ELECTRICAL TRANSMISSION & DISTRIBUTION PARTNERSHIP

10-HOUR OSHA TRAINING COURSE

Student Handout

Version 05.07.12

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	Introduction to OSHA	

Objectives

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

Define the acronym "OSHA"

i) Occupational Safety and Health Administration

Explain the role of OSHA

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

Define "Occupational Safety and Health Standard"

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

Explain where to locate OSHA standards

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

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

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

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

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

Explain where to find additional information about OSHA

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

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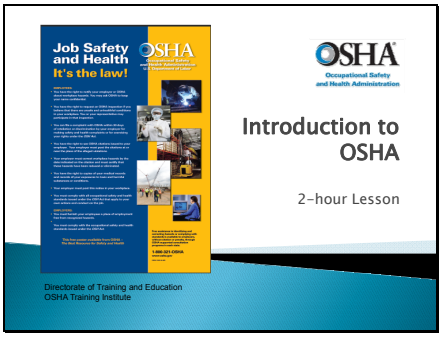

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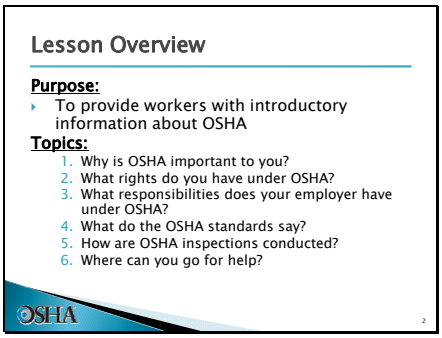

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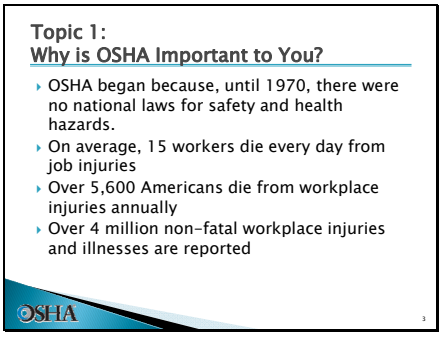

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Discussion Questions

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

OSHA

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Group Activity: FAT/CAT Report

Handout #1: Weekly Fatality/Catastrophe Report

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

OSHA

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History of OSHA

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

OSHA

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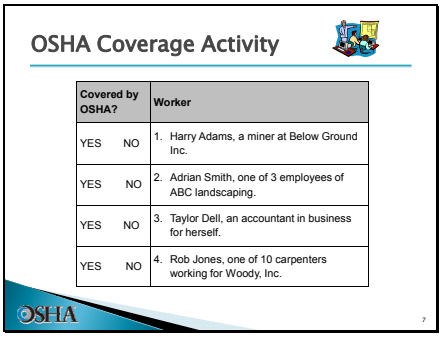

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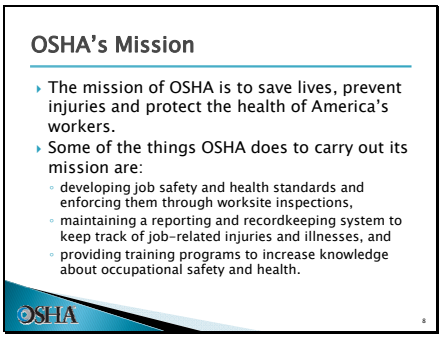

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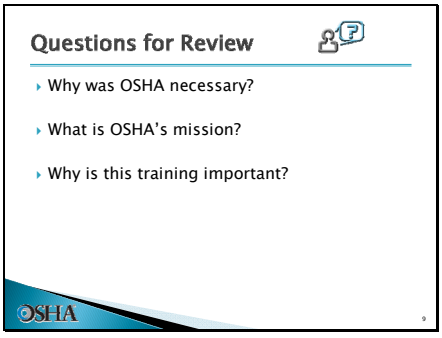

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Topic 2:
What Rights Do You Have Under OSHA?

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

OSHA

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Worker Rights

Handout #2:
OSHA Poster

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

OSHA

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Your Right to…

Safe & Healthful Workplace

- The creation of OSHA provided workers the right to a safe and healthful workplace.

- Section 5(a)(1) of the OSH Act states: "Each employer shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees."

OSHA

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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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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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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).

