



# ELECTRICAL TRANSMISSION & DISTRIBUTION PARTNERSHIP

## 10-HOUR OSHA TRAINING COURSE

Student Handout

Version 05.07.12





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	Electrical Transmission & Distribution Partnership 10-Hour OSHA Training Course	
	<b>Introduction to OSHA</b>	

## 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.”<sup>i</sup>

### 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](http://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

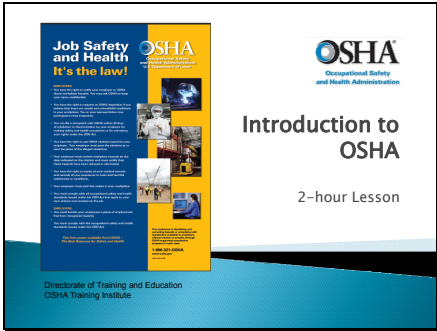
**List at least three (3) worker rights & responsibilities afforded by the OSH Act**

- 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](http://www.osha.gov)
- iii) [www.osha.gov/as/opa/worker/index.html](http://www.osha.gov/as/opa/worker/index.html) (workers' page)
- iv) The Code of Federal Regulations (CFR's)

Slide 1



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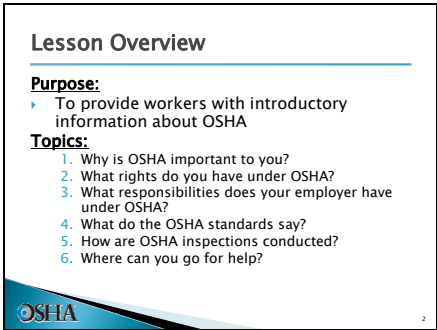
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Slide 2



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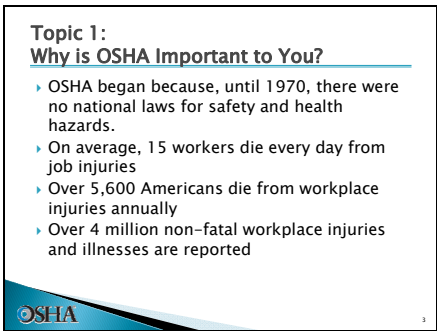
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Slide 3



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Slide 4

### 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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Slide 5

### 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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Slide 6

### 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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Slide 7

### OSHA Coverage Activity



Covered by OSHA?		Worker
YES	NO	1. Harry Adams, a miner at Below Ground Inc.
YES	NO	2. Adrian Smith, one of 3 employees of ABC landscaping.
YES	NO	3. Taylor Dell, an accountant in business for herself.
YES	NO	4. Rob Jones, one of 10 carpenters working for Woody, Inc.

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Slide 8

### OSHA's Mission

- ▶ The mission of OSHA is to save lives, prevent injuries and protect the health of America's workers.
- ▶ Some of the things OSHA does to carry out its mission are:
  - developing job safety and health standards and enforcing them through worksite inspections,
  - maintaining a reporting and recordkeeping system to keep track of job-related injuries and illnesses, and
  - providing training programs to increase knowledge about occupational safety and health.

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Slide 9

### Questions for Review



- ▶ Why was OSHA necessary?
- ▶ What is OSHA's mission?
- ▶ Why is this training important?

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Slide 10

**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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Slide 11

**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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Slide 12

**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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Slide 13

Your Right to...

### Know About Hazardous Chemicals

- Employers must have a written, complete hazard communication program that includes information on:
  - Container labeling,
  - Material Safety Data Sheets (MSDSs), and
  - Worker training. The training must include the physical and health hazards of the chemicals and how workers can protect themselves; including specific procedures the employer has implemented to protect workers, such as work practices, emergency procedures, and personal protective equipment.





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Slide 14

### Classroom Exercise: MSDS

**Handout #3:  
MSDS Example**

- What information does the MSDS provide?
- Has anyone seen an MSDS in their workplace?
- Were the instructions on the MSDS followed in their workplace?
- Has anyone worked with hazardous substances without an MSDS?



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Slide 15

Your Right to...

### Information About Injuries/Illnesses

- OSHA's Recordkeeping rule requires most employers with more than 10 workers to keep a log of injuries and illnesses.
- Workers have the right to review the current log, as well as the logs stored for the past 5 years.
- Workers also have the right to view the annually posted summary of the injuries and illnesses (OSHA 300A).





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Slide 16

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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Slide 17


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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Slide 18


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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Slide 19

*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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Slide 20

*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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Slide 21

*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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Slide 22

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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Slide 23

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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Slide 24

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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Slide 25

**Classroom Exercise: OSHA 300**

**Handout #6:  
OSHA 300 Log**

- ▶ Number of workers that are getting injured or ill
- ▶ The types of injuries and illnesses reported
- ▶ The jobs and departments where the most severe injuries or illnesses are occurring

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Slide 26

**Employers are Required to:**

**PROVIDE AND PAY FOR PPE**

**Handout #7: Employers Must  
Provide and Pay for PPE**

- ▶ Does anyone wear personal protective equipment on their job?
- ▶ Employers are required to determine if PPE should be used to protect their workers.
- ▶ Rule was effective on February 13, 2008 and implemented by May 15, 2008.

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Slide 27

**Questions for Review**

- ▶ What are some of the responsibilities employers have related to OSHA recordkeeping?
- ▶ Which section of the OSH Act prohibits employers from discriminating against workers for exercising their safety and health rights?
- ▶ What are some types of PPE that employers must pay for?

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Slide 28

**Topic 4:**  
**What do the OSHA Standards Say?**

- ▶ OSHA standards fall into four categories: General Industry, Construction, Maritime, and Agriculture.
- ▶ OSHA issues standards for a wide variety of workplace hazards
- ▶ Where there are no specific OSHA standards, employers must comply with The General Duty Clause, Section 5(a)(1)



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Slide 29


**Most Frequently Cited Standards**

Click: **Most Frequently Cited (MFC)** Standards to view current data

To search MFC data on this webpage:

- ▶ "Select number of employees in establishment," select **ALL** or one of the options listed
- ▶ "Federal or State Jurisdiction," select **Federal** or, from the dropdown menu, a specific state
- ▶ "SIC," select **ALL for all industry groups, C for Construction, D for Manufacturing** (General Industry), or **373 and 449 for Maritime**
- ▶ Shown are search results for: All sizes of establishments, in Federal jurisdiction, with Construction SIC codes





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Slide 30


**Classroom Exercise: OSHA Standards**



**Handout #8a:**  
General Industry



- ▶ What is the Subpart for Personal Protective Equipment?
- ▶ What is the Subpart for Machinery and Machine Guarding?
- ▶ What topic does 1910, Subpart H cover?



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Slide 31

**Classroom Exercise: OSHA Standards**

 **Handout #8b:**  
Construction 

- › What is the Subpart for Fall Protection?
- › What is the Subpart for Fire Protection and Prevention?
- › What topic does 1926, Subpart K cover?

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Slide 32

**Classroom Exercise: OSHA Standards**

 **Handout #8c:**  
Maritime 

- › What is the 29 CFR 1915 Subpart for Tools and Related Equipment?
- › What is the 29 CFR 1917 Subpart for Personal Protection?
- › What topic does 29 CFR 1918, Subpart H cover?

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Slide 33

**Questions for Review** 

- › What are the OSHA Construction standards also called?
- › What are the General Industry standards also called?
- › What are 29 CFR Parts 1915, 1917 and 1918 referred to as?

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Slide 34

Topic 5:  
How Are OSHA Inspections Conducted?

▶ The OSH Act authorizes OSHA compliance safety and health officers (CSHOs) to conduct workplace inspections at reasonable times.

▶ OSHA conducts inspections without advance notice, except in rare circumstances (e.g. Imminent Danger)

▶ In fact, anyone who tells an employer about an OSHA inspection in advance can receive fines and a jail term.



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Slide 35

OSHA Inspection Priority

Priority	Category of Inspection
1st	<b>Imminent Danger:</b> <i>Reasonable certainty an immediate danger exists</i>
2nd	<b>Fatality/Catastrophe:</b> <i>Reported to OSHA, inspected ASAP</i>
3rd	<b>Complaints/Referrals:</b> <i>Worker or worker representative can file a complaint about a safety or health hazard</i>
4th	<b>Programmed Inspections:</b> <i>Cover industries and employers with high injury and illness rates, specific hazards, or other exposures.</i>



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Slide 36

Citations and Penalties

VIOLATION TYPE	PENALTY
<b>WILLFUL</b> A violation that the employer intentionally and knowingly commits or a violation that the employer commits with plain indifference to the law.	OSHA may propose penalties of up to \$70,000 for each willful violation, with a minimum penalty of \$5,000 for each willful violation.
<b>SERIOUS</b> A violation where there is substantial probability that death or serious physical harm could result and that the employer knew, or should have known, of the hazard.	There is a mandatory penalty for serious violations which may be up to \$7,000.
<b>OTHER-THAN-SERIOUS</b> A violation that has a direct relationship to safety and health, but probably would not cause death or serious physical harm.	OSHA may propose a penalty of up to \$7,000 for each other-than-serious violation.
<b>REPEATED</b> A violation that is the same or similar to a previous violation.	OSHA may propose penalties of up to \$70,000 for each repeated violation.



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Slide 37

**Questions for Review** 

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- › 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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Slide 38

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

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

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Slide 39

**Sources Within the Workplace/Worksite**

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- › 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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Slide 40

**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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Slide 41

**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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Slide 42

**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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Slide 43



**Handout #12a:  
General Industry**



- ▶ Each group reviews the handout and discusses the industry-specific scenario
- ▶ Groups need to determine what information would be important to include in their complaint
- ▶ Have the class discuss the group's results:
  - What was included in the complaint?
  - What was added to the complaint?



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Slide 44



**Handout #12b:  
Construction**



- ▶ Each group reviews the handout and discusses the industry-specific scenario
- ▶ Groups need to determine what information would be important to include in their complaint
- ▶ Have the class discuss the group's results:
  - What was included in the complaint?
  - What was added to the complaint?



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Slide 45



**Handout #12c:  
Maritime**



- ▶ Each group reviews the handout and discusses the industry-specific scenario
- ▶ Groups need to determine what information would be important to include in their complaint
- ▶ Have the class discuss the group's results:
  - What was included in the complaint?
  - What was added to the complaint?



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Slide 46

### Questions for Review



- ▶ What are some resources inside the workplace that will help you find information on safety and health issues?
- ▶ What are some resources outside the workplace that will help you find information on safety and health issues?

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Slide 47

### Session Summary



This lesson covered:

- ▶ The importance of OSHA, including the history of safety and health regulation leading to the creation of OSHA and OSHA's mission;
- ▶ Worker rights under OSHA;
- ▶ Employer responsibilities;
- ▶ OSHA standards;
- ▶ OSHA inspections; and
- ▶ Safety and health resources, including how to file a complaint.

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Slide 48



✓ Check Yourself: Knowledge Test  
Next Up: Recognizing Specific Hazards

## Thank You!



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	Electrical Transmission & Distribution Partnership 10-Hour OSHA Training Course	
	<b>Electrical Safety</b>	

## 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) Electrocution
- 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](http://www.osha.gov)
- iii) The Code of Federal Regulations (CFR's)

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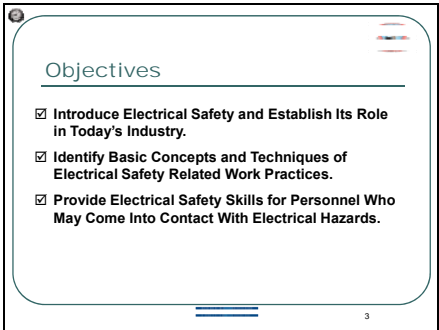
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Slide 3



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Slide 4

### Purpose

- ☑ Elimination of Workplace Injuries
- ☑ Elimination of Workplace Illnesses
- ☑ Development of Efficient Electrical Safety Techniques

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Slide 5

### Industry Statistics



PARTNERSHIP

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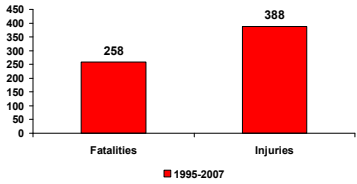
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Slide 6

### Line-Worker Incidents



Incident Type	Count (1995-2007)
Fatalities	258
Injuries	388

OSP Task Team-1

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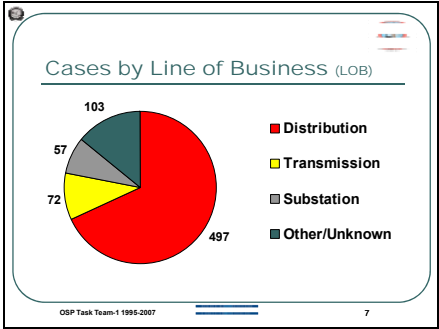
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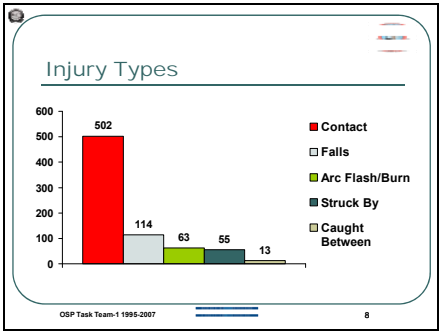
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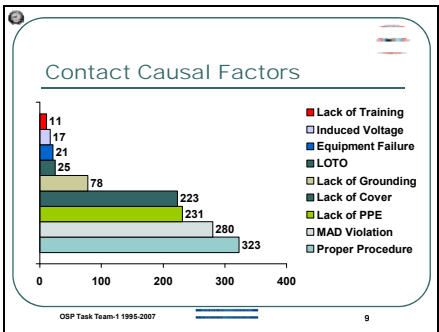
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Slide 9



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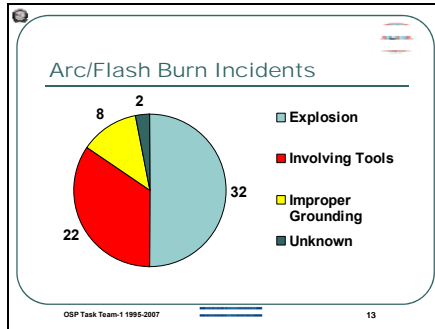
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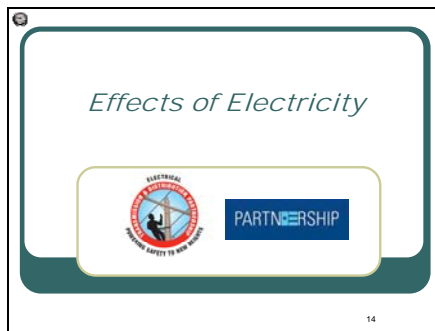




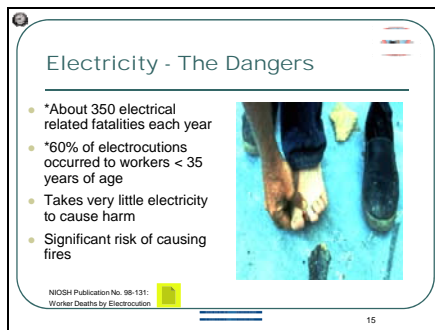
Slide 13



Slide 14



Slide 15



Slide 16

Electrical Injuries

There are four main types of electrical injuries:

• **Direct:**


• Electrocution

• Burns

• Electrical Shock Trauma

• **Indirect:**

• Falls



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Slide 17

Falls

• **Workers in elevated locations who experience a shock may fall, resulting in serious injury or death**



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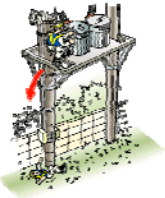
Slide 18

Fall From Transformer Rack

• Worker was inspecting transformer rack

• Worker contacted energized part and fell to the ground

• Worker was not wearing rubber gloves and was not belted off



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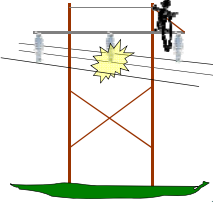
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Slide 19

### Fall Injury

- Installing knee braces on an energized 138kV circuit



The diagram shows a worker on a metal tower structure. A yellow starburst indicates a fall injury. The worker is positioned near a high-voltage line.

19

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Slide 20

### Electrical Shock

- An electrical shock is received when electrical current passes through the body
- You will get an electrical shock if a part of your body completes an electrical circuit by:
  - Touching an energized part and an electrical ground, or
  - Touching an energized part and another conductive object at a different electrical potential

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Slide 21

### Shock Severity

- Severity of the shock depends on:
  - Path of current through the body
  - Amount of current flowing through the body (amps)
  - Duration of the shocking current through the body,
- LOW VOLTAGE DOES NOT MEAN LOW HAZARD



The diagram shows a human silhouette with red lines indicating the path of electrical current. The current enters at the 'ENTRANCE' point (hand touching a 'LIVE WIRE') and exits at the 'EXIT' point (feet touching 'GROUNDED METAL').

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Slide 22

## Facts

- Each year many line-workers are killed or seriously injured by electrical contact
- Many were working on equipment they thought was de-energized

The diagram, titled "Effects on the Body", illustrates the path of an electrical current through a human figure. A thick black line represents the current's path, starting from the head (labeled "Shrapnel of lightning bolt") and ending at the feet (labeled "To ground"). Red arrows point to various effects: "Ventricular fibrillation" and "Cardiac arrest" near the heart, "Electrical burns from contact" on the arm, and "Involuntary muscle reactions" on the leg. The figure is shown standing on a green patch of ground.

