controls
 - Personal protective equipment requirements

Slide 7

Employee Requirements

- 5(b) Rule from the OSH Act
 - "Each employee shall comply with occupational safety and health standards and all rules, regulations, and orders issued pursuant to this Act which are applicable to his own actions and conduct."

Slide 8

How Many?

- If the work or operation to be performed during the work day or shift are repetitive and similar one job briefing shall be conducted before the start of the first job of each day of shift
- Additionally job briefings shall be held if significant changes, which might affect the safety of the employee, occur during the course of the work

Slide 9

Routine Briefing

- A briefing discussion is satisfactory if the work involved is routine and if the employee, by virtue of training and experience, can reasonably be expected to recognize and avoid the hazards involved in the job place

Slide 10

More Extensive Briefing

- A more extensive discussion shall be conducted:
 - If the work is complicated or particularly hazardous, or
 - If the employee cannot be expected to recognize and avoid the hazards involved in the job

Slide 11

Other Issues

- Are employees dressed properly?
- Are there hazard communications standards issues?
- Are the structures capable of handling the stress?
- Are there any hazardous energy sources?
- Is traffic an issue?

Slide 12

Personal Protective Equipment

- What PPE is needed?
- Is it (PPE) in good working order?
- Does every one understand how to us it?
- Did you do the daily check?



Slide 13

Working Alone

- An employee working alone need not conduct a job briefing. However, the employer shall ensure that the tasks to be performed are planned as if a briefing were required.



13

Slide 14

Emergency Procedures

- Where is the closest hospital
 - *Does everyone know directions*
- What are the emergency procedures
 - *Does everyone know them*
- Where is the emergency equipment located
 - *Has it been inspected lately*

Slide 15

Another Name

- T Talk
- A Assign
- I Identify
- L Let
- B Beware
- O Observe
- A Allow
- R Review
- D Determine



15

Slide 16

First Aid & CPR

- The supervisor must ensure that a sufficient number of trained workers are available
- Must also ensure that medical supplies are available



Slide 17

Rally Point

- If you are working in an area where you may need to evacuate the work site, have a rally point



Slide 18

Summary

1. When are job briefings required?
2. Who is required to conduct them?
3. What topics must be discussed?
4. When are additional job briefings required?
5. When do you need a rally point?

	Electrical Transmission & Distribution Partnership 10-Hour OSHA Training Course	
Trenching & Excavations		

Objectives

The OSHA Strategic Partnership (OSP) developed this training module with the intent that all employees have an understanding of the OSHA regulations and safe work practices that apply to trench and excavation safety and work activities they may perform. Upon successful completion of this training module, the attendee should be able to:

Define a trenching and excavation competent person along the his or her duties and responsibilities

- i) The OSHA Construction Standard defines a competent person as someone who is:
 - a. Capable of identifying existing and predictable hazards in the surroundings, or
 - b. Working conditions which are unsanitary, hazardous, or dangerous to employees, and
 - c. Who has authorization to take prompt corrective measures to eliminate them
- ii) Duties: Protective Systems or Equipment
 - a. Monitoring water removal equipment and operations Inspecting excavations subject to runoff from heavy rains to determine need for diversion ditches, dikes, or other suitable protection
 - b. Determining cave-in potential to assess need for shoring or other protective system
 - c. Examining damaged material or equipment used for protective systems to determine its suitability for continued use Classifying soil and rock deposits, by both visual analysis and by testing, to determine appropriate protection; re-classifying, if necessary, based on changing conditions
 - d. Determining the appropriate slope of an excavation to prevent collapse due to surcharge loads from stored material or equipment, operating equipment, adjacent structures, or traffic, and assuring that such slope is achieved
- iii) Duties: Inspecting Trench and Protective Systems
 - a. Authorizing immediate removal of employees from the hazardous area where evidence of possible cave-in, failure of protective systems, hazardous atmospheres, or other hazardous conditions exists
- iv) Duties: Unsafe Access/Egress
 - a. Design structural ramps that are used solely by employees as a means of access or egress. Structural ramps used for access or egress of equipment must be designed by a competent person qualified in structural design

Define the hazards associated with working in an unprotected trench or excavation