OSHA

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Your Right to…

Complain or Request Corrections

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

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Your Right to…

Training

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

OSHA

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Your Right to…

Examine Exposure & Medical Records

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

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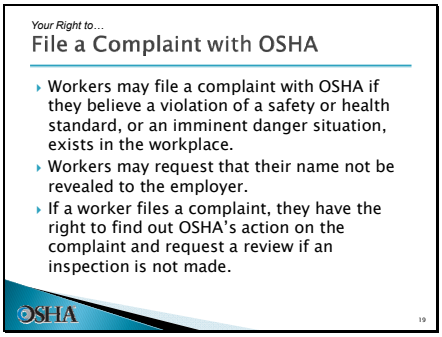

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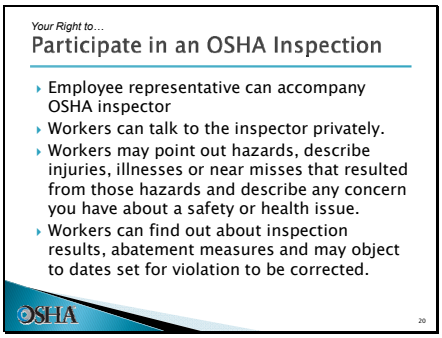

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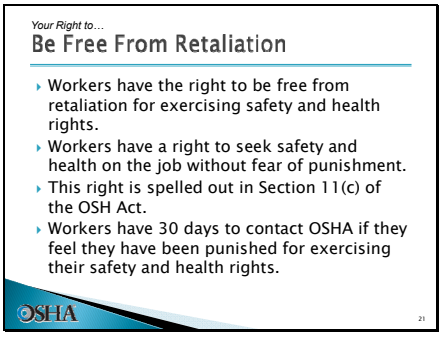

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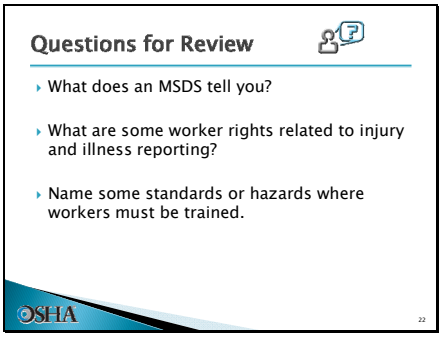

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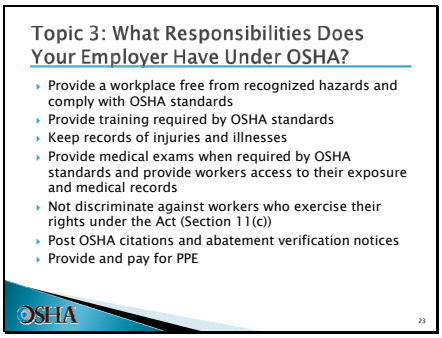

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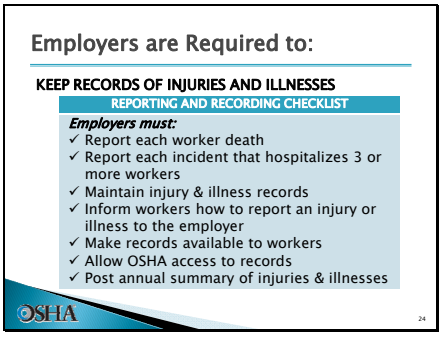

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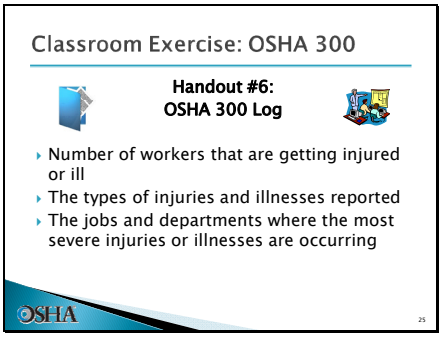

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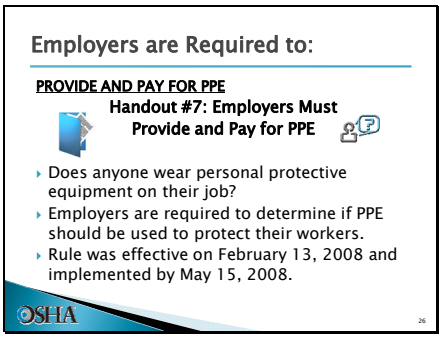

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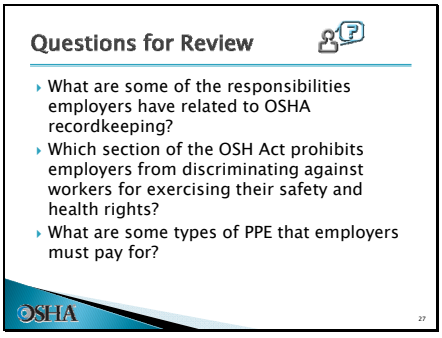

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Topic 4:
What do the OSHA Standards Say?