BIHNS OHSOSH PUBLICATION No. 98-131

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Slide 23

Electrical Arcs Can Generate Heat Up To 35,000° Fahrenheit



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Slide 24

## Electrical Arcs Generate Heat

- Where a workers' head can contact exposed energized parts, the worker must wear a hard hat that will reduce the shock hazard
  - How may stickers react if exposed to an arc flash?
  - How may stickers affect the insulating value of the hat?



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Slide 25

### Dangers of Electrical Shock

- Currents above 10 mA\* can paralyze or "freeze" muscles.
- Currents more than 75 mA can cause a rapid, ineffective heartbeat
- 75 mA is not much current – a small power drill uses 30 times as much



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Slide 26

### Burns

- Most common shock-related injury
- Can occur when you touch electrical wiring or equipment that is improperly used or not maintained
- Typically occurs on hands
- Very serious injury that needs immediate attention



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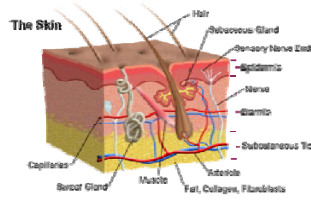
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Slide 27

### Full Thickness Burn



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Slide 28



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Slide 29



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Slide 30



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Slide 31



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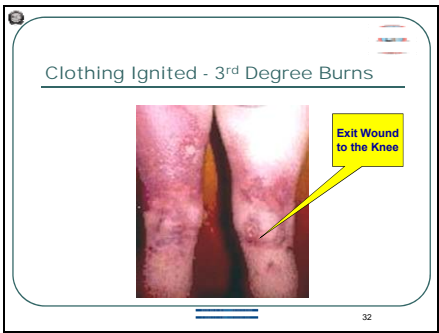
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Slide 32



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Slide 33



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Slide 34

### Arc Flash Hazards

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



[www.electricsubstationsafety.com](http://www.electricsubstationsafety.com)

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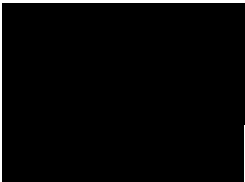
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Slide 35

### Arc Flash Hazards

- 60,000 amp, phase to ground fault



[www.electricsubstationsafety.com](http://www.electricsubstationsafety.com)

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Slide 36

### Protective Clothing

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



[www.electricsubstationsafety.com](http://www.electricsubstationsafety.com)

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Slide 37

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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Slide 38

## How Electricity Can Harm You

- Effects on Your Body
  - Nervous System
  - Circulatory System
  - Internal Organs
- The heart can be damaged because it is in the path of most common pathways:
  - Hand to hand
  - Hand to foot



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Slide 39

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Slide 40

### Non-Qualified Person

- **Non-qualified Person:**
  - A person who has little or no training with respect to avoiding the electrical hazards of working on or near exposed energized parts. And who is not familiar with the construction and operation of the equipment and hazards involved with the job.



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Slide 41

### Training

**Non-qualified Person**

- ☑ Safety Related Work Practices.
- ☑ Training Prior to Job Assignment.
- ☑ The Specific Regulations That Apply.
- ☑ The Hazards Associated with Electricity.



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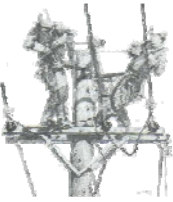
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Slide 42

### Qualified Person

- **Qualified Person:**
  - A person who has the training and experience in avoiding the electrical hazards of working on or near exposed energized parts
  - One who is familiar with the construction and operation of the equipment and hazards involved with the job



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Slide 43

### Training

**Qualified Person:**

- ☑ Train in Safety Related Work Practices
- ☑ Training Prior to Job Assignment
- ☑ The Specific Regulations That Apply
- ☑ The Hazards Associated with Electricity
- ☑ How to Determine The Nominal Voltage of Live Parts
- ☑ How to Determine The Clearance Distances of Live Parts
- ☑ How to Distinguish Between Live Parts and Other Parts
- ☑ Emergency procedures



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Slide 44

### RETRAINING

**REQUIRED WHEN THERE IS A:**

- ☑ New Electrical Hazard
- ☑ Program Related Injury
- ☑ Change in Job Assignment
- ☑ New Equipment Introduced
- ☑ New Hazard Control Methods
- ☑ Failure to Follow Safe Work Practices
- ☑ Reason to Doubt Employee Proficiency



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Slide 45

### Qualified Persons

- Two Qualified Workers Present
  - *Work on >600 volts*
  - *First aid & CPR trained*
  - *Includes Lines & Electrical Equipment*
- One Qualified worker
  - *Routine switching of circuits*
  - *Work with live line tools not exposed to parts >600 volts*
  - *Emergency repairs to safeguard public*



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Slide 46

### Distinguishing Live Parts (Substation)

- Look for insulators supporting buss work
- Look for bare conductors, either copper/aluminum

Hook Type Disconnected Switch

Single Phase Voltage Regulator

15kV Class Vacuum Recloser

Power Transformer

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Slide 47

### Distinguishing Live Parts (Substation)

- Recognize switches, breakers, transformers
- Recognize low voltage panel boards, switches

Hook Type Disconnected Switch

Water Trap

Rubber Aluminum Busswork

480V Class Vacuum Recloser

Grounding Capacitor

15kV Class Vacuum Recloser

Power Transformer

480V Class Vacuum Recloser

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Slide 48

### Distinguishing Live Parts (Transmission)

- Look for insulators supporting conductors & jumpers

Insulators

Jumper

Dead End Structure

Tangent Structure

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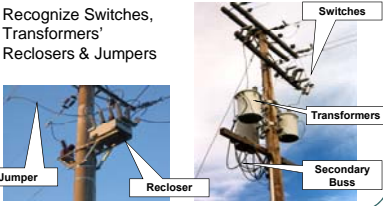
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Slide 49

### Distinguishing Live Parts (Distribution)

- Recognize Switches, Transformers' Reclosers & Jumpers



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Slide 50

### First Aid & CPR

- When working on parts energized at 50 volts or more there must be a sufficient number of First Aid & CPR trained workers are available
- Medical supplies must also be available



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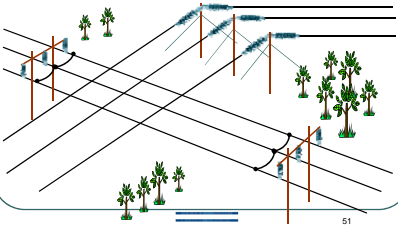
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Slide 51

### Induced Voltage



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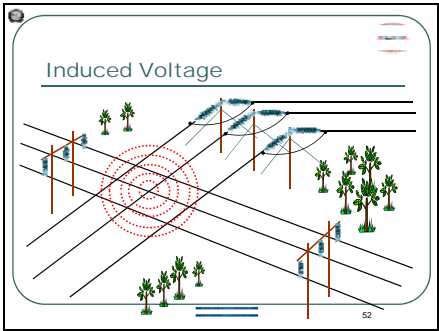
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Slide 52



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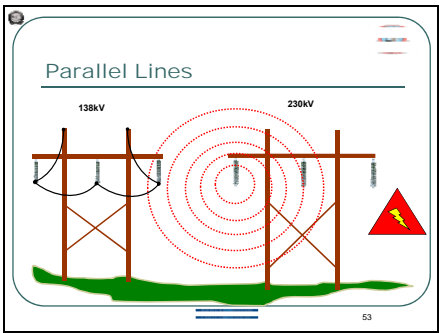
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Slide 53



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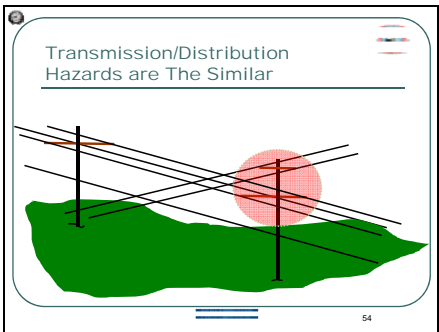
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Slide 54



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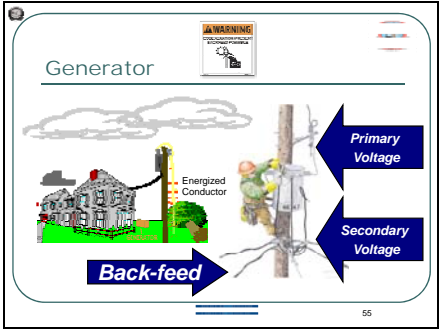
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Slide 55



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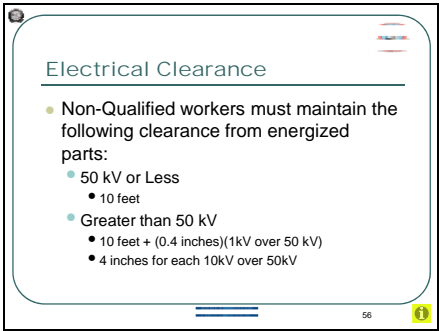
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Slide 56



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Slide 57



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Slide 58

## 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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Slide 59

## 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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Slide 60

## 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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Slide 64

### Minimum Approach Distance

- The minimum approach distance (MAD) is the closest distance a qualified worker can bring an non-insulated or conductive object (including their body) to an object energized at a different potential
- Likewise, the same distances apply to taking an energized object in proximity to a grounded object or object of a different potential

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Slide 65

### Minimum Approach Distance

- Line workers must maintain the minimum approach distance from exposed energized parts



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Slide 66

### Nominal Voltage

- Qualified electrical workers must be trained in:
  - *The skills and techniques necessary to determine the nominal voltage of exposed live parts*

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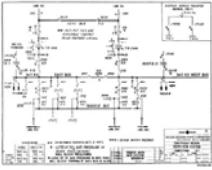
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Slide 67

### Determining Nominal Voltage

- Station single line diagrams
- Feeder maps of overhead and underground systems



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Slide 68

### Determining Nominal Voltage

- Equipment nameplates
- Circuit breaker nameplates can be misleading



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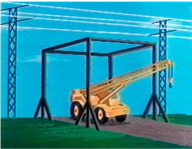
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Slide 69

### Vehicle in Transit

- Line Clearance:
  - Up to .75kV
    - 4 ft
  - .75kV to 50kV
    - 6 ft
  - 50kV to 345 kV
    - 10 ft
  - 345kV to 750kV
    - 16 ft
  - 750kV to 1,000kV
    - 20 ft



69

Up to .75kV	4 feet
.75 to 50kV	6 feet
50 to 345kV	10 feet
345 to 750kV	16 feet
750 to 1,000kV	20 feet

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Slide 70

### Emergency Procedures

- A qualified worker must be trained in emergency procedures such as pole top and man-hole rescue
- You want to avoid this:



A photograph showing a worker in safety gear climbing or working on a tall utility pole. The worker is positioned high up, and the pole is a wooden structure with wires attached.

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Slide 71

### Manhole & Vault Rescue

- When workers are performing duties in vaults and manholes a rescue plan must be in place prior to beginning work



A diagram illustrating a rescue setup for a manhole or vault. It shows a tripod stand with a pulley system and a rescue basket or stretcher positioned over an opening in the ground.

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Slide 72

### Emergency Action Plan

- Only one way:
- THE CORRECT WAY!
- Be prepared!



A photograph showing a worker on a ladder. The worker is positioned on the ladder, and there are other people standing around, possibly observing or assisting. The scene appears to be outdoors, possibly at a construction or maintenance site.

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Slide 73



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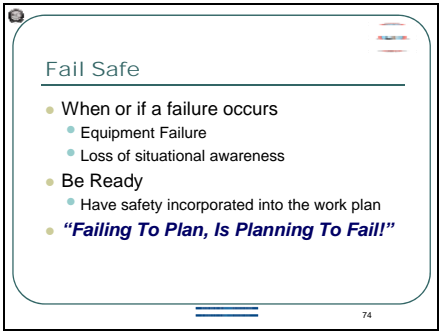
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Slide 74



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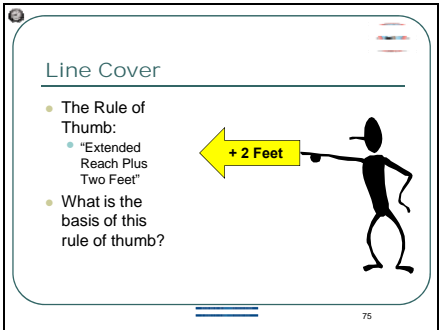
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Slide 75



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Slide 79

### Protection

- Your gloves and sleeves are your first line of defense



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Slide 80

### Working Position

- Protective covers must be installed when a "Slip" or "Fall" could cause the worker to contact exposed energized parts



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Slide 81

### Insulating Equipment

- When untying energized phase conductors the Minimum Approach Distance between the tie and any conductive object must be observed



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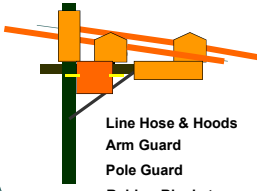
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Slide 82

### Second Point of Contact

- Insulating equipment is used to eliminate second points of contact hazards



Line Hose & Hoods  
Arm Guard  
Pole Guard  
Rubber Blanket

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Slide 83

### Second Point of Contact

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



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Slide 84

### Second Point of Contact

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



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Slide 85

### Second Point of Contact

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

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Slide 86

### Second Point of Contact

- Secure work area both above and BELOW the work area

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Slide 87

### 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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Slide 88

### Proper Care & Storage

- Rubber blankets should never be stored folded
- Blankets should be rolled



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Slide 89

### Proper Care & Storage

- Rubber blankets should never be stored folded
- Should be rolled and stored in tubes



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Slide 90

### Rubber Protective Material

- Do not use tape on blankets
- Tape leaves a residue that will attract dirt
- Use
  - Rope
  - Velcro
  - Tie wraps



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Slide 91

### 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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Slide 92

### 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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Slide 93

### 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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Slide 94

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### Insulation Equipment

- Insulated conductor holder on material handler boom



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Slide 95

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### Insulated Equipment

- The use of the jib is required when lifting or relocating any conductors using an aerial lift.



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Slide 96

96

### Working More Than One Phase Conductor at a Time

- Working more than one phase is permissible when:
  - Adequate separation is maintained between work zones by using separate aerial lifts or platforms.
  - Two employees in a single aerial lift **MUST NOT** cover-up or work different phases simultaneously.

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Slide 97

## Work Zone Cover-Up

- Provide adequate protection from all differences of potential.
  - Insulate and Isolate within reaching distance plus the minimum approach distance of the work zone.
  - Cover all exposed energized parts except the part being worked on
  - No part of body will come in contact with any difference of potential, even if covered with protective equipment.

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Slide 98



*Live Line Tools*

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Slide 99

## Live Line Tools

- Minimum approach distance must be maintained

**Minimum Approach Distance**



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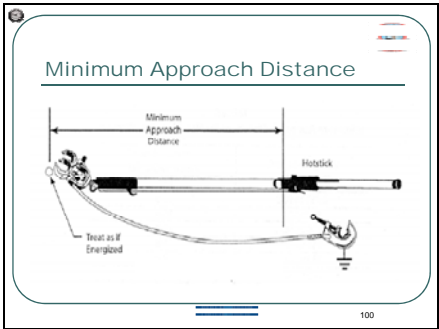
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Slide 100



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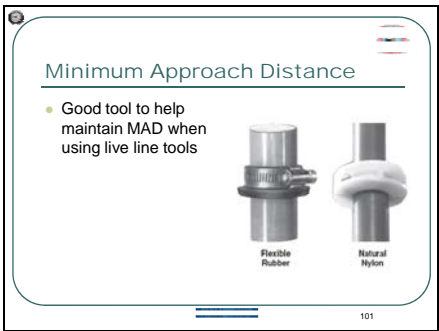
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Slide 101



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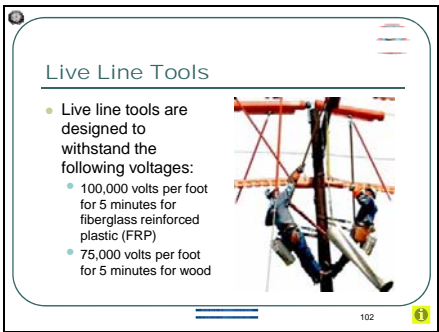
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Slide 102



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Slide 103

### Live Line Tools

- Each live-line tool shall be wiped clean and visually inspected for defects before use each day



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Slide 104

### Live Line Tools

- Would you do hot work with dirty sticks?
- Is an insulated boom any different?



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Slide 105

### Live Line Tools

- Live-line tools used for primary employee protection shall be removed from service every 2 years for examination, cleaning, repair, and testing as needed



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Slide 106

### Live Line Tools

- The test method used shall be designed to verify the tool's integrity along its entire working length
- If the tool is made of fiberglass-reinforced plastic, its integrity under wet conditions.



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Slide 107

### Live Line Tools

- Live-line tools must be tested prior to use when repairs are made to the finish



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Slide 108

### Material Storage



**PARTNERSHIP**

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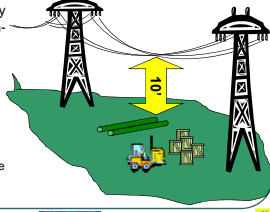
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Slide 109

### Material Storage

- For areas that may be entered by non-qualified workers:
  - 10 feet of clearance for lines and equipment energized at 50kV or less
  - Plus 4 inches for every 10kV above 50kV



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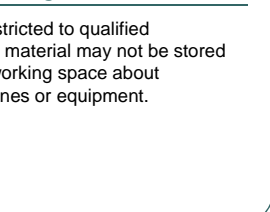
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Slide 110

### Material Storage (Qualified)

- In areas restricted to qualified employees, material may not be stored within the working space about energized lines or equipment.