- i)
 - a. Death or serious injury from
 - b. Cave-in and/or entrapment
 - c. Asphyxiation
 - d. Being struck-by falling/swinging loads from above
 - e. Vehicles/equipment entering the trench or excavation
 - f. Fire/explosion

Describe different types of protective systems

- i) Sloping, Shoring, Shielding, Benching

Describe means of access and egress

- i) Ladders, Ramps, Stairways

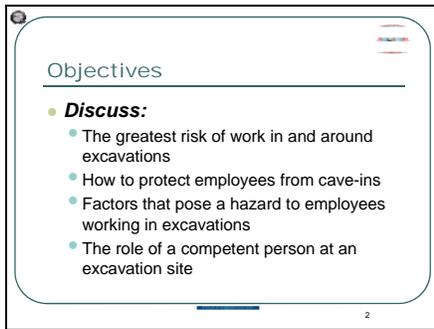
Describe "One-Call" requirements

- i) Notify owners of utilities a minimum of 24 hours prior to digging

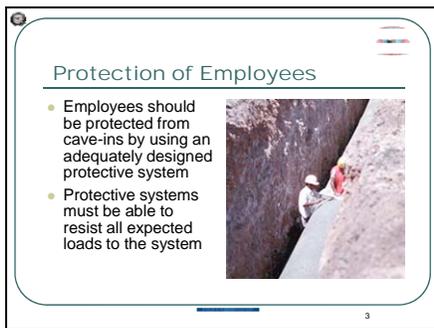
Slide 1



Slide 2



Slide 3



Slide 4

Competent Person

- Must have had specific training in and be knowledgeable about:
 - Soils classification
 - The use of protective systems
 - The requirements of the standard
- Must be capable of identifying hazards, and authorized to immediately eliminate hazards



4

Slide 5

Site Evaluation Planning

- Soil conditions
- Protective systems
- Atmospheric hazards
- Access/egress
- Underground utilities
- Structures



5

Slide 6

Inspections of Excavations

- A competent person must make daily inspections of excavations, areas around them and protective systems:
 - Before work starts and as needed,
 - After rainstorms, high winds or other occurrence which may increase hazards, and
 - When you can reasonably anticipate an employee will be exposed to hazards.



6

Slide 7

Inspections of Excavations

- If the competent person finds evidence of a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions:
 - Exposed employees must be removed from the hazardous area
 - Employees may not return until the necessary precautions have been taken



7

Slide 8

Excavation Hazards

- Cave-ins
- Asphyxiation
- Toxic materials
- Fire
- Equipment
- Underground utilities

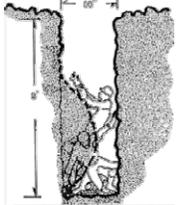


8

Slide 9

Injury and Death

- Excavating is one of the most hazardous construction operations
- Most accidents occur in trenches 5-15 feet deep
- There is usually no warning before a cave-in



9

Slide 10

Soil Weight

- One cubic foot of soil weighs approximately 100 pounds.
- That's 2700 pounds per cubic yard



10

Slide 11

Types of Protection



11

Slide 12

Definitions

- **Excavation**
 - a man-made cut, cavity, trench, or depression formed by earth removal.
- **Trench**
 - a narrow excavation. The depth is greater than the width, but not wider than 15 feet.
- **Shield**
 - a structure able to withstand a cave-in and protect employees

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Slide 13

Stacked Trench Boxes



13

Slide 14

Trench Shield

- A trench shield is utilized in this work location to provide employee protection from cave in hazards



14

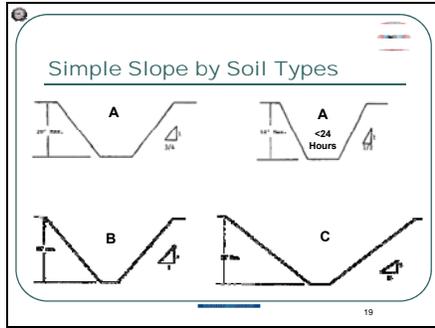
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Definitions