- 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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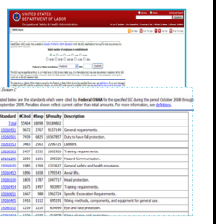
Most Frequently Cited Standards

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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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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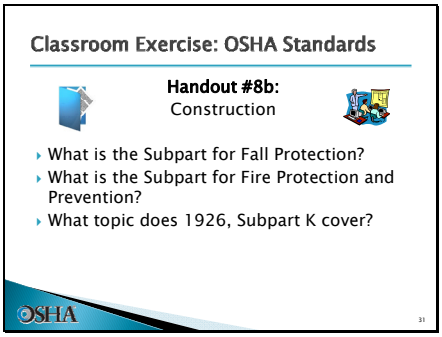

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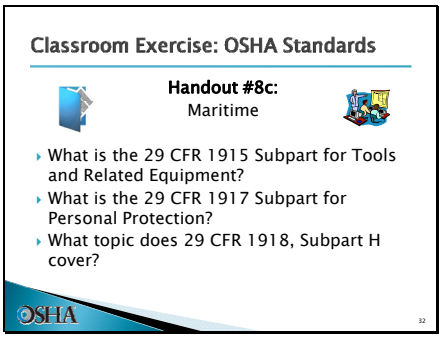

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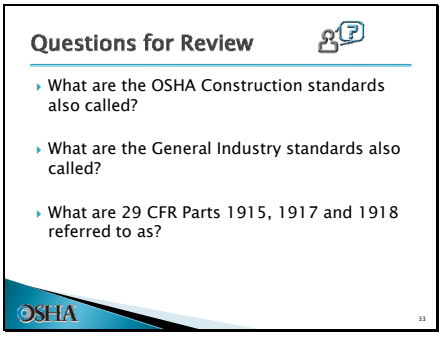

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Topic 5:
How Are OSHA Inspections Conducted?

- 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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OSHA Inspection Priority

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

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Citations and Penalties

VIOLATION TYPE	PENALTY
WILLFUL 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.
SERIOUS 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.
OTHER-THAN-SERIOUS 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.
REPEATED 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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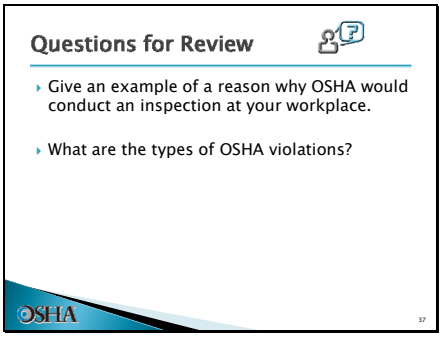

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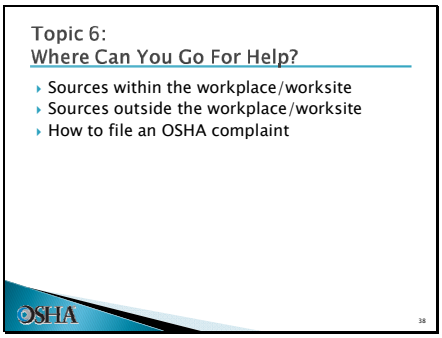

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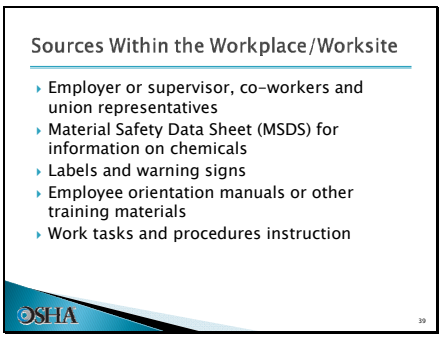

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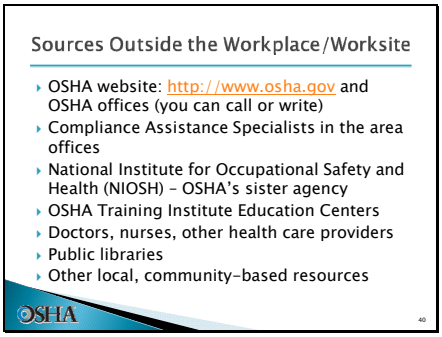

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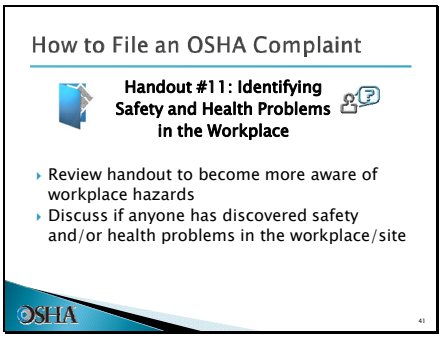

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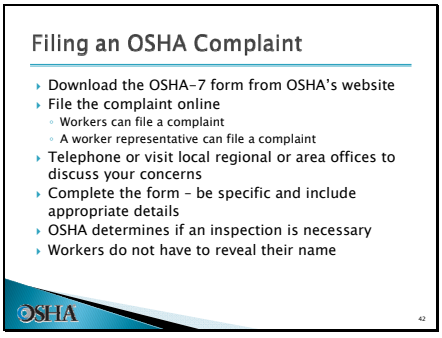