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Slide 111

### Cord Sets, GFCI's Portable Tools



PARTNERSHIP

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## Slide 112

## Material

- Extension cord sets used with portable electric tools and appliances shall be of three-wire type and shall be designed for hard or extra-hard usage
- Flexible cords used with temporary and portable lights shall be designed for hard or extra-hard usage.



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## Slide 113

## Basic Rules

- All extension cords must be 3-wire type & hard or extra hard duty.
- Flexible cords & cables must be protected from damage.
- Cords may not run through pinch points.
- Extension cords may not be suspended by nails, staples, or wires.

113

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Slide 114

## Cord Sets-Construction

- These ratings are derived from the National Electrical Code, and are required to be indelibly marked approximately every foot along the length of the cord



114

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Slide 115

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### Wiring Methods

- What about TAPE???
- Any splice or repair must be equivalent to the original insulation, outer sheath, etc
- Electrical tape ALONE will not do that
- However, there ARE repair products that will equal the original insulation



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Slide 116

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### Extension Cords - Repairs

- Repairs can only be made to 12 gauge or larger extension cords.
- Repairs (splices) must maintain outer sheath insulation properties (No electrical tape).
- Strain relief must be provided.

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Slide 117

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### Inspection

- Damaged equipment must be removed from service and not used until it is repaired



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Slide 118

### Strain Relief

- To reduce hazards, flexible cords must connect to devices and to fittings in ways that prevent tension at joints and terminal screws.



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Slide 119

### Temporary Cord Set



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Slide 120

### Wet Conditions

- When a cord connector is wet, electric current can leak to the equipment grounding conductor



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Slide 121

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Slide 122

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Slide 123

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Slide 124

### Ground Fault Circuit Interrupter Portable Generators

- Protection can be built in or added as a "pig tail"



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Slide 125

### Ground Fault Circuit Interrupters

- Ground fault circuit interrupters or assured equipment grounding conductor program required for construction



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Slide 126

### GFCI



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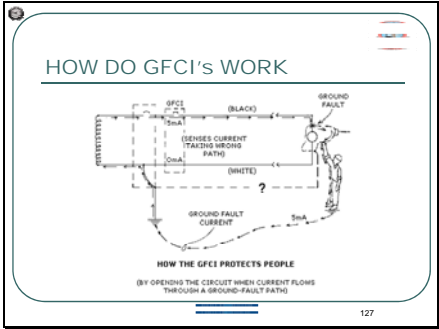
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Slide 127



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Slide 128

**HOW DO GFCI's WORK**

- They compare the current on the 2 wires
- If there is an electrical short, the current is different
- GFCI trips before injury takes place

The slide includes two photographs: a yellow GFCI outlet and a white GFCI outlet. The number 128 is in the bottom right corner.

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Slide 129

**Flexible Cords & Cables**

**Portable Electric Equipment:**

1. Handling. Portable equipment must be handled in a manner which will not cause damage. Flexible electric cords connected to equipment may not be used for raising or lowering the equipment. Flexible cords may not be fastened with staples or otherwise hung in such a fashion as could damage the outer jacket or insulation.

The slide features a photograph of a black power cord plugged into a wall outlet, with a power drill at the other end. The number 129 is in the bottom right corner.

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Slide 130



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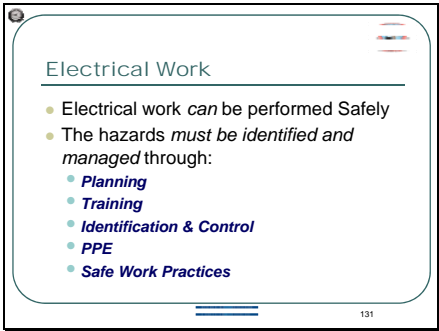
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Slide 131



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	Electrical Transmission & Distribution Partnership 10-Hour OSHA Training Course	
	<b>Personal Protective Grounding</b>	

## 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**

Slide 1



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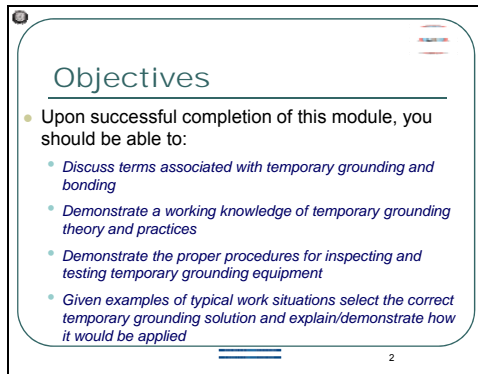
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Slide 2



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Slide 3



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Slide 4



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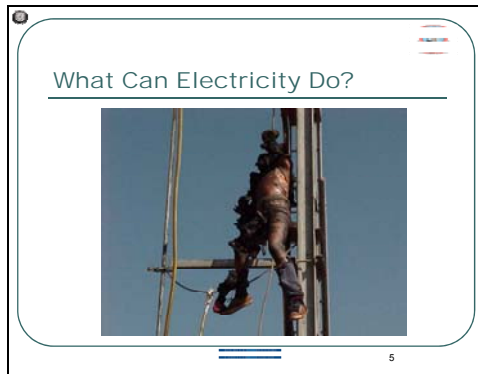
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Slide 5



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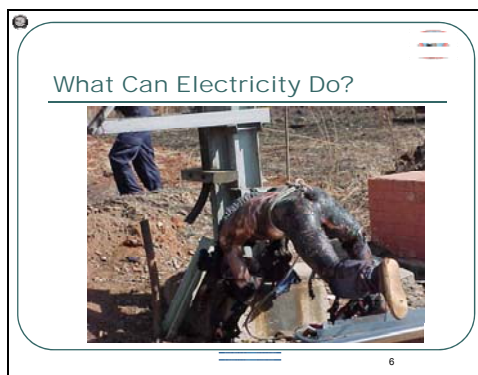
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Slide 6



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Slide 7

**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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Slide 8

**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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Slide 9

**The End Result of Not Working Safely With Electricity**



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Slide 10



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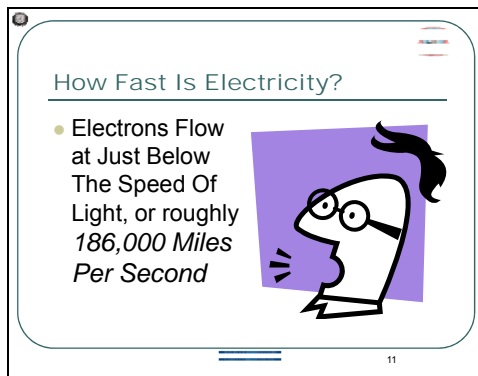
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Slide 11



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Slide 12



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Slide 13

**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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Slide 14

**Basics of Electricity**

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



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Slide 15

**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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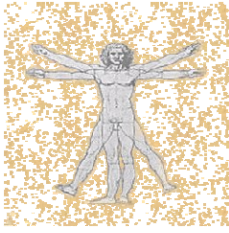
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Slide 16

**Body Resistance**

- Hand to Hand
  - Wet 865Ω
  - Dry 4838Ω
- Hand to Feet
  - Wet 1221Ω
- Internal Body
  - 500Ω



Source: Ditzel, Charles F. The Effects of Electric Shock on Man. *IRE Transactions on Medical Electronics*, vol. POME-5, May 1956.

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Slide 17

**Resistance**



	Dry	Wet
Finger Touch	40K to 1Million	4K to 15K
Hand Holding	15 to 50K	3 to 6k
Finger/Thumb	10 to 30K	2 to 5K
Hand Around Pipe	1 to 3K	.5 to 1.5K

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Slide 18

**Material Resistance**



Material	Resistance
Rubber Glove	720 Million
Dry Concrete	1 to 5 Million
Wet Concrete	1 to 5 Thousand
Dry Leather	.1 to .5 Million
Damp Leather	5 to 20 Thousand

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Slide 19


### 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


Slide 20

### Shunt Reactor Malfunction

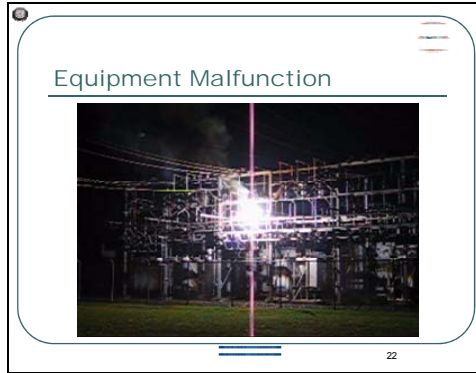


Slide 21

### Switching Errors



Slide 22



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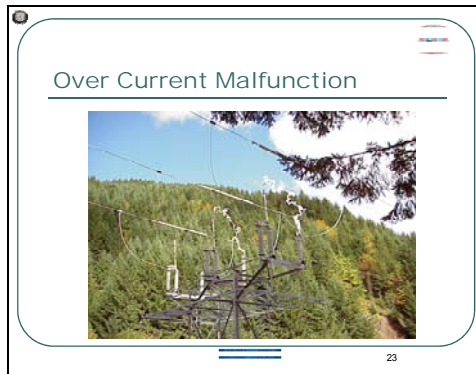
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Slide 23



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Slide 24



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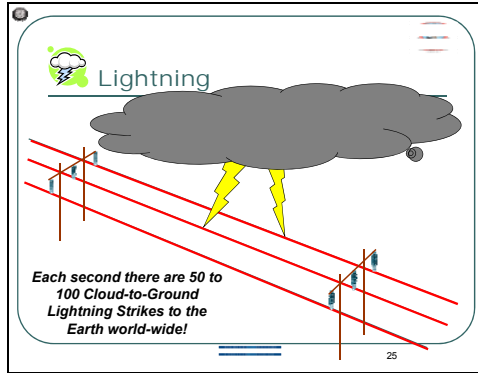
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Slide 25



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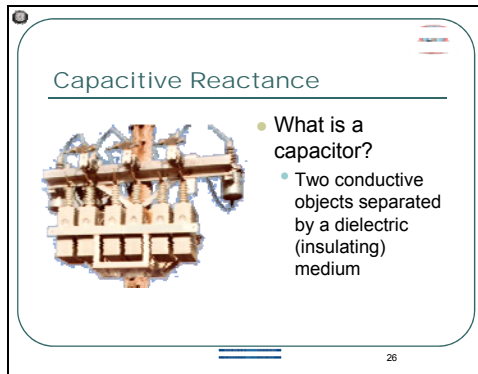
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Slide 26



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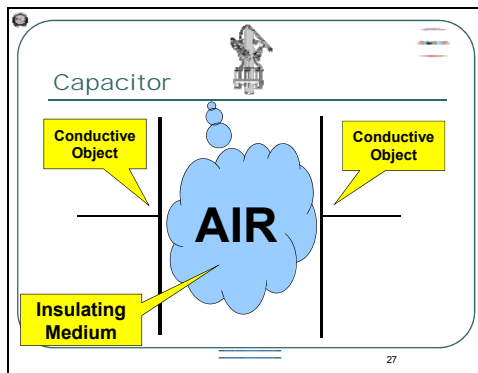
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Slide 27



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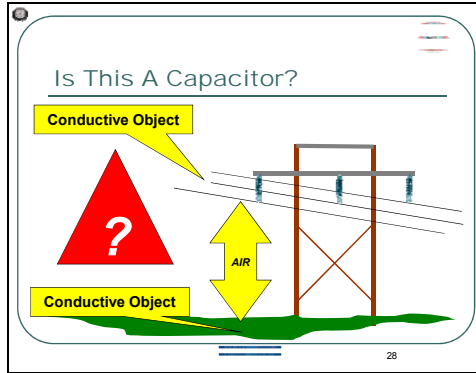
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Slide 28



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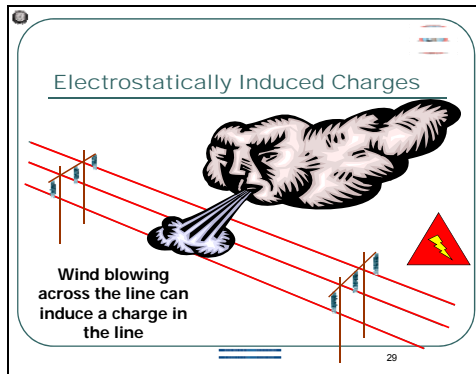
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Slide 29



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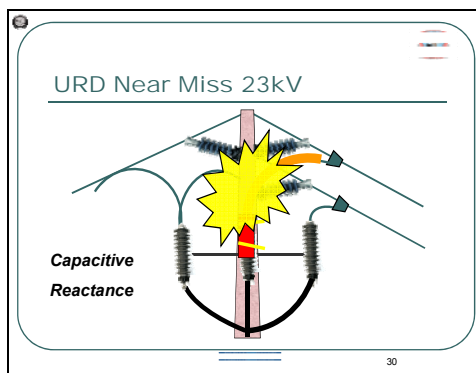
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Slide 30



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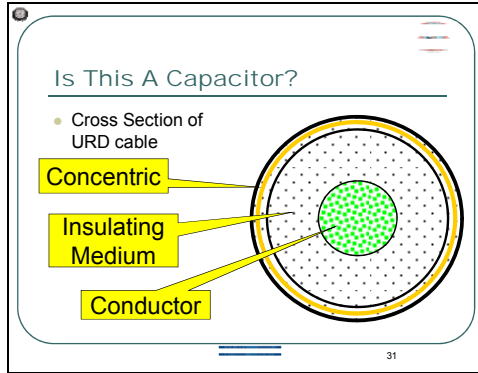
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Slide 31



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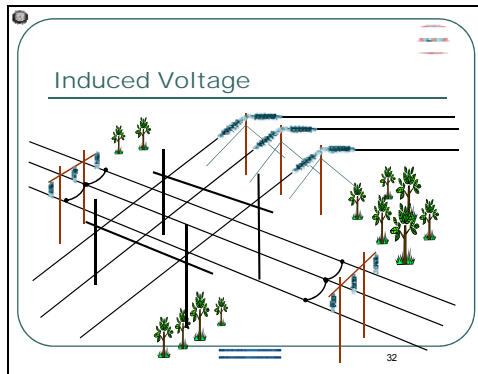
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Slide 32



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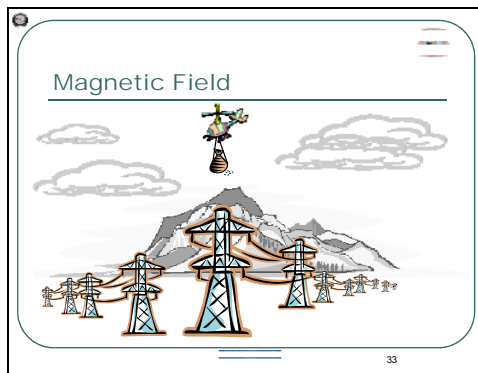
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Slide 33



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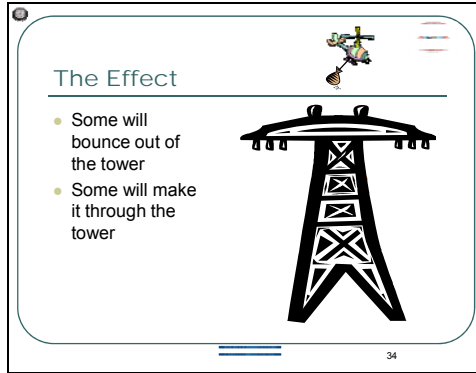
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Slide 34



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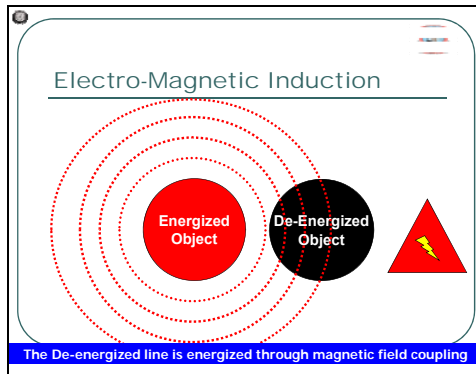
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Slide 35



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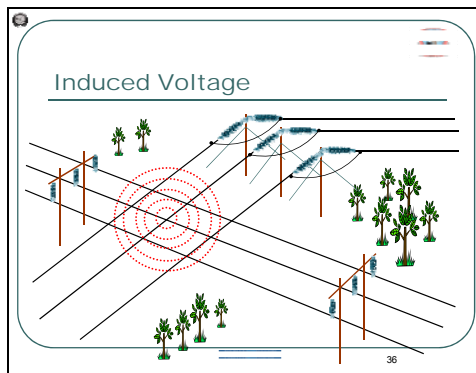
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Slide 36



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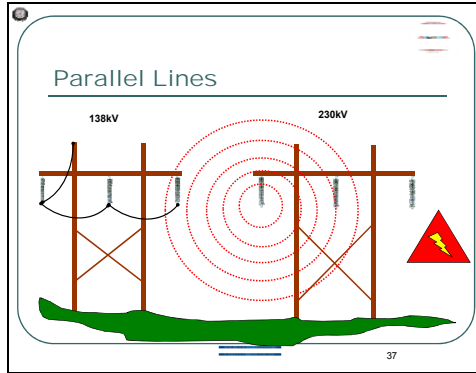
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Slide 37