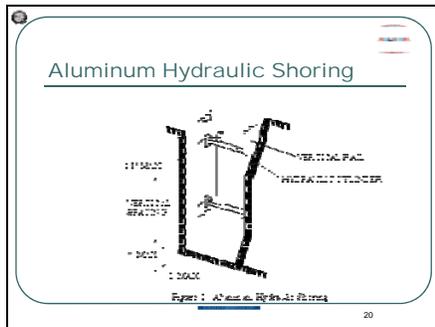
- Shoring
 - A structure that supports the sides of an excavation and protects against cave-ins
- Sloping
 - A technique that employs a specific angle of incline on the sides of the excavation. The angle varies based on assessment of impacting site factors

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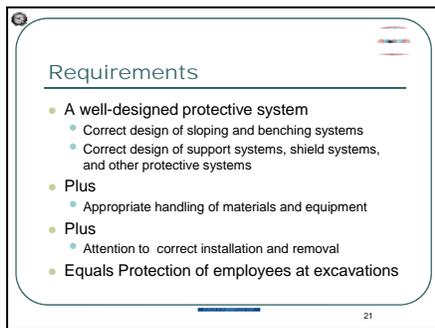
Slide 19



Slide 20



Slide 21



Slide 22

Design of Protective Systems

- Soil classification
- Depth of cut
- Water content of soil
- Changes due to weather and climate
- Other operations in the vicinity



22

Slide 23

Design of Protective Systems

- An employer must select and construct :
 - Slopes and configurations of sloping and benching systems
 - Support systems, shield systems, and other protective systems
- Shield
 - Can be permanent or portable
 - Also known as trench box or trench shield

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Slide 24

Design of Protective Systems

- An employer must select and construct :
- Shoring
 - Such as metal hydraulic, mechanical or timber shoring system that supports the sides
- Sloping
 - Form sides of an excavation that are inclined away from the excavation

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Slide 28

Cave-in Hazard

- Example of an inadequate shoring system



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Slide 29

At Risk?

- This worker is in a trench with no protective system
 - Slope
 - Bench
 - Shore
 - Shield
- No means of egress
- Spoil pile to close



29

Slide 30

Materials and Equipment

- Inspected by a competent person
- Free of damage or defects that impair function



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Slide 31

Protection from Vehicles

- Install barricades
- Hand/mechanical signals
- Stop logs
- Grade soil away from excavation
- Fence or barricade trenches left overnight



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Slide 32

Hazardous Conditions

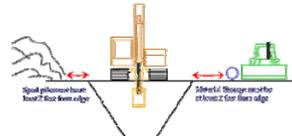


- No Cave-in Protection
- Close proximity of equipment
- Spoil pile too close
- No ladder
- Unsupported utilities
- No head protection
- Suspended load
- Fall Hazard

32

Slide 33

Spoils



- Don't place spoils within 2 feet from edge of excavation
- Measure from nearest part of the spoil to the excavation edge
- Place spoils so rainwater runs away from the excavation

33

Slide 34

Other Excavation Hazards

- Water accumulation
- Oxygen deficiency
- Toxic fumes
- Access/Egress
- Falls



34

Slide 35

Water is Hazardous

- When water is present in an excavation it is extremely hazardous to enter



35

Slide 36

Hazardous Atmosphere

- Test excavations more than 4 feet before an employee enters the excavation for:
 - Oxygen deficiency
 - High combustible gas concentration
 - High levels of other hazardous substances



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Slide 37

Means of Egress

- A stairway, ladder, or ramp must be present in excavations that are 4 or more feet deep, and within 25 feet of the employees

This ladder does not meet the requirements of the standard



The ladder should extend 3 feet above the excavation

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Slide 38

Access and Egress



- These two lashed together ladders are not an adequate means of egress
- The ladder should extend 3 feet above the top of the excavation

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Slide 39

Protection from Falls, Falling Loads, and Mobile Equipment

- Install barricades
- Use hand / mechanical signals
- Grade soil away from excavation
- Fence or barricade trenches left overnight
- Use a flag person when signs, signals and barricades are not enough protection

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Slide 40

Dig Safe

RED	ELECTRIC
YELLOW	GAS, OIL, STEAM
ORANGE	COMMUNICATIONS
BLUE	POTABLE WATER
PURPLE	RECLAIMED WATER
GREEN	SEWER / DRAINAGE
PINK	SURVEY MARKS
WHITE	PROPOSED EXCAVATION