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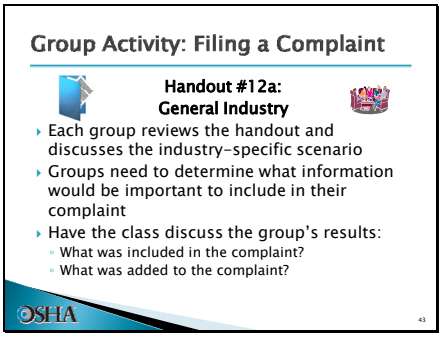

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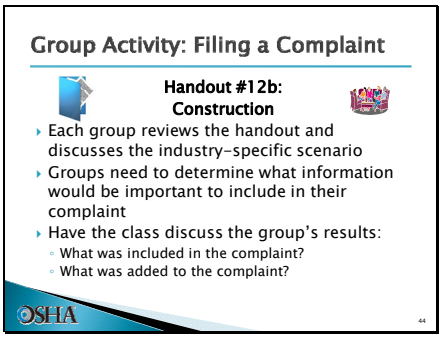

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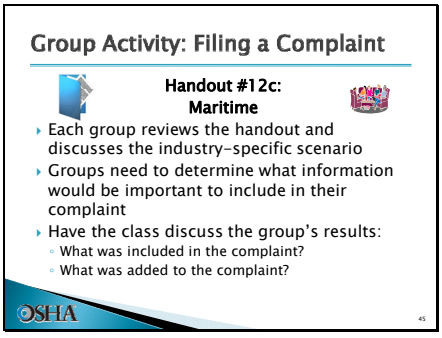

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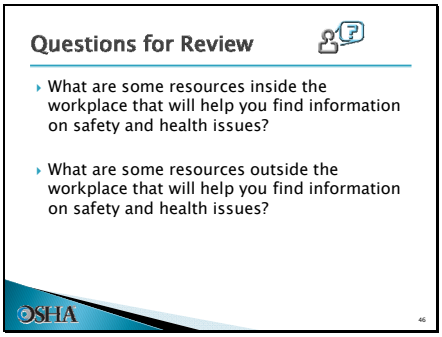

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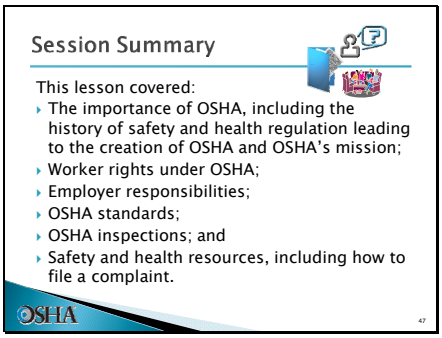

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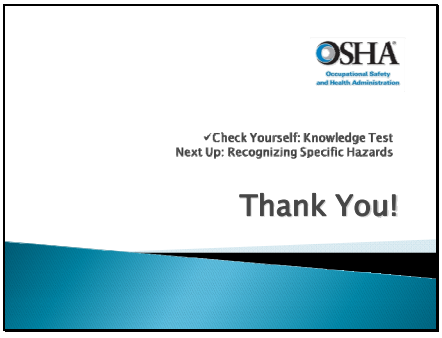

	Electrical Transmission & Distribution Partnership 10-Hour OSHA Training Course	PARTNERSHIP An OSHA Cooperative Program
	Electrical Safety	

Objectives

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

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

i) Industry statistics
ii) Second points of contact
iii) 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
iii) The Code of Federal Regulations (CFR's)

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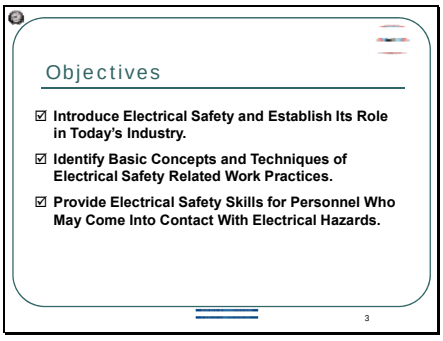

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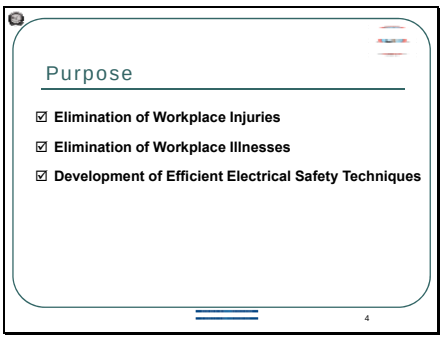