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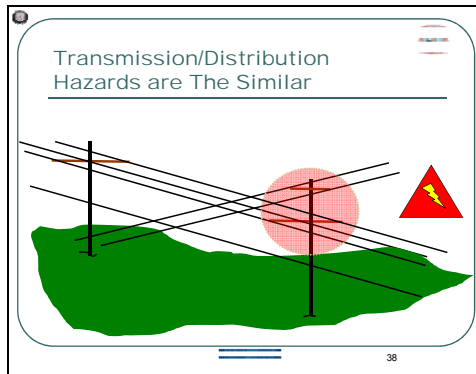
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Slide 38



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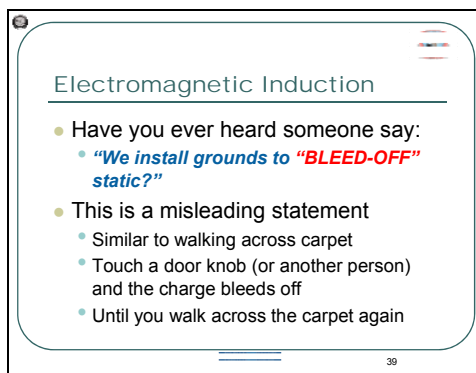
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Slide 39



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Slide 40

**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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Slide 41

**Remember**

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

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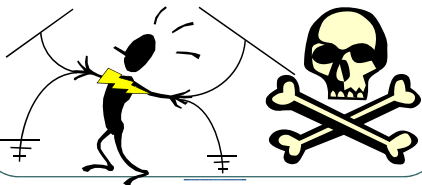
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Slide 42

**Safe Work Practices**

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



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Slide 43

### Auto Accident

- Pole strikes can cause an unintentional contact between circuits



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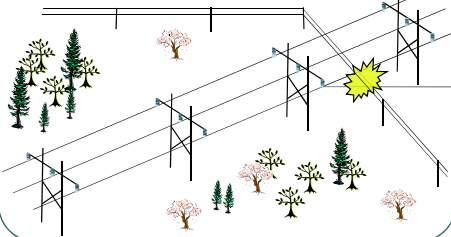
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Slide 44

### Equipment Failure



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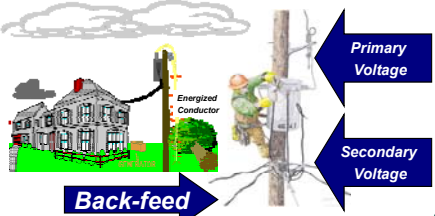
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Slide 45

### Generator



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Slide 46



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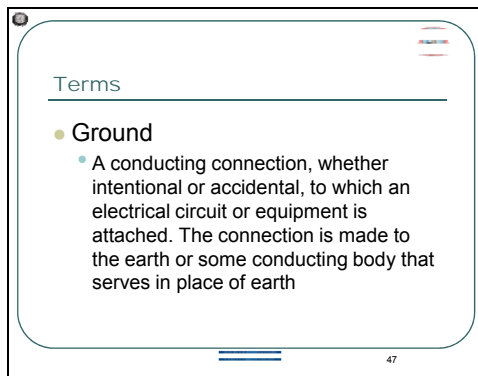
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Slide 47



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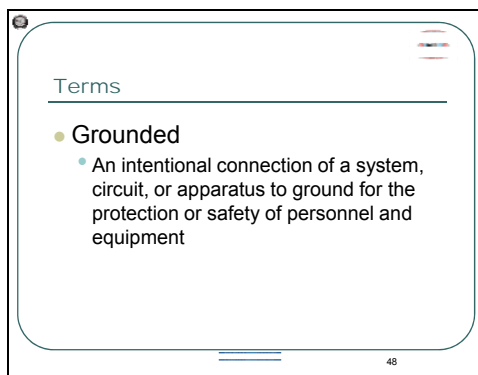
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Slide 48



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Slide 49

**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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Slide 50

**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.



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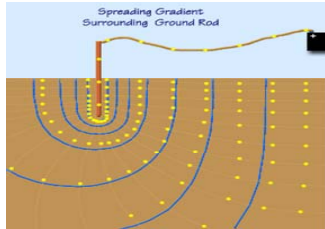
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Slide 51

**Terms**



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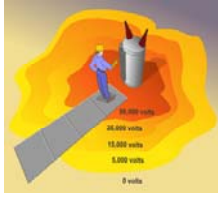
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Slide 52

**Terms**

- **Step Potential**
  - The potential difference between two points on the earth's surface, separated by the distance of one pace (3 feet) in the direction of the maximum potential.



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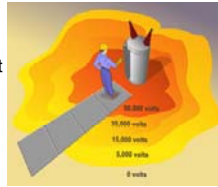
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Slide 53

**Terms**

- **Touch Potential**
  - Potential difference between a grounded metallic structure/object and a point on the earth's surface equal to the normal maximum horizontal reach of a person (approximately 3 feet)



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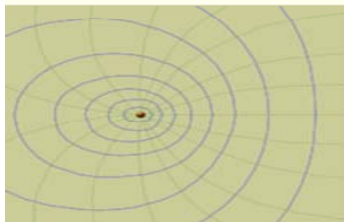
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Slide 54



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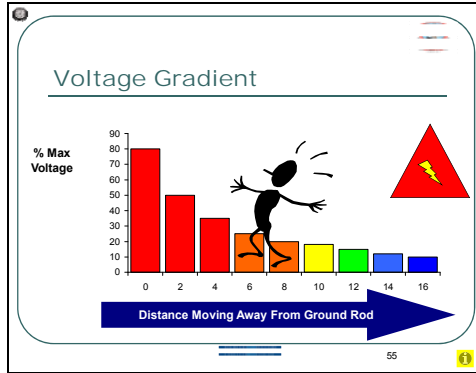
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Slide 55



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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.

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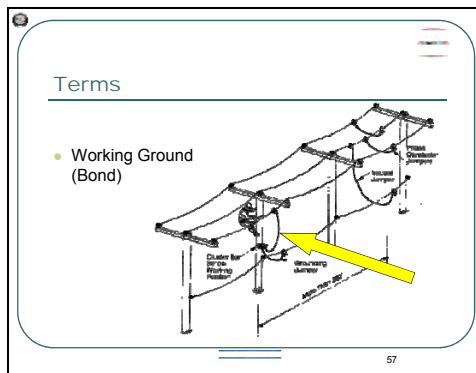
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Slide 57



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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

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Slide 59

*Equal Potential  
How It Works*



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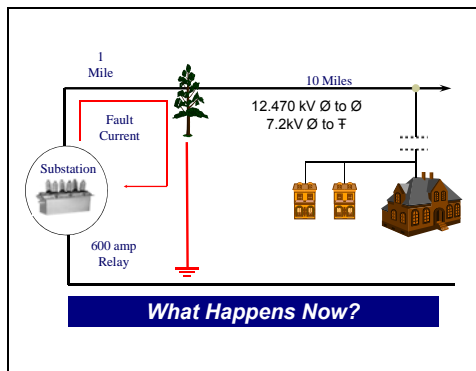
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Slide 60



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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

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Slide 62

**Protective Systems**  
**Re-closer/Breaker**



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

62

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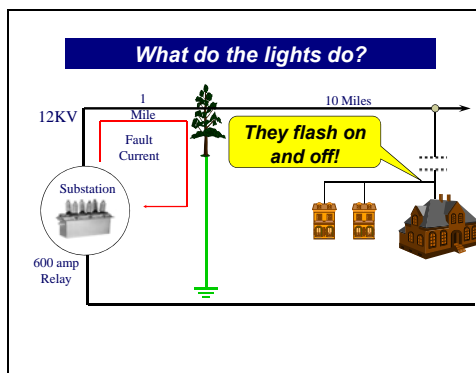
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Slide 63



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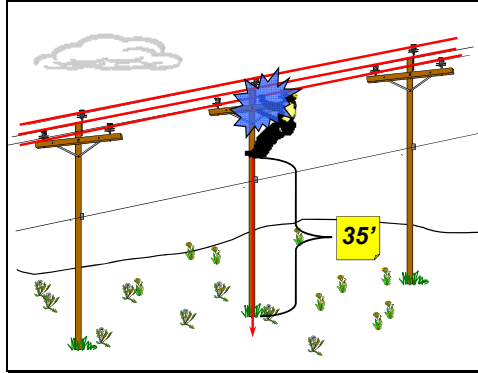
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Slide 64




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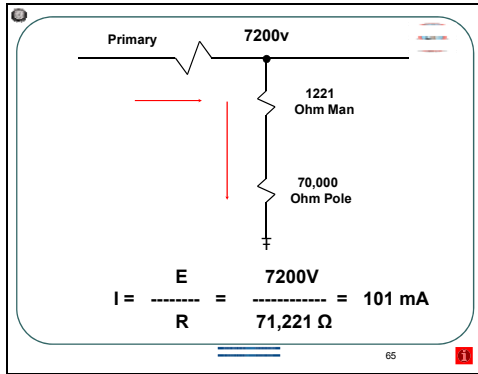
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Slide 65




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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

The table is part of a slide labeled '66'.

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Slide 67



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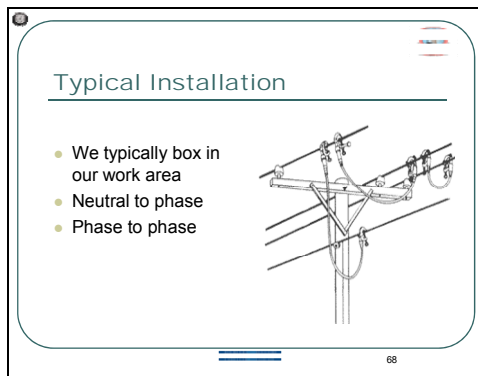
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Slide 68



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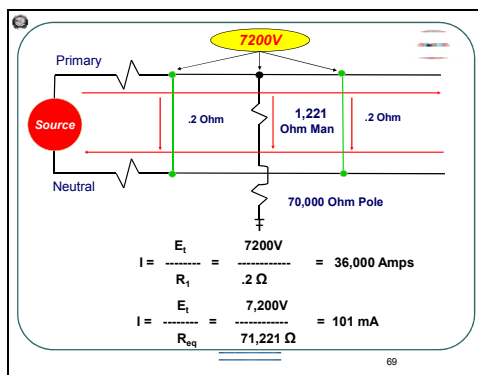
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Slide 69



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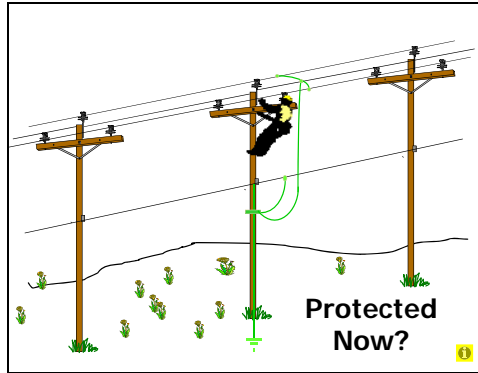
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Slide 70



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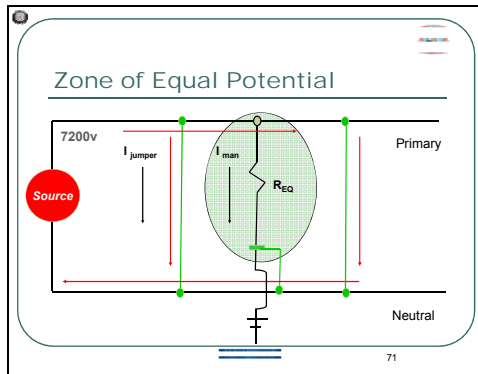
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Slide 71



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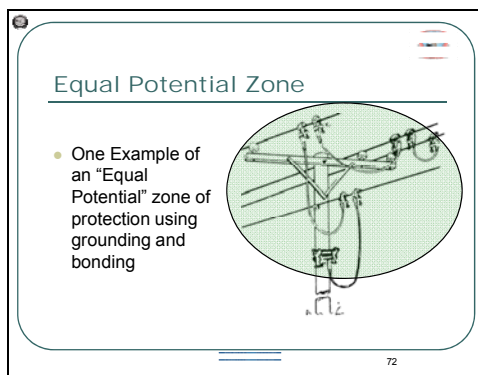
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Slide 72



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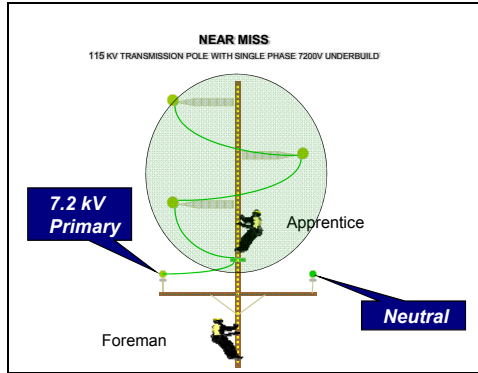
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Slide 73



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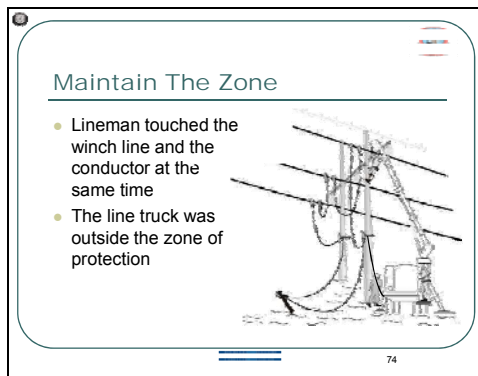
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Slide 74



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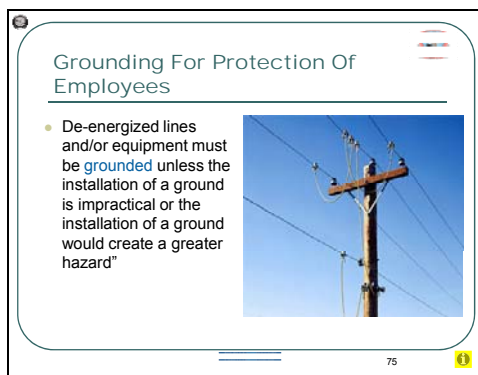
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Slide 75



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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*



77

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Slide 78

**Grounding For Protection Of Employees**

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



78

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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



80

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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*

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Slide 82



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Slide 83

**Installing Grounds**



- When attaching grounds, the ground end shall be attached to a earth ground potential first, and the other end shall be attached by insulating live line tools

**The installation and or removal of line grounds is NOT a rubber gloving or bare hand procedure!**

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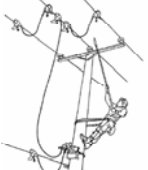
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Slide 84

**Removing Grounds**



- When removing grounds, the grounding device shall first be removed from the normally energized conductor, line or equipment first using insulating live line tools

**The installation and or removal of line grounds is NOT a rubber gloving or bare hand procedure!**

84

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Slide 85



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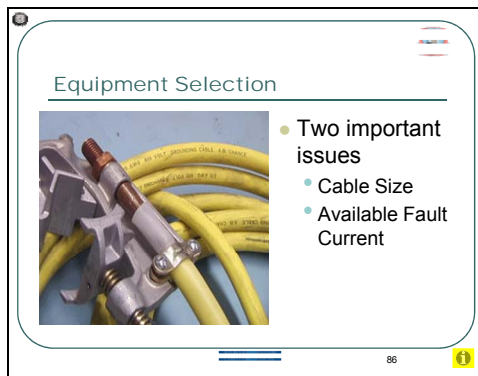
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Slide 86



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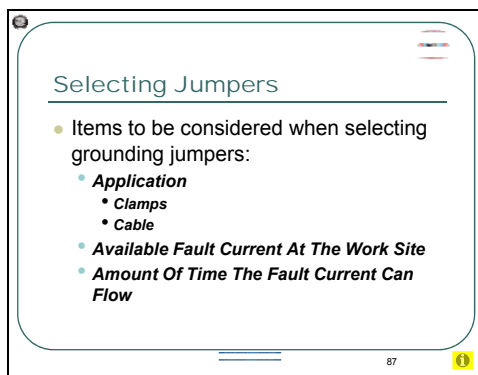
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Slide 87



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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

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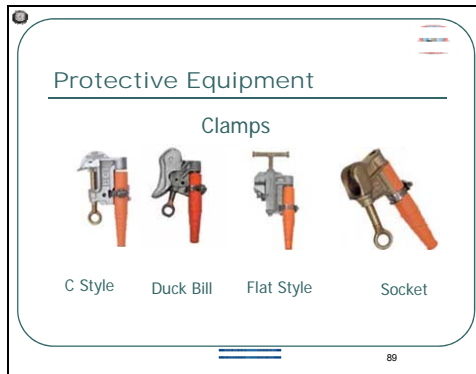
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Slide 89



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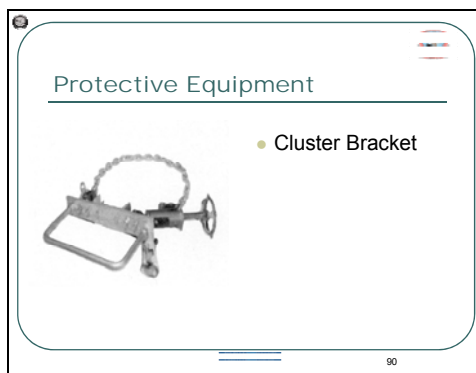
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Slide 90



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Slide 91

### Safe Work Practices

- Attach the grounding jumpers to best available ground at the worksite
  - The system neutral or shield wire when available
  - A grounded structure... lattice tower or steel pole
  - A temporary driven ground rod
    - When using a driven ground rod, the rod resistance should be verified