40

Slide 41

Summary

- The greatest risk in an excavation is a cave-in.
- Employees can be protected through sloping, shielding, and shoring the excavation.
- A competent person is responsible to inspect the excavation.
- Other excavation hazards include water accumulation, oxygen deficiency, toxic fumes, falls, and mobile equipment.
- **DO NOT WORK IN AN UNPROTECTED TRENCH**

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Slide 42

Questions for Review

1. What is the greatest risk in an excavation?
2. What are the three main methods for protecting employees in excavations?
3. What is the role of the competent person with respect to excavations?

42

	Electrical Transmission & Distribution Partnership 10-Hour OSHA Training Course	
Confined and Enclosed Spaces		

Objectives

The OSHA Strategic Partnership (OSP) developed this training module with the intent that all employees have an understanding of the OSHA regulations and safe work practices that apply to confined/enclosed space work and other work activities they may perform. Upon successful completion of this training module, the attendee should be able to:

Define a confined and an enclosed space

- i) A confined space has limited or restricted means for entry or exit, and it is not designed for continuous employee occupancy. Confined spaces include, but are not limited to underground vaults, tanks, storage bins, manholes, pits, silos, process vessels, and pipelines.
- ii) An enclosed space is similar to a confined space as to having limited or restricted means for entry or exit, and it is not designed for continuous employee occupancy. The prime difference is that an enclosed space contains only electrical hazards. *Review 1910.269(e)*

Explain the pre-entry requirements

- i) Use flow chart to determine space type
- ii) Test air
- iii) Test for flammables
- iv) Look for electrical hazards
- v) Look for entrapment/engulfment hazards
- vi) Look for cave-in hazards

Explain training requirements

- i) Entrant duties
- ii) P.P.E. requirements
- iii) Permit requirements
- iv) Responsibilities
- v) Procedures
- vi) Hazards
- vii) Emergency plan-summoning help
- viii) Communication
- ix) Rescue
- x) Removal of non-qualified entrants
- xi) Maintaining accurate count of entrants

Explain the roles of the Qualified employee, the Attendant, and the Entry Supervisor

- i) Attendants
 - a. First aid training
 - b. Immediately available outside the enclosed space
- ii) Entry supervisor
 - a. Determine if acceptable entry conditions are present entry is planned
 - b. Authorizing entry and overseeing entry operations
 - c. Terminating entry
- iii) Qualified Worker
 - a. Employees that are trained in and familiar with the safety-related work practices, safety procedures, and other safety requirements that pertain to their respective job assignments
 - b. Employees that are trained in and familiar with any other safety practices, including applicable emergency procedures (such as pole top and manhole rescue), that are not specifically addressed the OSHA standards but that are related to their work and are necessary for their safety
- iv) Qualified employees are also trained and competent in:
 - a. The skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment
 - b. The skills and techniques necessary to determine the nominal voltage of exposed live parts
 - c. The minimum approach distances specified in this section corresponding to the voltages to which the qualified employee will be exposed
 - d. The proper use of the special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools for working on or near exposed energized parts of electric equipment.

Note: For the purposes of the OSHA standards, a person must have this training in order to be considered a qualified person.

Slide 1



Slide 2



Slide 3



Slide 4

Definitions

- A non-permit required space is one that:
 - that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

PARTNERSHIP

Slide 5

Definitions

- A permit required confined space is one that:
 - Contains or has the potential to contain a hazardous atmosphere;
 - Contains a material that has the potential for engulfing an entrant;
 - Has an internal configuration such that an entrant could become trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or
 - Contains any other recognized serious safety or health hazard.

PARTNERSHIP

Slide 6

Definitions

- An enclosed space is:
 - A space that does not contain an atmospheric hazard. The only hazards are electrical and the space is to be entered by a "qualified person."
 - Entry requirements are identical to that of a non-permit space except retrieval equipment will be available and an observer will be present.

PARTNERSHIP

Slide 10

Confined Space

So what's the big deal?