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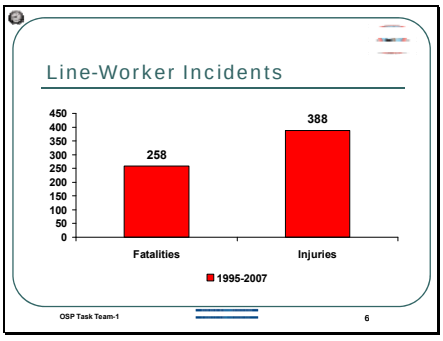

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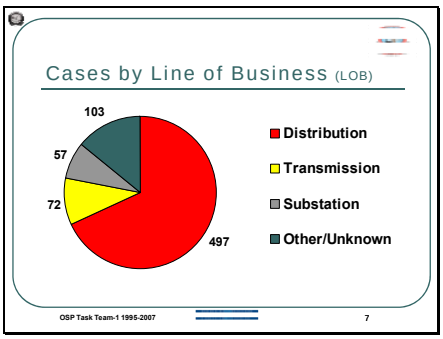

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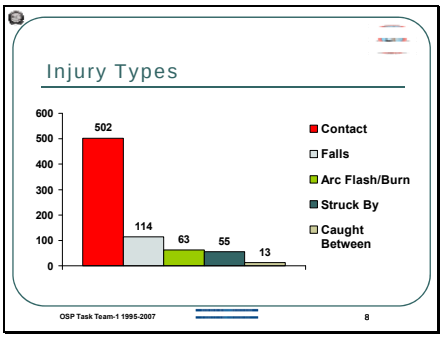

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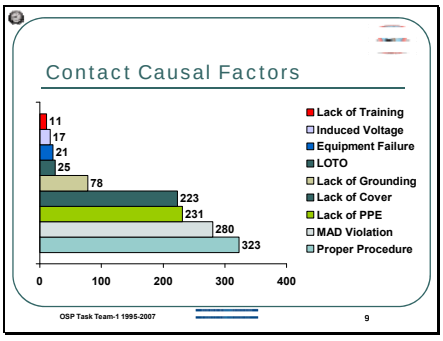

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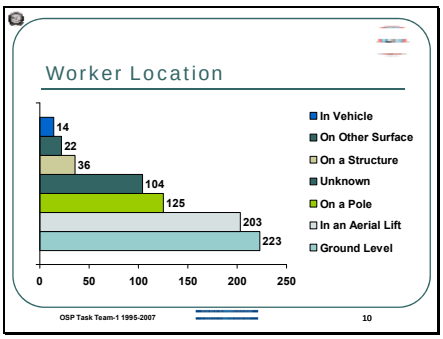
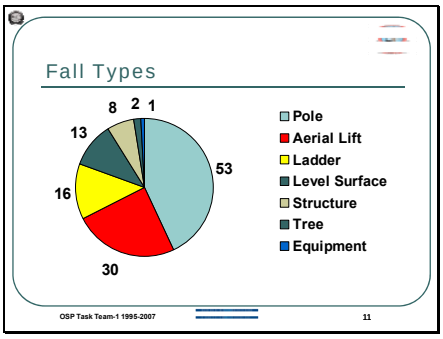


Slide 11



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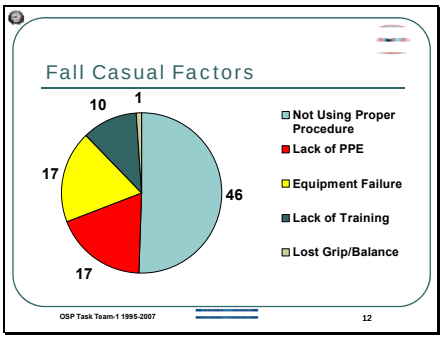

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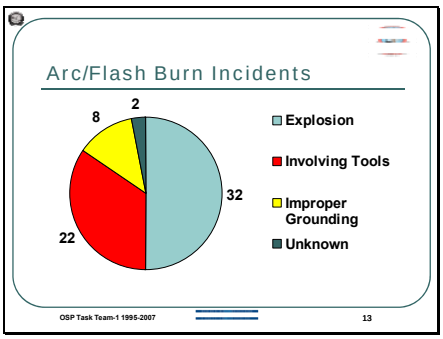
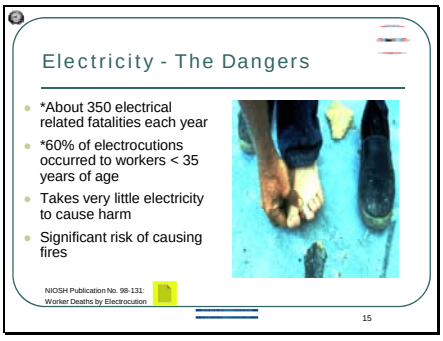