91

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Slide 92

### Safe Work Practices

- Personal protective grounding equipment shall be visually inspected before each use



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Slide 93

### Safe Work Practices

- Temporary protective grounds shall be installed as short, straight and direct as possible
- *Do not coil extra lengths of grounding cables*
- No part of the personal protective grounding jumpers should be contacted when being installed or removed

93

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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!*

94

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Slide 95

**Hazards of Coiled Cable**



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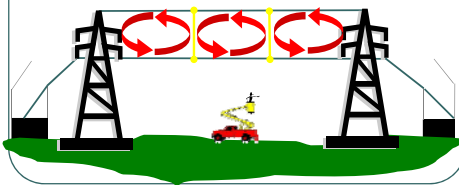
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Slide 96

**Ground Blades on Switches**

Circulating Voltage  
Series "Loop" Circuit



96

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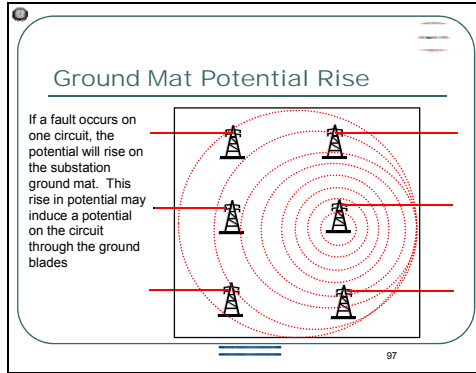
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Slide 97



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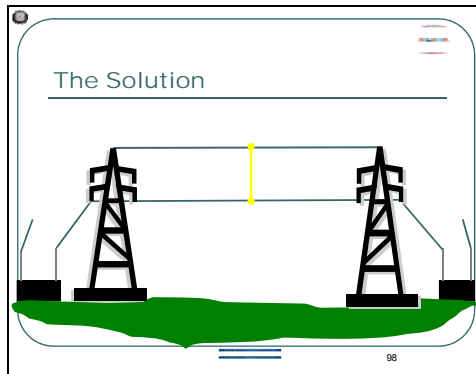
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Slide 98



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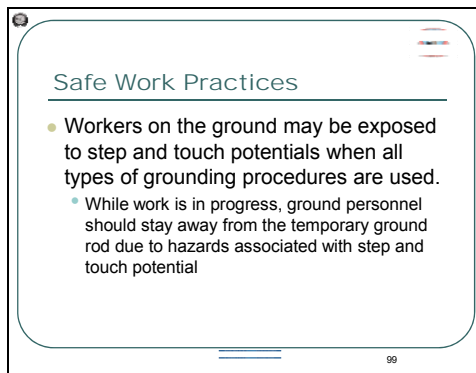
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Slide 99



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Slide 100

**Safe Work Practices**



- During testing you may remove grounds

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Slide 101

*Equipment Performance*



PARTNERSHIP

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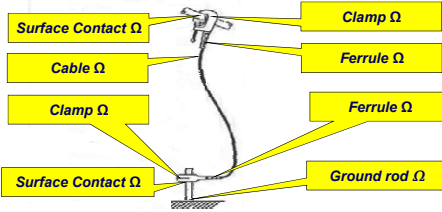
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Slide 102

**Chain of Resistance**



Surface Contact  $\Omega$

Cable  $\Omega$

Clamp  $\Omega$

Ferrule  $\Omega$

Ground rod  $\Omega$

102

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Slide 103



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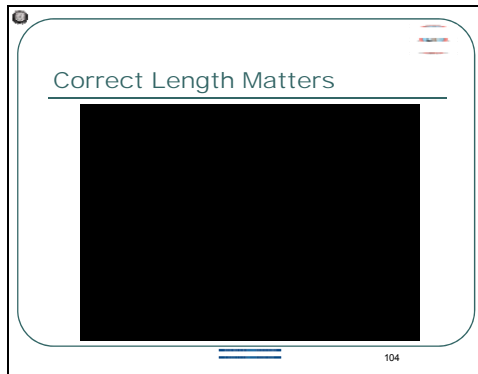
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Slide 104



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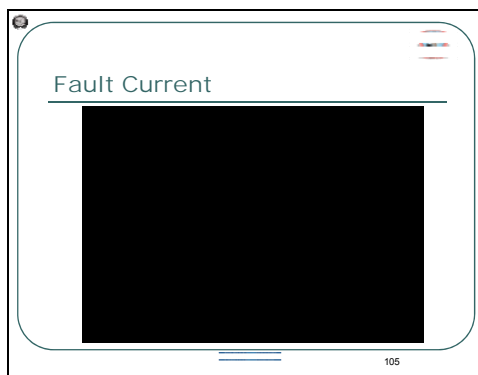
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Slide 105



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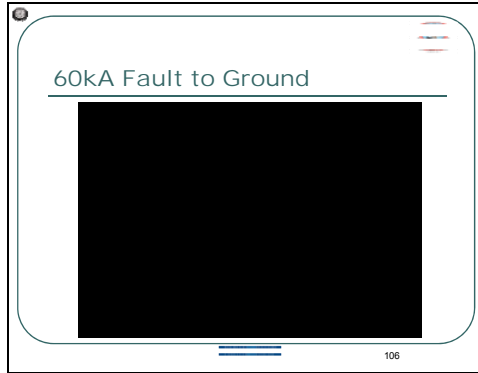
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Slide 106



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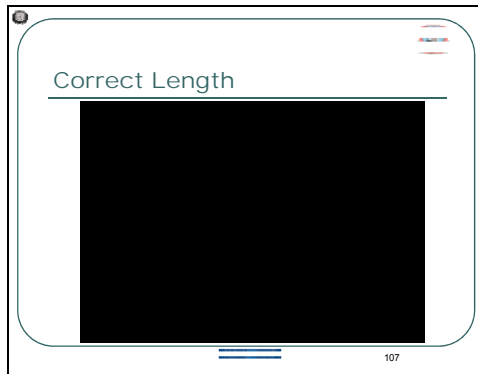
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Slide 107



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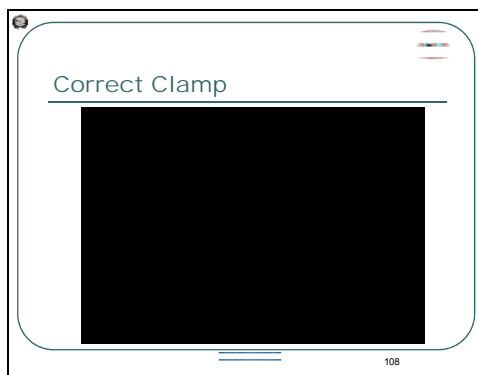
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Slide 108



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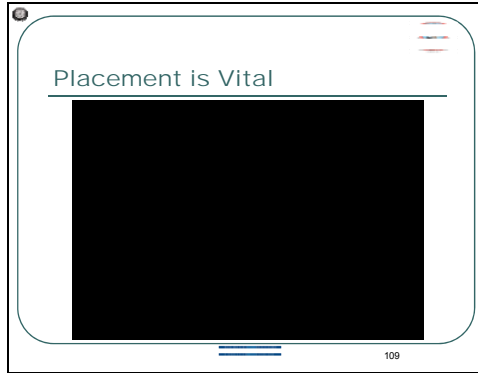
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Slide 109



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Slide 110



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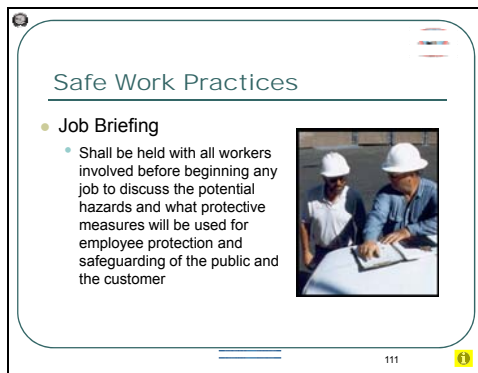
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Slide 111



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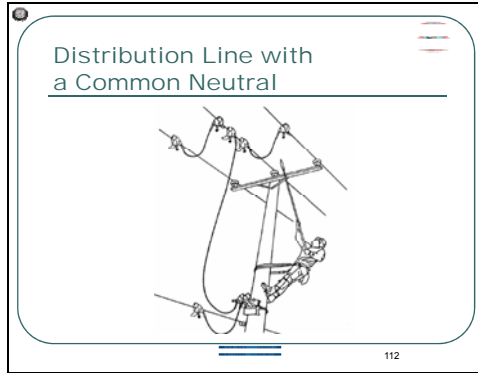
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Slide 112



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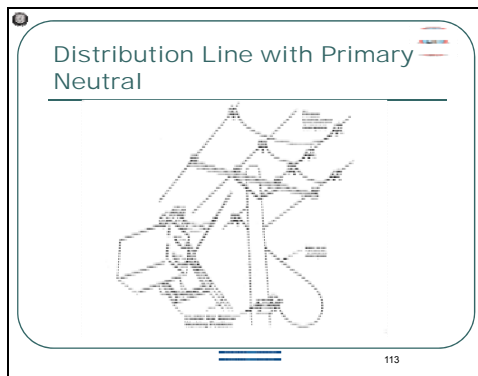
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Slide 113



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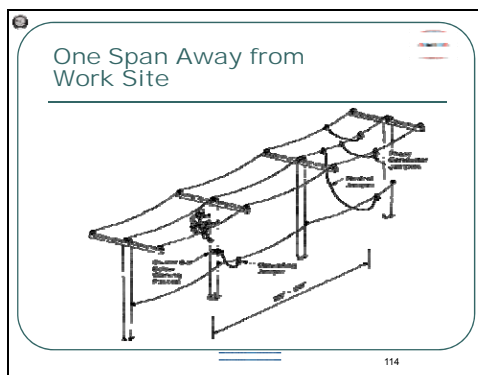
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Slide 114



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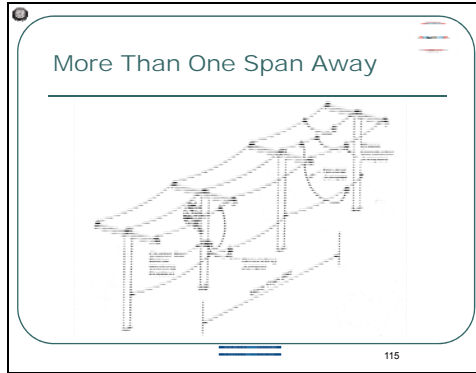
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Slide 115



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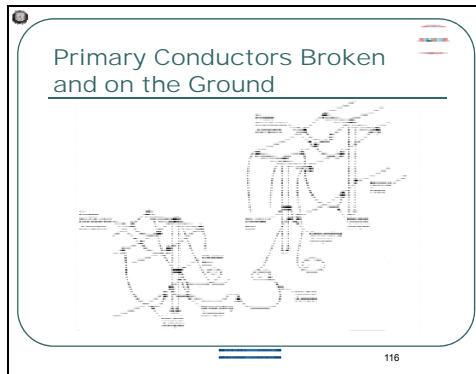
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Slide 116



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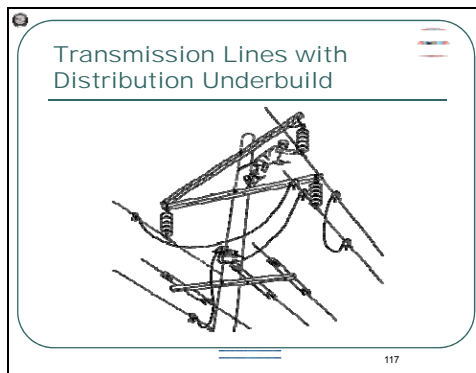
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Slide 117



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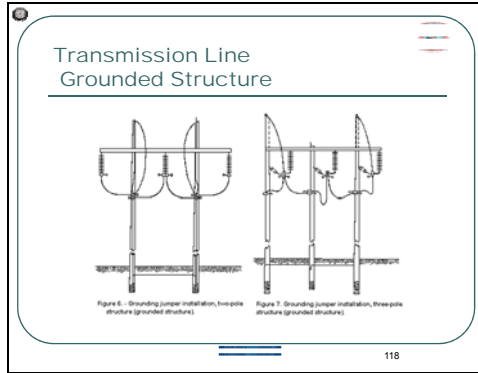
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Slide 118



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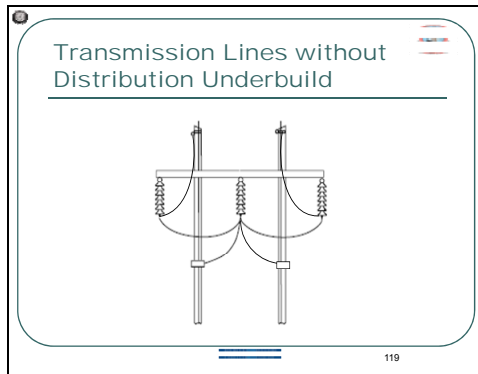
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Slide 119



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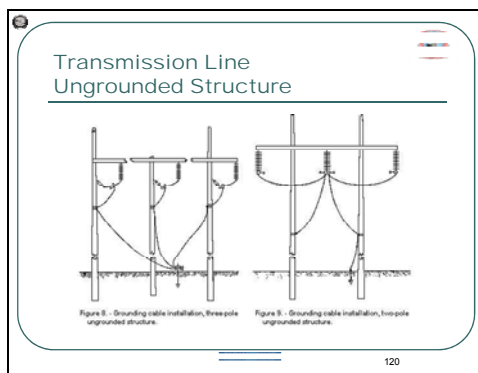
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Slide 120



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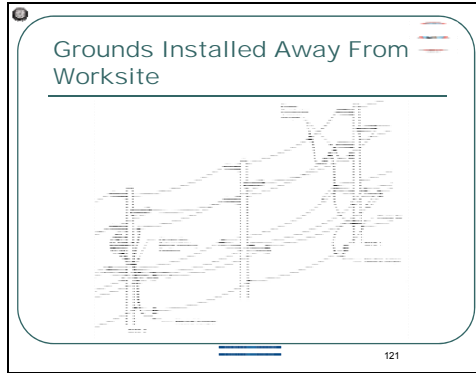
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Slide 121



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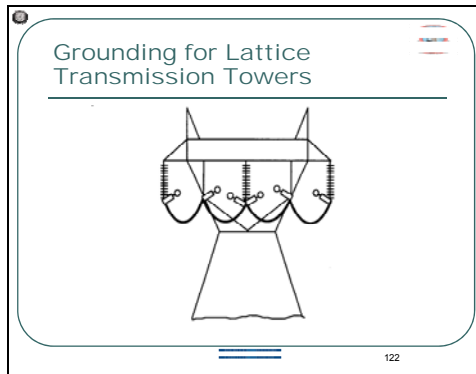
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Slide 122



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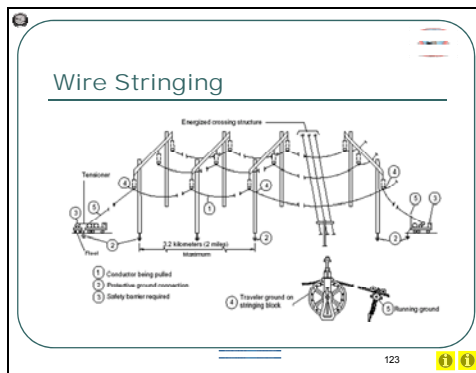
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Slide 123



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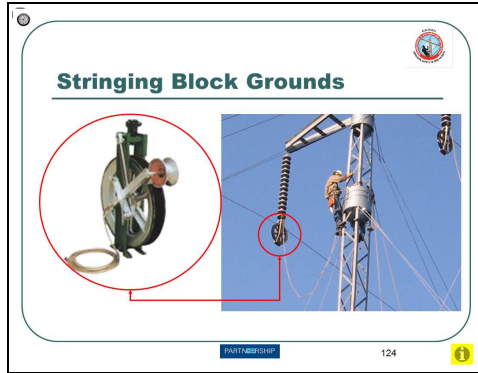
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Slide 124



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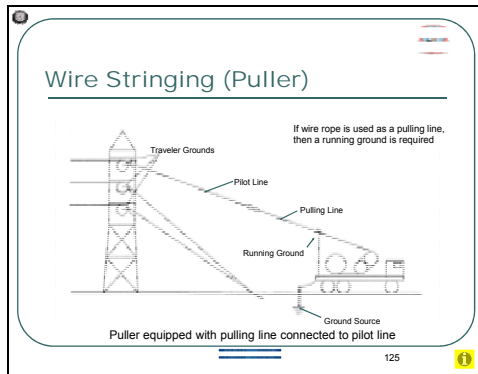
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Slide 125



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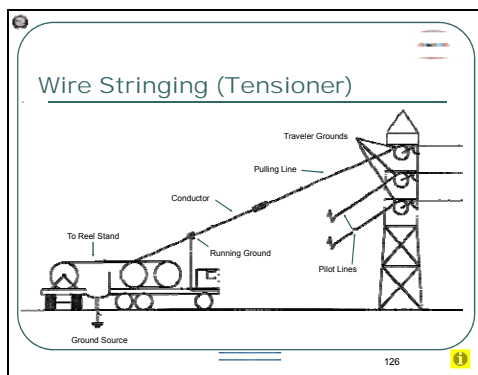
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Slide 126