- NIOSH 1986 Alert (86-110)
 - Reviewed its records of accident investigations
 - "OSHA concluded during this review that, where multiple deaths occurred the majority of the victims in each event died trying to rescue the original entrant from a confined space."
 - Rescuers accounted for more than 60% of confined space fatalities

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Confined Space

Hazards Present

- Oxygen deficiency
- Flammability
- Toxic contaminants
- Physical hazards

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Slide 12

Hazards

- **Oxygen deficient**
 - Normal 21%
 - Below 19.5%
 - Symptoms
 - disorientation
 - impaired judgment
 - hard breathing
 - rapid fatigue
- **Oxygen enriched**
 - Greater than 23.5 %



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Hazards

- Flammability
 - UEL/UFL
 - LEL/LFL



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Slide 14

Hazards

- Toxic Contaminants
 - Hydrogen Sulfide
 - Carbon Monoxide
 - Mangrove Gas
 - Southern Coastal Areas



PARTNERSHIP

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Hazards

- Physical hazards
 - Cave-in
 - Electrical
 - Struck-by
 - Falls



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Slide 16

Confined Space Entry Program

- Permit (only for PRCS)
- Testing
- Ventilation
- Equipment
- Fire
- Attendant
- Emergency plan



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Enclosed Space Decision Flow Chart

- Must follow the flow chart to determine the type of space



PARTNERSHIP

Slide 18

Procedures

- Job Briefing
 - Is the Space a Confined space??
 - Test confined atmosphere prior to opening confined space
 - Remove confined space entry cover
 - Guard confined space portal (e.g. manhole guard)



PARTNERSHIP

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Procedures

- Test confined atmosphere strata
- Purge and ventilate confined space
- Entry Supervisor determines confined space classification, permit required, enclosed, or non permit required



PARTNERSHIP

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Entry Supervisor

- Entry Supervisor
 - **Such person as the supervisor, foreman, or crew chief**
 - Responsible for determining if acceptable entry conditions are present when entry is planned
 - Verifies rescue is available
 - Authorizes entry & removes unauthorized individuals
 - Overseeing entry operations and terminating entry as required
 - **An entry supervisor may also**
 - serve as an attendant or as an authorized entrant, as long as that person is trained and equipped for each role he/she fills
 - **Also, the duties of entry supervisor may be passed from one individual to another during the course of an entry operation**
 - The entry supervisor may be considered the "Competent Person."

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Testing

- Before entry
- Periodic sampling during work
- Test after breaks and when conditions change
- Continuously monitor for oxygen deficiency during welding or cutting



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Testing

- If space fails
 - report to Entry Supervisor
 - post appropriate warning
 - ventilate if appropriate
- If space fails while space is occupied, immediately remove entrants from space.

PARTNERSHIP

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Ventilation

- Ventilation or exhaust systems
 - designed, maintained & operated
 - ensure required protection with
 - volume and
 - velocity
 - periodic sampling before, during
 - When used, forced ventilation must maintain the PRCS safe throughout the entry
- Do not use oxygen for ventilation

PARTNERSHIP

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Ventilation

- Welding, Cutting and Heating
 - general mechanical or local exhaust ventilation
 - when sufficient ventilation cannot be obtained without blocking the means of egress
 - employees inside protected by air line respirators
 - an employee outside assigned to maintain communication and aid them in emergency

PARTNERSHIP

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Attendant

- Duties, responsibilities and procedures
- Hazards, signs and symptoms of overexposure
- Procedures for summoning rescue or other emergency services
- Proper use of equipment used for communication, if necessary
- Performance of non-entry rescue

PARTNERSHIP

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Attendant

- Maintain an accurate count of entrants
- Remain outside of the PRCS unless relieved of attendant duties
- Monitors activities inside space
- Performs NO OTHER duties that may interfere with attendant duties

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Emergency Plan

- Emergency plan will specify:
 - who to notify
 - how to summon other assistance
 - the emergency equipment on hand
 - procedure for extraction without the attendant(s) entering space
 - who is trained in FA/CPR?

PARTNERSHIP

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Questions for Review

1. What is the difference between an enclosed and permit required space?
2. Can an unqualified person enter an enclosed space?
3. When is atmospheric testing required?
4. Can an attendant enter an enclosed space for routine functions?