Slide 14

Slide 15



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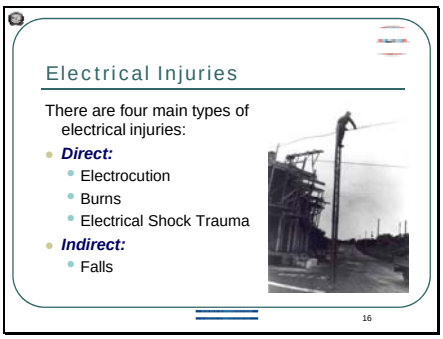

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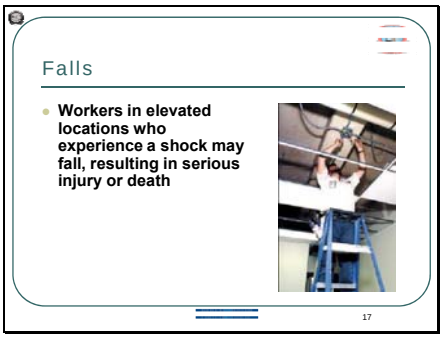

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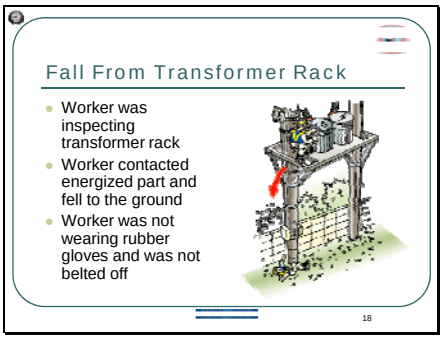

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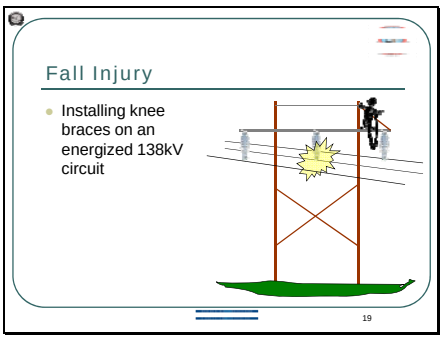

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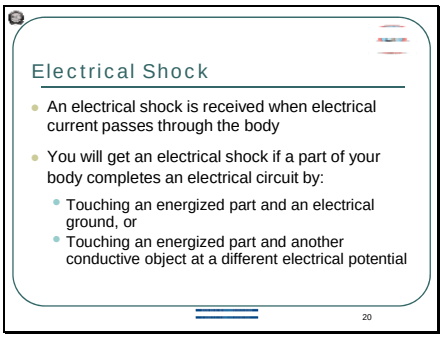

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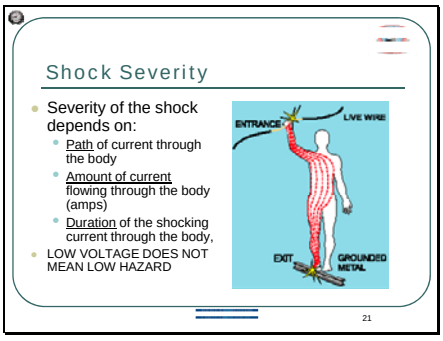

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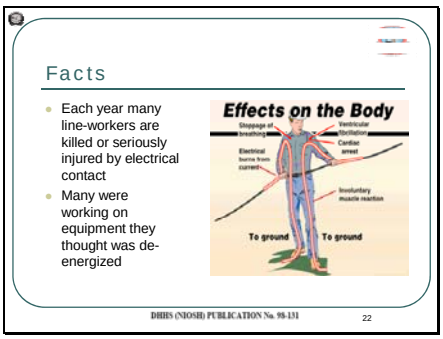
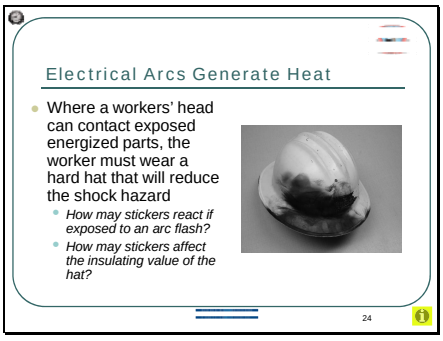


Slide 23

Slide 24



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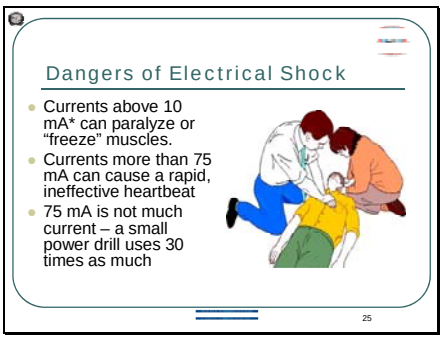