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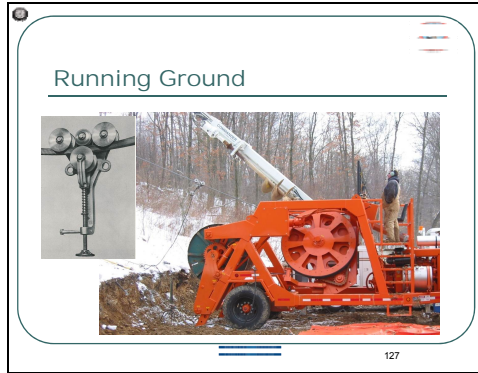
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Slide 127



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Slide 128



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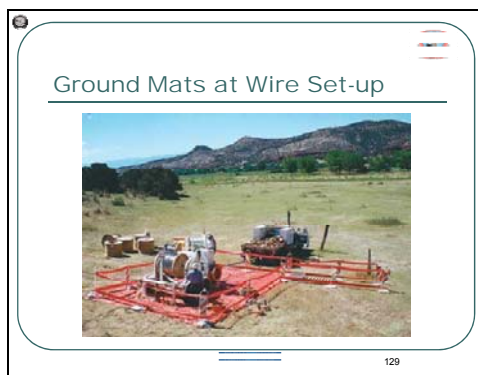
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Slide 129



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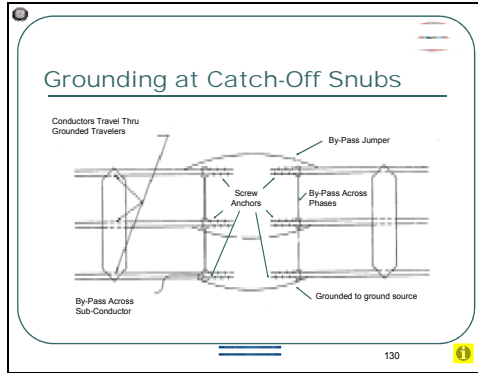
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Slide 130



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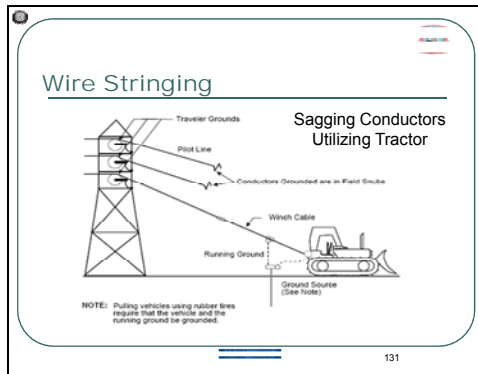
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Slide 131



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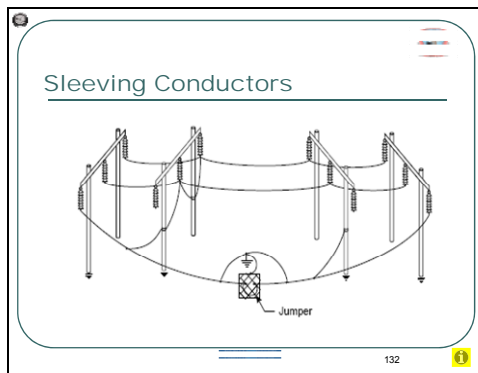
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Slide 132



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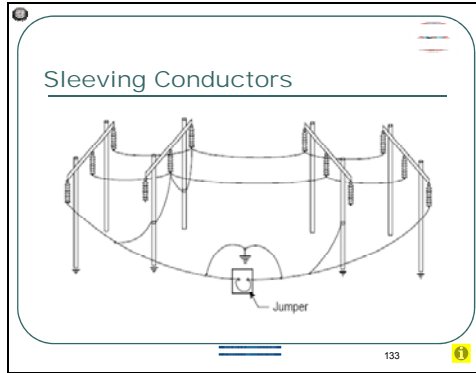
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Slide 133



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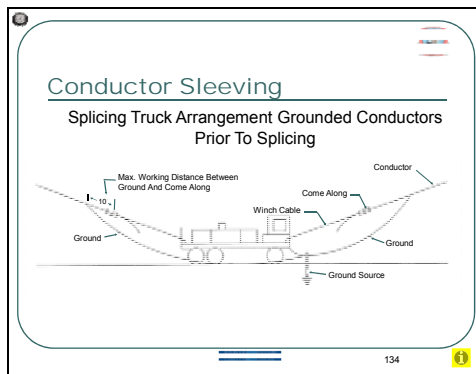
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Slide 134



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Slide 135



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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



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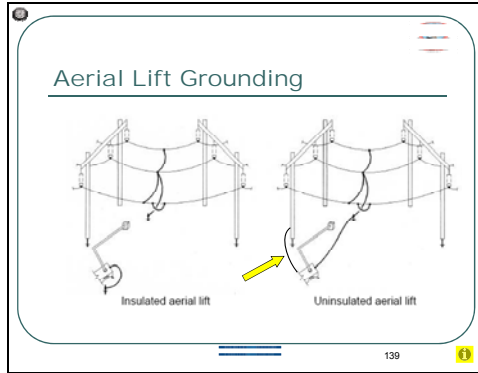
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Slide 139



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Slide 140



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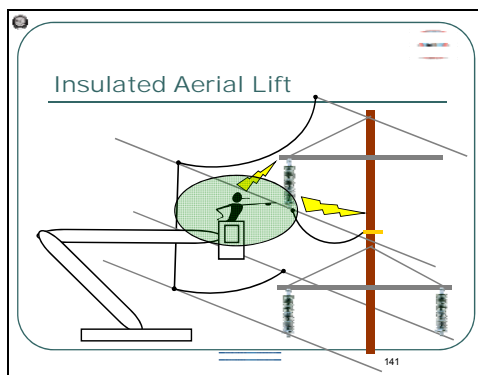
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Slide 141



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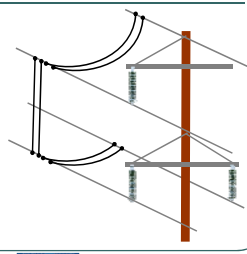
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Slide 142

**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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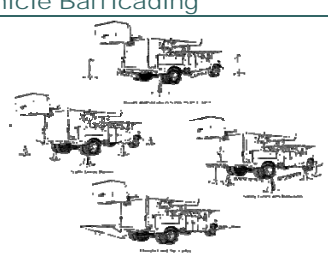
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Slide 143

**Vehicle Barricading**



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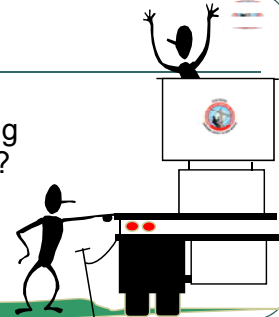
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Slide 144

**Barricade**

- Why is Barricading Important?



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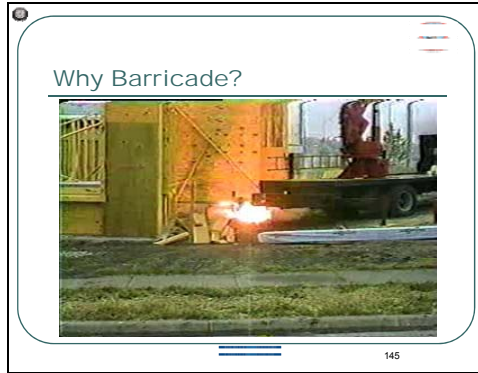
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Slide 145



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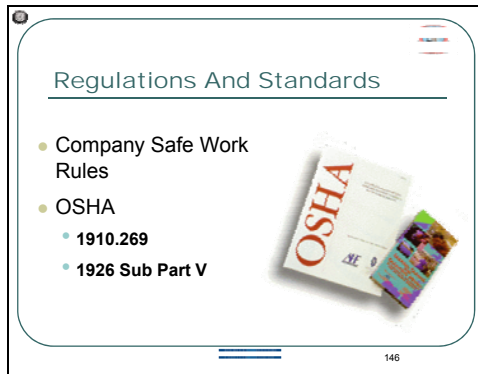
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Slide 146



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Slide 147



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Slide 148



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Slide 149



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Slide 160



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Slide 163



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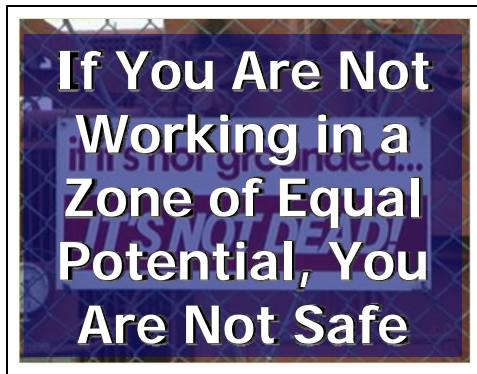
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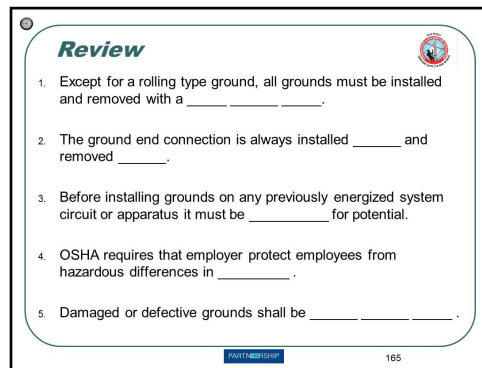
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Slide 165



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	Electrical Transmission & Distribution Partnership 10-Hour OSHA Training Course	
	<b>Lifting and Rigging</b>	

## 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



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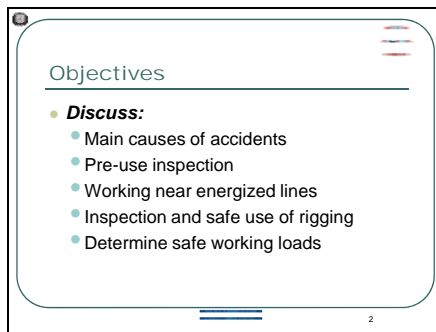
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Slide 2



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Slide 3



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Slide 4

Major Causes of Crane Accidents

- Contact with power lines
- Overturns
- Falls
- Mechanical failures

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Slide 5

Planning Before Startup

- Level the crane and ensure support surface is firm and able to support the load
- Know the basic crane capacities, limitations, and job site restrictions, such as the location of power lines, unstable soil, or high winds
- Make other personnel aware of hoisting activities.
- Barricade areas within swing radius.
- Ensure proper maintenance and inspections.

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Slide 6

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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





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
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







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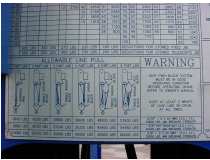
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
Slide 9




### Load Charts

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







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Slide 10

Overhead Hazards

- Before you start work look for overhead power lines
- Remember your minimum approach distance for equipment
- Make sure everyone is aware



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Slide 11

11

Stephen's Crane Incident video clip

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Slide 12

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Big Blue video clip

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Slide 13



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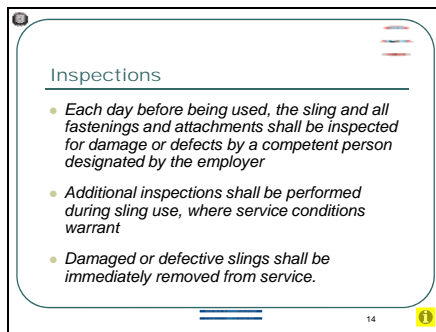
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Slide 14



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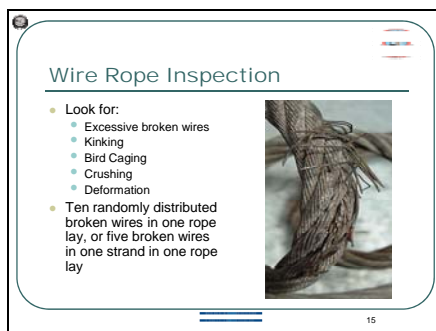
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Slide 15



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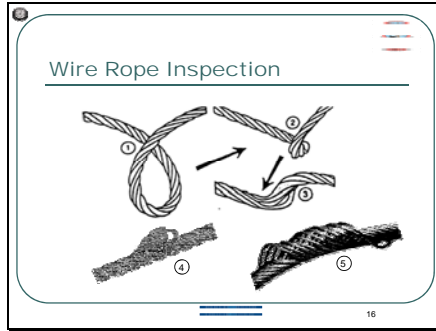
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Slide 16



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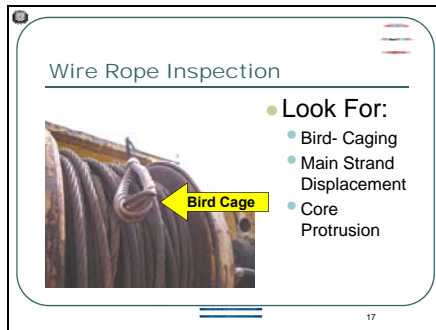
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Slide 17



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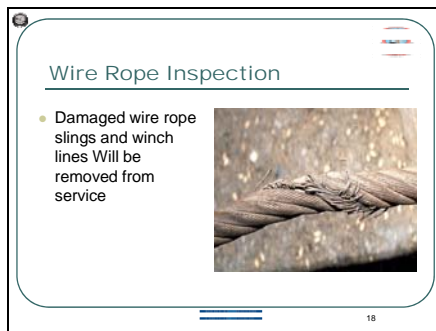
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Slide 18



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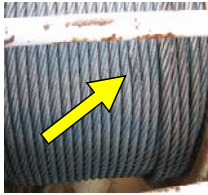
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Slide 19

**Out Of Service Criteria**  
Wire Rope Winch Lines



- 6 randomly distributed broken wires in one lay  
OR
- 3 broken wires in one strand in one lay
- At end fittings-1 broken wire

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Slide 20

**Sheave Inspection**

- The grooves must be smooth and free from surface defects which could cause rope damage



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Slide 21

**Web Sling Inspection**

- Each synthetic web sling Will be marked or coded to show:
  - Name or trademark of manufacturer.
  - Rated capacities for the type of hitch.
  - Type of material.



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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

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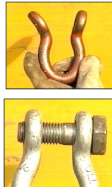
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Slide 24

**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 25

### Fiber Rope Inspection

- Natural and synthetic fiber rope slings Will be immediately removed from service if any of the following conditions are present:
  - Abnormal wear.
  - Powdered fiber between strands.
  - Broken or cut fibers.
  - Variations in the size or roundness of strands.
  - Discoloration or rotting.
  - Distortion of hardware in the sling.



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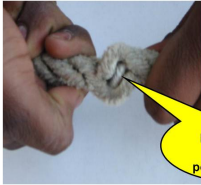
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Slide 26

### Fiber Rope Inspection

- Check the interior of the rope



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Slide 27

### Chain Slings

- A thorough periodic inspection of alloy steel chain slings in use shall be made on a regular basis
- Such inspections shall in no event be at intervals greater than once every 12 months
- The employer shall make and maintain a record of the most recent month in which each alloy steel chain sling was thoroughly inspected



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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

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Slide 30

**Load Hook Periodic Inspection**



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

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Slide 31

**Load Hook**  
**Frequent Inspection**



- Inspect for
  - Distortion of hook
    - Bending
    - Twisting
    - Increased throat opening
  - Wear
    - Cracks, Nicks, Gouges
    - Latch damage or malfunction
    - Hook attachment device

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Slide 32

**Load Hook Latch**



- A competent person will inspect all machinery

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Slide 33

*Safe Rigging Practices*



PARTNERSHIP

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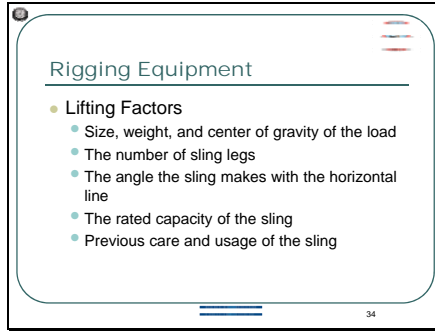
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Slide 34



Slide 34 features a title 'Rigging Equipment' and a section 'Lifting Factors'. The factors listed are: 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; and Previous care and usage of the sling. The slide has a blue header, a blue footer with the number 34, and a small logo in the top right corner.

- **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

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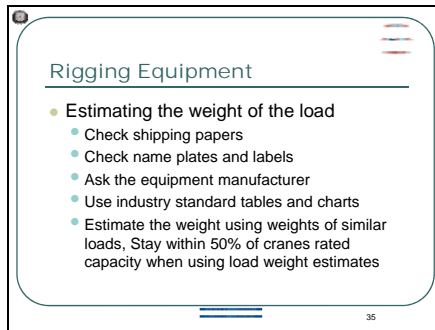
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Slide 35



Slide 35 features a title 'Rigging Equipment' and a section 'Estimating the weight of the load'. The steps listed are: Check shipping papers; Check name plates and labels; Ask the equipment manufacturer; Use industry standard tables and charts; and Estimate the weight using weights of similar loads, Stay within 50% of cranes rated capacity when using load weight estimates. The slide has a blue header, a blue footer with the number 35, and a small logo in the top right corner.

- **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

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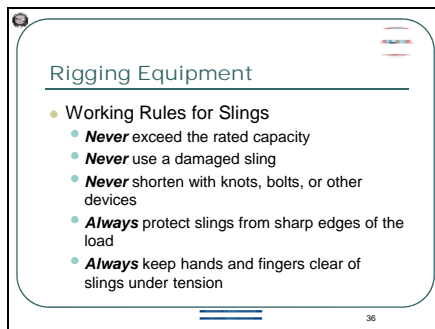
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Slide 36



Slide 36 features a title 'Rigging Equipment' and a section 'Working Rules for Slings'. The rules listed are: 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; and Always keep hands and fingers clear of slings under tension. The slide has a blue header, a blue footer with the number 36, and a small logo in the top right corner.