PARTNERSHIP

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	Electrical Transmission & Distribution Partnership 10-Hour OSHA Training Course	
	Fall Protection	

Objectives

The OSHA Strategic Partnership (OSP) developed this training module with the intent that all employees have an understanding of the roles and purpose of the Occupational Safety and Health Administration (OSHA). The OSP also desires that each effected employee have an understanding of the OSHA regulations that apply to the work they may perform. Upon successful completion of this training module, the attendee should be able to:

Describe at least two methods of protecting electrical workers from fall hazards

- i) Guard rail systems
- ii) Travel restricting equipment
- iii) Controlled access zone
- iv) Safety monitor

Explain the difference between, fall protection, fall restraint, and positioning systems.

- i) Fall protection prevents the fall
- ii) Fall restraint limits the arresting forces imposed on the body
- iii) Positioning systems allow a worker to have his or her hands free to work and still be tied-off

Discuss requirements for employees working from aerial lift devices.

- i) May use a body belt so long as it can be rigged so that the worker cannot free-fall more than two-feet
- ii) Full body harness and shock-absorbing lanyard is the preferred method
- iii) Must also follow manufacturer recommendations

Explain requirements for qualified employees climbing power-line support structures

- i) May ascend, descend, and move point-to-point without fall protection
- ii) Explain the exceptions to this rule
- iii) Explain that non-qualified climbers must use 100% fall protection when working at heights greater than four-feet

Explain what items to look for when inspecting fall protection/restraint equipment

- i) Condition of: webbing, stitching, buckles, keepers, eyelets, connectors, D-rings, lanyards (rip stitch)
- ii) Operation of mechanisms as in self-retracting life-lines and rope grabs
- iii) Discuss roll-out and connections

Explain how to calculate fall distance to ensure one does not strike a lower level

Explain anchorage requirements

- i) For fall restraint: must be capable to support 5,000 pounds for falls at or greater than four feet
- ii) For positioning systems: Must be capable to support 3,000 pounds
- iii) May be reduced by the competent person

Discuss the training and re-training requirements mandated by the OSHA standards

- i) Train all employees exposed to fall hazards at or greater than four feet
- ii) Retrain when there a change in equipment, a change in procedures, non-compliance
- iii) Training must be documented

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Slide 1

Fall Protection

Subpart M 1926.500 – 1926.503
Subpart V 1910.269

Slide 2

Objectives

- **Discuss:**
- What is needed for fall protection
- When is fall protection needed
- Inspection, use, and care of fall protection equipment

Slide 3

Scope and Application

Covers all Fall Hazards except those in:

- Subpart L – Scaffolds, Aerial Lifts
- Subpart V – Electrical Transmission
- Subpart N – Cranes & Derricks
- Subpart S – Underground Construction
- Subpart X – Stairways & Ladders
- 1910.269(g)(2) – Electric Power Generation, Transmission, and Distribution

Slide 4

Duty to have fall protection
29 CFR 1926.501 (Subpart M)

Unprotected side or edge with > 6' fall possible

Wall openings

- 6' or more above lower levels
- bottom inside edge < 39" above walking/working surface



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Slide 5

Exceptions

- Workers engaged in the construction of electric transmission and distribution lines & equipment



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Slide 6

Something New-Pole Climbing



Wood pole climbing
Fall-Arrest systems

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Fall restraint while climbing wooden poles is a Best Practice requirement for all Partnership member companies

Slide 7

Duty to have fall protection
1926.550 & 1910.269

- Qualified climbers are not required to have fall protection unless conditions such as, but not limited to,
 - Ice
 - High winds
 - Design of the structure
 - Presence of contaminants on the structure
- Could cause the employee to lose grip or footing.
- Applies to **"QUALIFIED CLIMBERS!"**



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Duty to have fall protection –
1926.453

- Body belt and lanyard in compliance with 1926.502(e)
- Full body harness with shock absorbing lanyard in compliance with 1926.502(d)



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Slide 9

Systems
1926.502

- Fall Protection
 - To prevent the fall
- Personal Fall Arrest Systems (FAS)
 - To stop free fall in 6' or less