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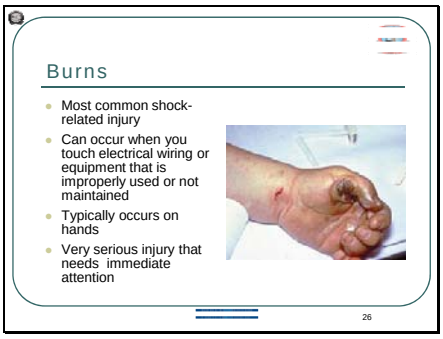

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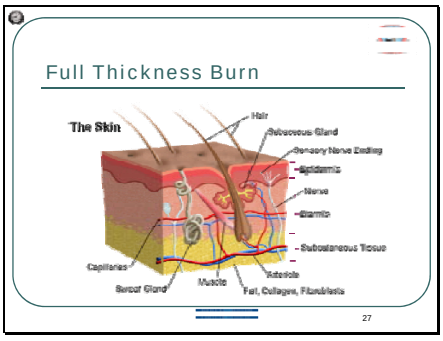

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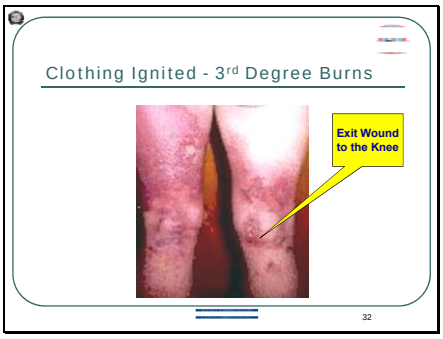

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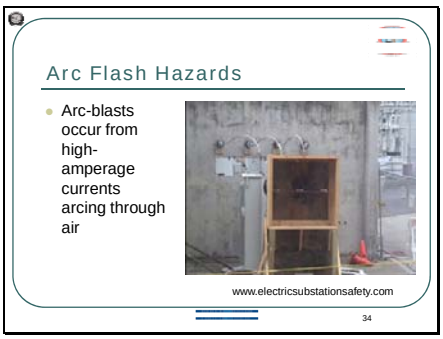

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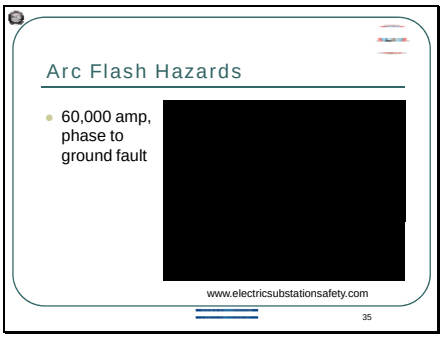

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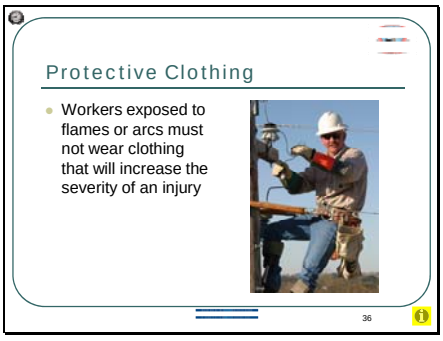
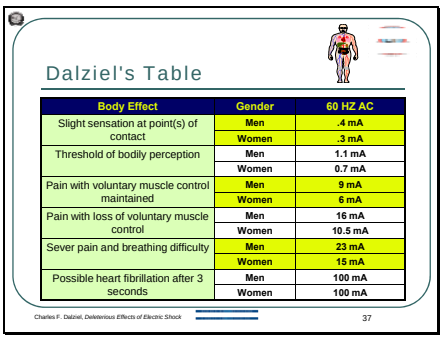


Slide 37



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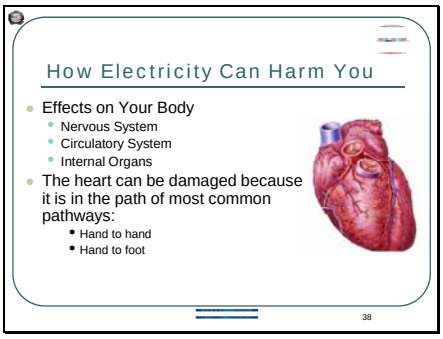