- **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

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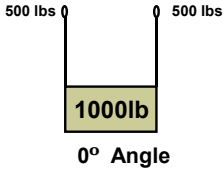
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Slide 37

### Rigging Equipment

- **Sling Angles**
  - Two slings, each supporting the same weight and having the same support angle results in an equal distribution of the load to each sling



500 lbs 500 lbs

1000lb

0° Angle

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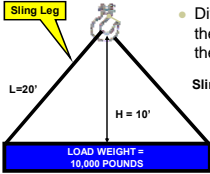
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Slide 38

### Load Angle Factor



**Sling Leg**

L=20'

H = 10'

LOAD WEIGHT = 10,000 POUNDS

- Divide the sling length by the height from the load to the hook

**Sling Tension = L/H x 1/2 Load**

- 20 / 10 = 2
- 2 x 1/2 Weight = 10,000
- Each leg = 10,000 tension

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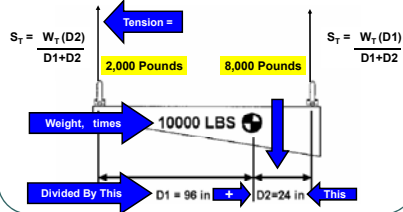
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Slide 39

### Sling Load Calculations



**Tension =**

$S_T = \frac{W_T (D_2)}{D_1 + D_2}$

2,000 Pounds

8,000 Pounds

**Weight, times**

10000 LBS

**Divided By This**

D1 = 96 in + D2 = 24 in

**This**

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Slide 40

**Block Loading**

0° (2)

90° (1.41)

500#

What is the line pull?

$P = \frac{W}{\text{Mechanical Advantage}}$

40

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Slide 41

**Gin Loading**

$W_g = \text{weight of object} + \text{pull on fall line}$

500#

$W_g = 550 + 500 = 1,050 \text{ pounds}$

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Slide 42

**Rigging Equipment**

- Storage Rules for Slings
  - Store in a dry environment out of direct sun light
  - Off of the floor or ground to prevent corrosion
  - Hung from hooks to prevent tangling
  - Away from electrical sources
  - By type – don't mix steel chain slings with synthetics etc..

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Slide 43



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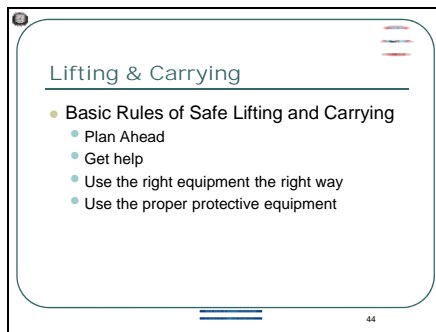
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Slide 44



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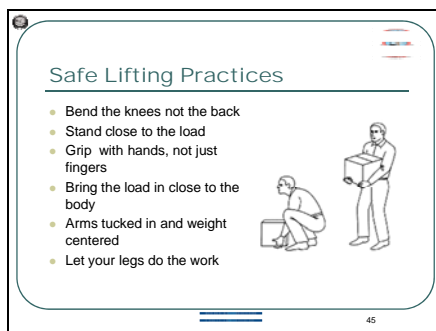
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Slide 45



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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



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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



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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



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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



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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



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Slide 51

### Questions for Review

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



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	Electrical Transmission & Distribution Partnership 10-Hour OSHA Training Course	
	<b>Personal Protective Equipment</b>	

## 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**

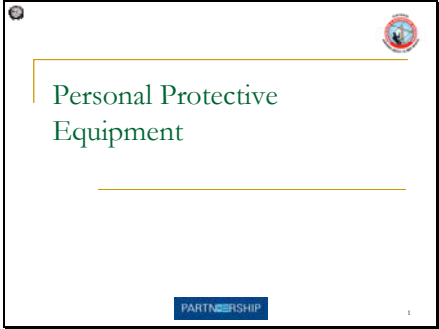
- i) Air test
- ii) ozone checking
- iii) Punctures
- iv) Tears
- v) Cuts
- vi) Cracks
- vii) Deformation
- viii) UV and/or chemical damage

**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/cm<sup>2</sup>



Slide 1



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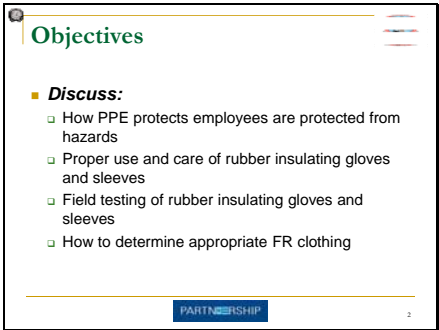
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Slide 2



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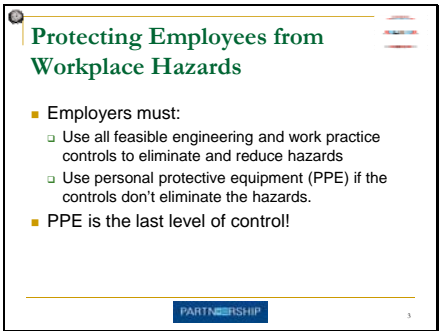
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Slide 3



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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

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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

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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

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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

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Slide 8



### Engineering Controls

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

PARTNERSHIP

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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

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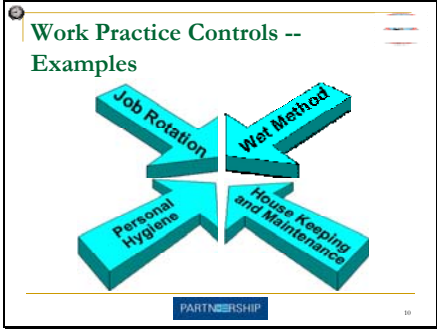
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Slide 10



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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

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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

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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**

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Slide 14



### Head Protection



**PARTNERSHIP**

14

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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**

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Slide 16

### Selecting the Right Hard Hat

- Class C
  - Construction (building construction, shipbuilding, lumbering)
  - Good impact protection but limited voltage protection
- Class E
  - Electrical / Utility work
  - Protects against falling objects and high-voltage shock and burns
- Class G
  - General use. Offers limited protection
  - Protects against bumps from fixed objects, but does not protect against falling objects or electrical shock

PARTNERSHIP

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Slide 17

### Hearing Protection

Graph 1: Average dB(A) For Some Construction Trades / Activities

Legend: Carpenter, Masonry, Framing, Sheet Metal, Ironworker, Bulldozer, Heavy Equipment Operator

PARTNERSHIP

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Slide 18

### Hearing Protection

- When it's not feasible to reduce the noise or its duration – use ear protective devices
- Ear protective devices must be fitted

DECIBEL - dB(A)	EQUIPMENT
115	File driver
110	Air drilling grouting
105	Impact wrench
100	Bulldozer - no muffler
100-105	Air grinder
100	Crane - articulated cab
100-105	Bulldozer - no cab
95	Chipping machine
95	Circular saw and hammering
95	Sack hoister
95	Quick cut saw
95	Masonry saw
95	Compressor - no cab
90	Loader - mounted cab
90	Loader/backhoe - insulated cab
85	Grinder
85-90	Welding machine
85	Bulldozer - insulated cab
80-85	Spreading water

Table 1: Some typical noise levels found on construction sites

PARTNERSHIP

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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

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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 area)



PARTNERSHIP

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Slide 21

### 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

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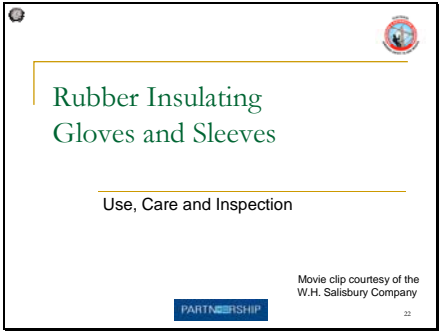
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Slide 22



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Slide 23



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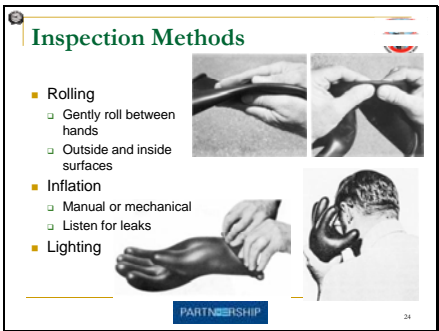
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Slide 24



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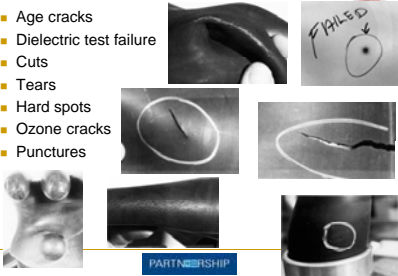
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Slide 25

### Common Problems to Look For

- Age cracks
- Dielectric test failure
- Cuts
- Tears
- Hard spots
- Ozone cracks
- Punctures



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Slide 26

ASTM Labeling Chart for Solisbury Lineman's Natural Rubber and SALCORB Rubber Protective Equipment					
Class Color	Rated Test Voltage AC / kV	Min. Dielectric Strength AC / kV	Rubber Material Productivity Label	Stress Label	Rubber Stippled Stress Label
00 Blue	2000 / 10,000	500 / 750*			
0 Red	5,000 / 25,000	1,000 / 1,500*			
1 White	10,000 / 40,000	2,000 / 11,250*			
2 Yellow	20,000 / 80,000	4,000 / 22,500*			
3 Green	30,000 / 120,000	6,000 / 33,750*			
4 Orange	40,000 / 160,000	8,000 / 45,000*			

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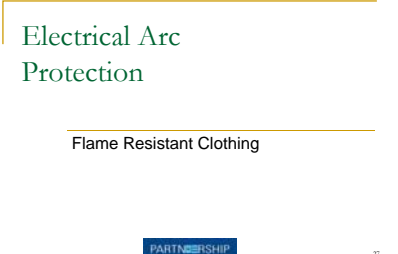
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Slide 27

### Electrical Arc Protection

#### Flame Resistant Clothing



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Slide 28



### At Risk Employees

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



PARTNERSHIP

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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

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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

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Slide 31



### Electric Arc Hazards

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



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
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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



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
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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



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Slide 34



### Factors Affecting Worker Injury

- Electric Arc intensity
  - Amperage, voltage, electrode gap, focused arc (arc in box)
- Electric Arc Duration
- Distance of the Worker from the Electric Arc
- Type and Fit of Clothing Worn
- Percentage of Body Burn
- Personal Factors
  - Age
  - Medical Condition

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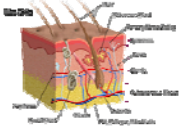
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Slide 35



### Burn Injury Principles

- Burn Depth Is a Measure of Severity
  - First-degree
  - Second-degree
  - Third-degree
- Exposure to an Electric Arc or Flame Can Rapidly Exceed Human Tissue Heat Tolerance and Cause Second- or Third-Degree Burns



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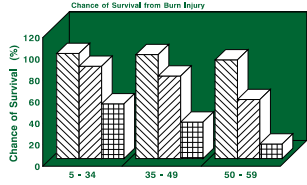
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Slide 36



### Chance of Survival




Chance of Survival from Burn Injury

Chance of Survival (%)

5 • 34 35 • 49 50 • 59

National Burn Information Exchange, April 1986. Based on percentage of body area receiving second and third degree burns.

25% Body Burn 50% Body Burn 75% Body Burn

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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

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Slide 38

### 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

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Slide 39



PARTNERSHIP

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Slide 40

Arc Thermal Protective Values		
■ Level I	0-4	cal/cm <sup>2</sup>
■ Level II	4-8	cal/cm <sup>2</sup>
■ Level III	8-30	cal/cm <sup>2</sup>
■ Level IV	30-50	cal/cm <sup>2</sup>
■ Level V	50-75	cal/cm <sup>2</sup>
■ Level VI	75-100	cal/cm <sup>2</sup>
■ Level VII	> 100	cal/cm <sup>2</sup>

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Slide 41

Questions for Review	
1.	List the means of protecting workers from workplace hazards.
2.	Name at least two types of field tests for rubber insulating gloves.
3.	What is <b>A.T.P.V.</b> ?
4.	What is the purpose of FR clothing?

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	<p>Electrical Transmission &amp; Distribution Partnership 10-Hour OSHA Training Course</p>	
	<p><b>Job Briefings</b></p>	

## 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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Slide 1



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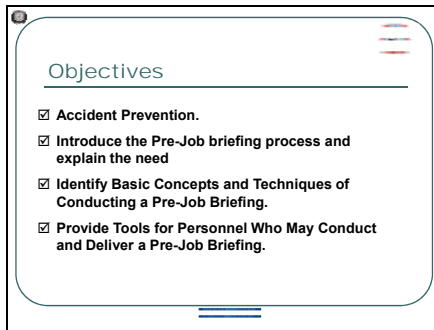
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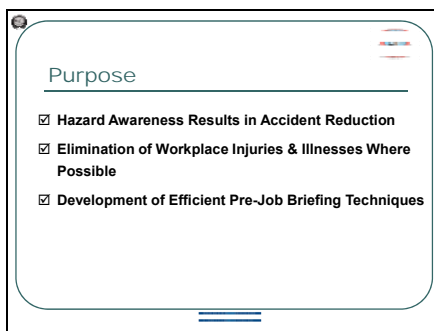
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Slide 3



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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



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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



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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

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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."

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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

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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

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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

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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?

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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?



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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.



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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*

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Slide 15

### Another Name

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



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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



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Slide 17

### Rally Point

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



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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?

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	Electrical Transmission & Distribution Partnership 10-Hour OSHA Training Course	
	<b>Trenching &amp; Excavations</b>	

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



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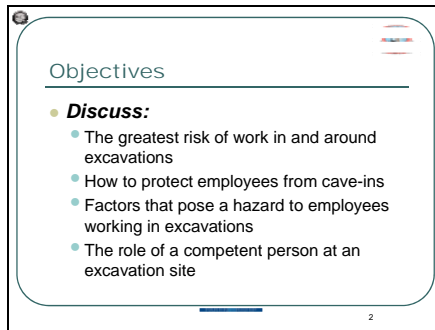
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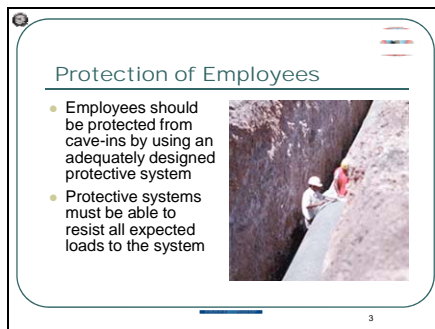
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Slide 3



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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



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Slide 5

### Site Evaluation Planning

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



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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.



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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



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Slide 8

### Excavation Hazards

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



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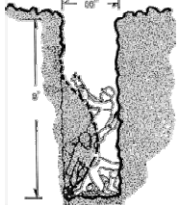
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Slide 9

### 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



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Slide 10

### Soil Weight

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



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Slide 11

### Types of Protection



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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



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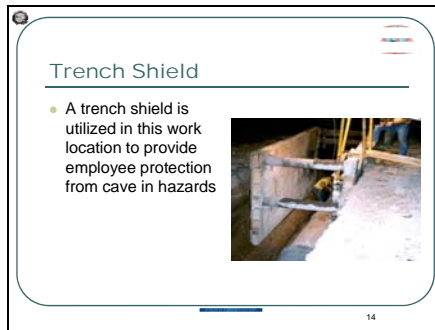
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Slide 14



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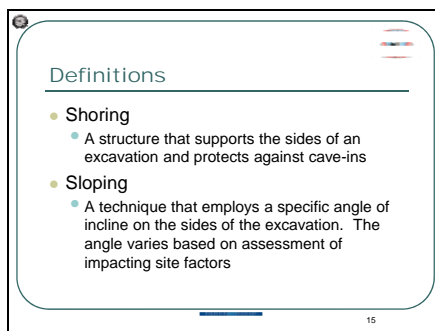
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Slide 15



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Slide 16

### Shoring

- General
  - Provides a framework to work in
  - Uses wales, cross braces and uprights
  - Supports excavation walls
- OSHA tables provide shoring data
  - Must know soil type
  - Must know depth and width of excavation
  - Must be familiar with the OSHA Tables

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Slide 17

### Hydraulic Trench Support



- Ease of use
- Hydraulic pressure keeps forms in place
- Lightweight
- Portable

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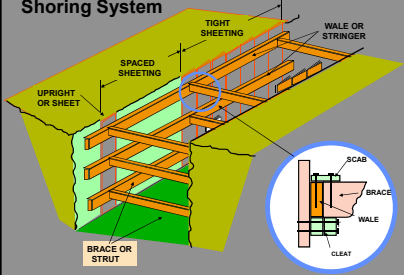
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Slide 18

### Components of a Shoring System



The diagram illustrates the components of a timber shoring system. It shows a cross-section of an excavation with sheeting (green) supported by a framework of timber. Labels include: UPRIGHT OR SHEET, SPACED SHEETING, TIGHT SHEETING, WALE OR STRINGER, BRACE OR STRUT, SCAB, BRACE, WALE, and CLEAT. An inset circle provides a detailed view of the connection between a wale, a brace, and a cleat.