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Slide 13

Body Harness Inspection

- Manufacturer's markings
- Missing pieces
- Defects or damage
- Alteration



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Slide 14

Damaged/Defective Equipment

- Remove from Service
- Tag
- Do Not Use until repaired
- If repairs cannot be made, destroy the device



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Shock Absorbing Lanyard

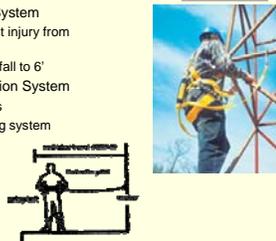


- Shock Absorbing lanyards that are subject to a fall must be removed from service and inspected by a competent person
- Even if the lanyard does not fully deploy

Slide 16

Fall Systems

- Fall Arrest System
 - To prevent injury from a fall
 - Limit free fall to 6'
- Fall Prevention System
 - Guardrails
 - Positioning system

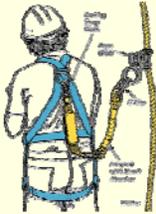


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Fall Arrest Systems

- Life Line
- Static Line
- Retracting Lifeline
- Structural Anchorage
- Nets



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Slide 18

Fall Arrest Systems

- Components of a personal fall arrest system
 - Anchorage
 - Lifeline
 - Lanyard
 - Harness
 - Hardware



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Slide 19

Aerial Lift Requirements

- Only authorized persons shall operate an aerial lift
- Belting off to an adjacent pole, structure, or equipment while working from an aerial lift shall not be permitted
- Employees shall always stand firmly on the floor of the basket, and shall not sit or climb on the edge of the basket or use planks, ladders, or other devices for a work position



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Fall Arrest Systems

- Anchorage
 - Support at least 5,000# per employee attached
 - Positioning: 3,000# or twice impact load
 - Manufacturer supplied



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Slide 21

Fall Arrest Systems

- Lifeline
 - Horizontal
 - Minimum breaking strength of 5,000# per
 - Protected from being cut or abraded
 - Designed, installed, and used - supervision of a qualified person

Qualified person means one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated his ability to solve or resolve problems relating to the subject matter, the work, or the project.

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Fall Arrest Systems

- Lifeline
 - Vertical (rope grab)
 - Minimum breaking strength of 5,000#
 - Designed, installed, and used - supervision of a qualified person
 - Only one worker per lifeline
 - Rope or straps (webbing) made of synthetic fibers



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Slide 23

Fall Arrest Systems

- Lifeline
 - Self-Retracting; 2' max. free fall
 - Minimum breaking strength of 3,000#.



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Slide 24

Fall Arrest Systems

- Lanyard
 - Minimum breaking strength of 5,000#
 - Made of synthetic fibers



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Personal fall arrest systems

- **Harness**
 - D-ring in center of back near shoulders
 - Limit arresting force to 1800 lbs
 - Nylon strap lanyard = 2800 lbs
 - *Nylon rope lanyard = 2300 lbs*
 - *Steel rope lanyard = 4000 lbs*
 - *Shock absorbing lanyard = 900 lbs*



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Personal fall arrest systems

- **Hardware**
 - Connectors
 - 5,000#
 - D-rings
 - 5,000#; proof tested to 3,600#
 - Snaphooks
 - 5,000#; proof tested to 3,600#
 - sized to prevent unintentional disengagement
 - locking type snaphook (required 1/1/98)



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Slide 27

Snap Hooks

Locking snap hooks are required to prevent "roll out"

Non Locking Type	Locking Type
	

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Slide 37

Retraining

Changes in:

- Workplace
- Types of fall protection or equipment
- Inadequacies in affected employee's knowledge or use of fall protection systems or equipment

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Certification of Training

- Written certification prepared by employer
- Record of each employee trained
- Date of training
- Signature of person who conducted training
- The latest training certificate shall be maintained
- Training done by others - date employer determined prior training was adequate

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Questions for Review

1. At what height must fall protection be provided for non-qualified climbers engaged in construction of transmission and distribution lines?
2. At what height must fall protection be provided for work other than electrical?
3. Anchorage points must be capable of supporting _____ lbs?
4. In addition to anchorage requirements, what other factors must be considered in using a personal fall arrest system?

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