Timber Shoring

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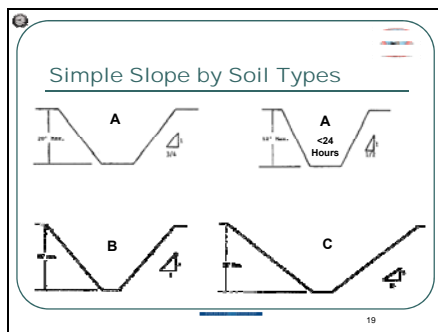
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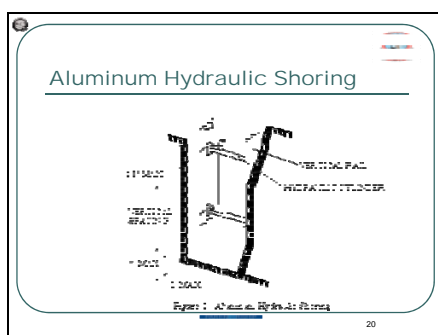
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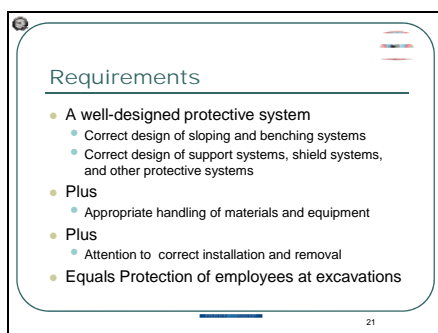
Slide 19



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



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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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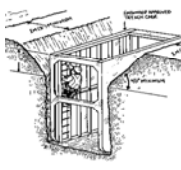
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Slide 25

### Cave-in Protection

- Slope or bench the sides of the excavation,
- Support the sides of the excavation, or
- Place a shield between the side of the excavation and the work area



A cross-sectional diagram of a trench. On the left, a vertical wooden shoring system is shown. In the center, a worker is visible inside the trench. To the right of the worker, a large, rectangular shield is positioned between the trench wall and the work area. Labels include 'SHIELD', 'SHORING', and 'WORK AREA'.

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Slide 26



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Slide 27

### Adequate Protective System

- Must not only protect the sides of the trench but the end of the trench as well



A photograph showing a trench with a red, heavy-duty metal protective system installed along its side. The system appears to be a trench box or shield. The ground is dark and uneven.

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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



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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



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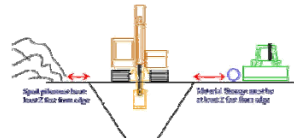
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Slide 33

### 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

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Slide 34



### Other Excavation Hazards

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

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Slide 35



### Water is Hazardous

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

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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



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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?

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	Electrical Transmission & Distribution Partnership 10-Hour OSHA Training Course	
	<b>Confined and Enclosed Spaces</b>	

## 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

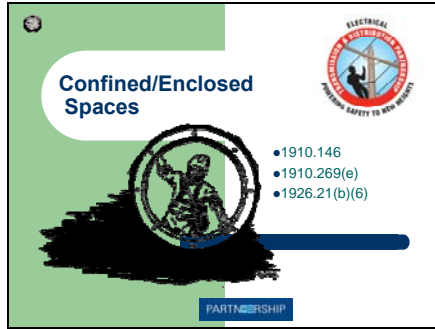
**Explain the roles of the Qualified employee, the Attendant, and the Entry Supervisor**

- 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



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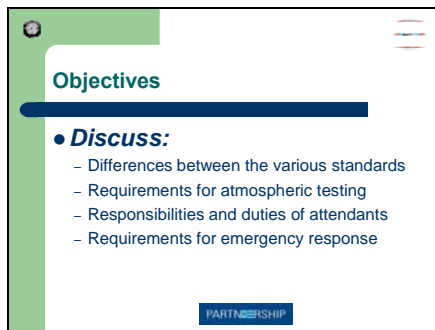
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Slide 2



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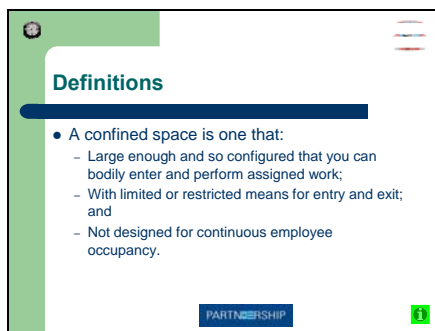
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Slide 3



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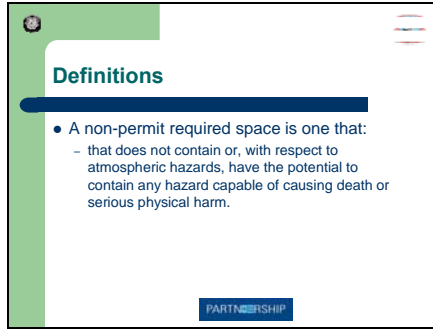
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Slide 4



Slide 4 is a presentation slide titled "Definitions". It features a green header bar with a small circular icon on the left and a red and blue icon on the right. The main content area is white with a blue horizontal bar below the title. A blue bullet point defines a non-permit required space. At the bottom, there is a blue "PARTNERSHIP" logo and a small red and blue icon.

**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.

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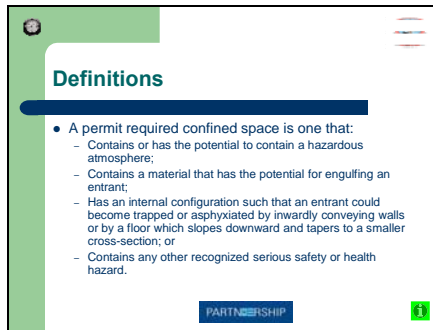
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Slide 5



Slide 5 is a presentation slide titled "Definitions". It features a green header bar with a small circular icon on the left and a red and blue icon on the right. The main content area is white with a blue horizontal bar below the title. A blue bullet point defines a permit required confined space. At the bottom, there is a blue "PARTNERSHIP" logo, a small red and blue icon, and a green square icon with the number 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 conveying 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.

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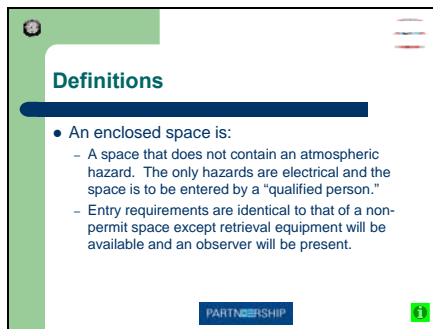
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Slide 6



Slide 6 is a presentation slide titled "Definitions". It features a green header bar with a small circular icon on the left and a red and blue icon on the right. The main content area is white with a blue horizontal bar below the title. A blue bullet point defines an enclosed space. At the bottom, there is a blue "PARTNERSHIP" logo, a small red and blue icon, and a green square icon with the number 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.

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Slide 7

**Confined space**

- Examples include, but are not limited to:
  - Storage tanks
  - Process vessels
  - Bins
  - Boilers
  - Ventilation or exhaust ducts
  - Sewers
  - Underground utility vaults
  - Tunnels
  - Pipelines
  - Open top spaces > 4 ft.
    - Pits
    - Tubs
    - Vaults
    - Vessels

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Slide 8

**Confined or Enclosed Spaces**

- All employees required to enter into confined or enclosed spaces shall be instructed
  - as to the nature of the hazards involved (general & specific)
  - the necessary precautions to be taken
  - in the use of protective and emergency equipment required

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Slide 9

**Confined Space**

So what's the big deal?

- 238,000 establishments contained PRCS
- 1.6 million workers
- 4.8 million PRCS
- 63 fatalities annually
- 13,000 injuries annually

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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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Slide 11

**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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Slide 13

**Hazards**

- Flammability
  - UEL/UFL
  - LEL/LFL



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Slide 14

**Hazards**

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



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Slide 15

**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



**Partnership**

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Slide 17

**Enclosed Space Decision Flow Chart**

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



**Partnership**

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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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Slide 19



### Procedures

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



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Slide 20



### 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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Slide 21



### 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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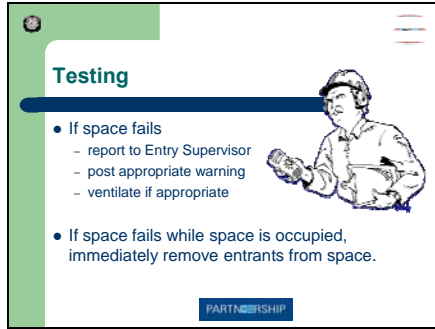
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Slide 22



**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.

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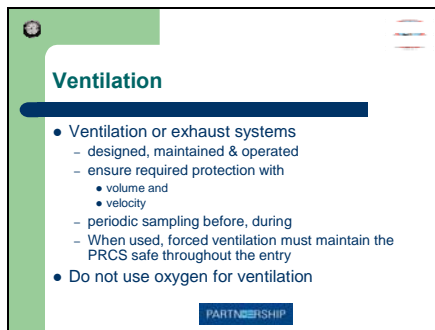
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Slide 23



**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

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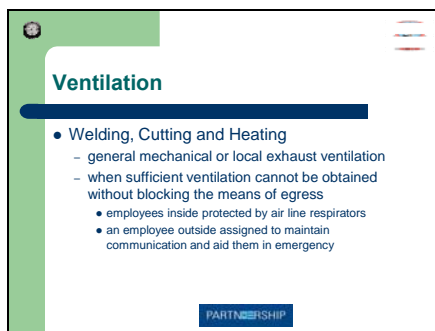
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Slide 24



**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

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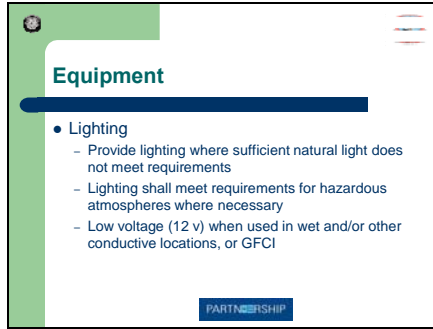
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Slide 25



**Equipment**

- Lighting
  - Provide lighting where sufficient natural light does not meet requirements
  - Lighting shall meet requirements for hazardous atmospheres where necessary
  - Low voltage (12 v) when used in wet and/or other conductive locations, or GFCI

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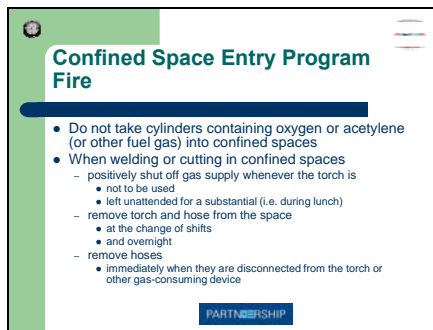
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Slide 26



**Confined Space Entry Program Fire**

- Do not take cylinders containing oxygen or acetylene (or other fuel gas) into confined spaces
- When welding or cutting in confined spaces
  - positively shut off gas supply whenever the torch is
    - not to be used
    - left unattended for a substantial (i.e. during lunch)
  - remove torch and hose from the space
    - at the change of shifts
    - and overnight
  - remove hoses
    - immediately when they are disconnected from the torch or other gas-consuming device

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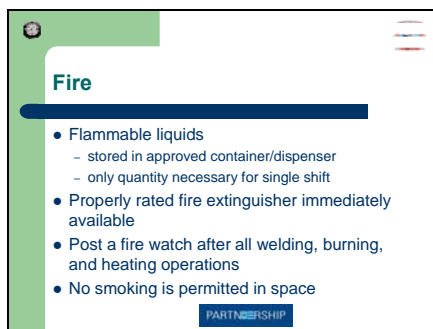
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Slide 27



**Fire**

- Flammable liquids
  - stored in approved container/dispenser
  - only quantity necessary for single shift
- Properly rated fire extinguisher immediately available
- Post a fire watch after all welding, burning, and heating operations
- No smoking is permitted in space

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Slide 28



Slide 28 features a green header bar with a small circular icon on the left and a small flag icon on the right. The title "Attendant" is in bold blue text, underlined by a thick blue horizontal bar. Below the title is a bulleted list of five items. At the bottom center is a blue rectangular button with the word "PARTNERSHIP" in white capital letters.

**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

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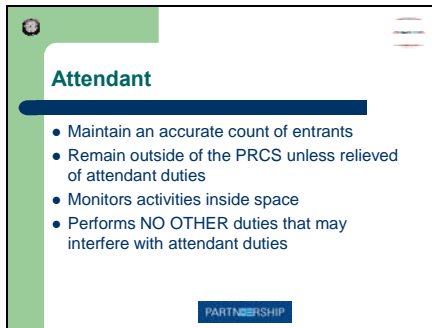
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Slide 29



Slide 29 features a green header bar with a small circular icon on the left and a small flag icon on the right. The title "Attendant" is in bold blue text, underlined by a thick blue horizontal bar. Below the title is a bulleted list of four items. At the bottom center is a blue rectangular button with the word "PARTNERSHIP" in white capital letters.

**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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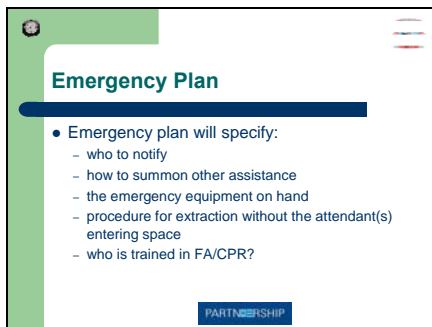
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Slide 30



Slide 30 features a green header bar with a small circular icon on the left and a small flag icon on the right. The title "Emergency Plan" is in bold blue text, underlined by a thick blue horizontal bar. Below the title is a bulleted list with one main item and four sub-items. At the bottom center is a blue rectangular button with the word "PARTNERSHIP" in white capital letters.

**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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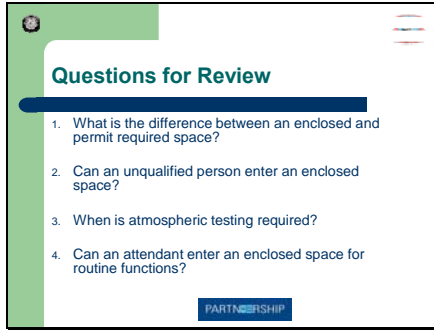
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Slide 31



Slide 31 features a green header bar with a small circular logo on the left and a small graphic on the right. The main content area is white with a blue horizontal bar. Below this bar, the text "Questions for Review" is displayed in a bold, dark green font. A list of four questions follows, each preceded by a number. At the bottom of the slide, there is a blue rectangular button with the word "PARTNERSHIP" in white capital letters.

**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	
	<b>Fall Protection</b>	

## 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



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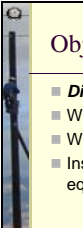
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Slide 2



## Objectives

■ **Discuss:**

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



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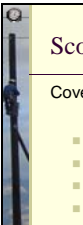
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Slide 3



## 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

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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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Slide 8



### 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 10

### Fall protection - Inspection

- Inspection prior to use
- Defective or damaged equipment removed from service
- This includes equipment subjected to fall event
  - Some manufacturers require that equipment subjected to a fall event be removed from service and destroyed



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Slide 11

### Body Belt Inspection

- Hardware
- Waist strap
- D-rings



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Slide 12

### Roll-out



**Caused by non-compatible connections**  
**Eliminated by using locking snap hooks**

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6

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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Slide 15



### 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

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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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Slide 17

### 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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Slide 20



### 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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Slide 22



### 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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Slide 25



### 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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Slide 26



### 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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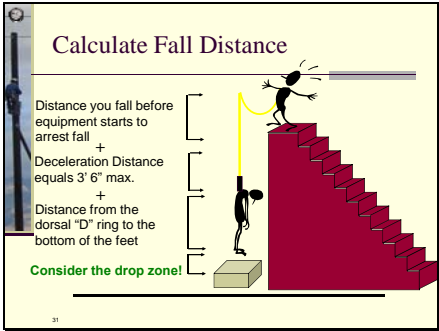
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Slide 31



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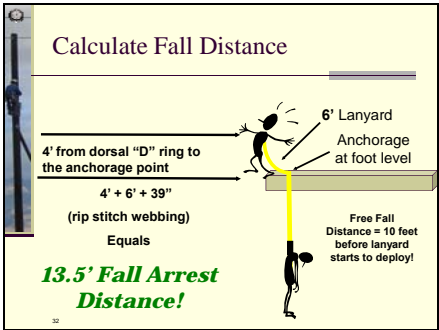
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Slide 32



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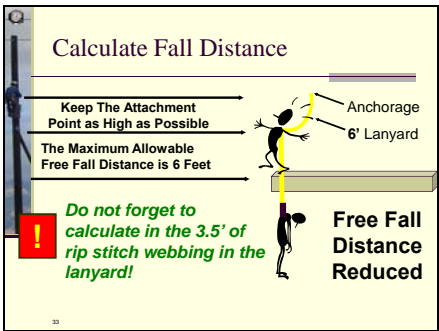
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Slide 33



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Slide 34



### Use of Body Belts

- Effective January 1, 1998, body belts were prohibited as a fall arrest device.
- Body belts can still be used as a positioning device.



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Slide 35



### Excavations

When excavation 6" or more in depth is not *readily seen* due to plant growth or other visual barrier

- Guardrail System
- Fence
- Barricade



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Slide 36



### Training

1926.503

- Each employee who might be exposed to fall hazards
- Procedures to be followed to minimize hazards
- The nature of fall hazards in work area
- Correct procedure for fall protection system used

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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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Slide 38



### 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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Slide 39



### 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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