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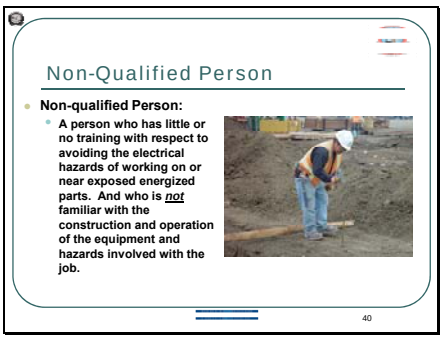
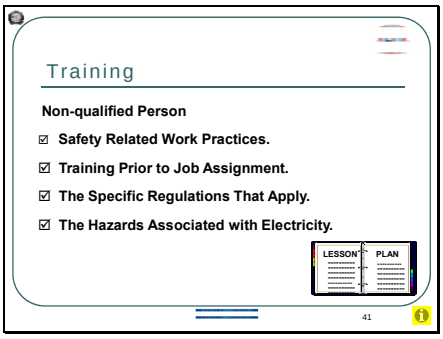
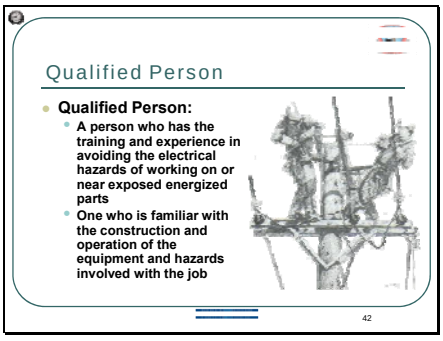


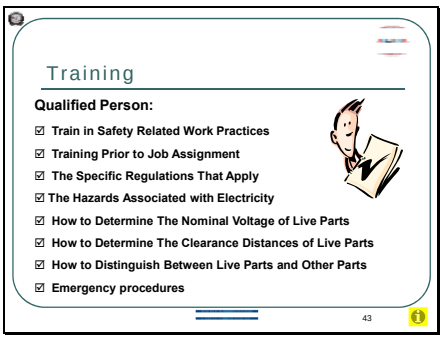
Slide 41



Slide 42



Slide 43



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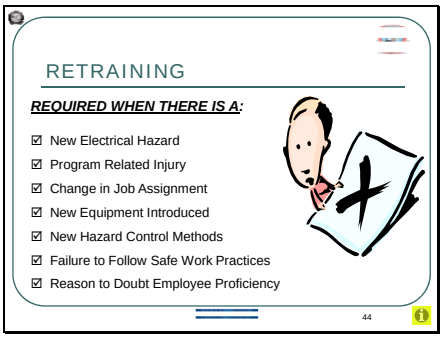

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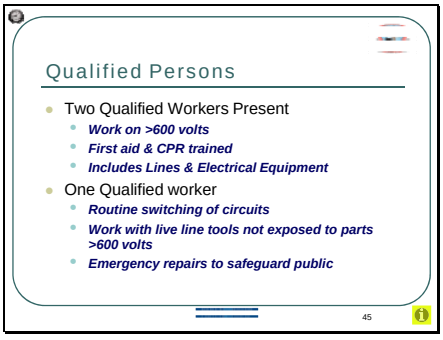

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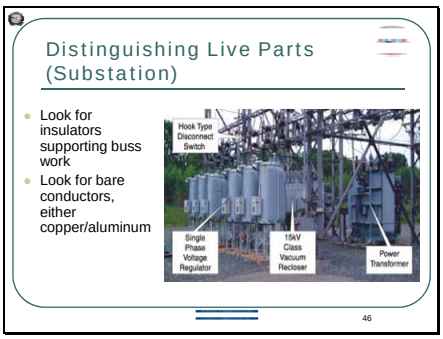

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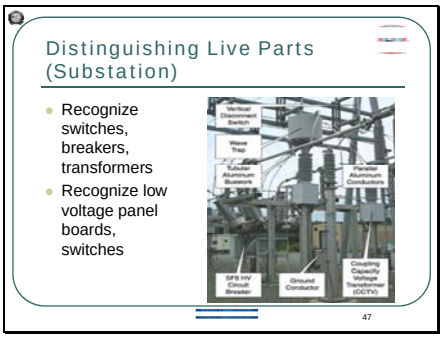

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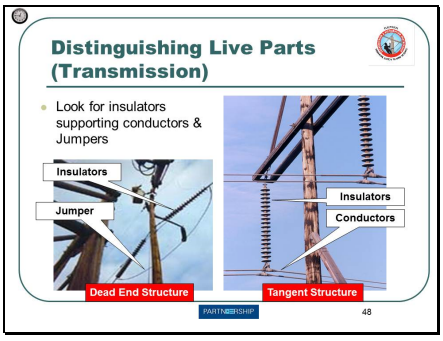

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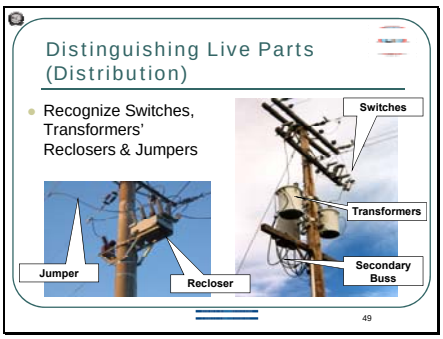
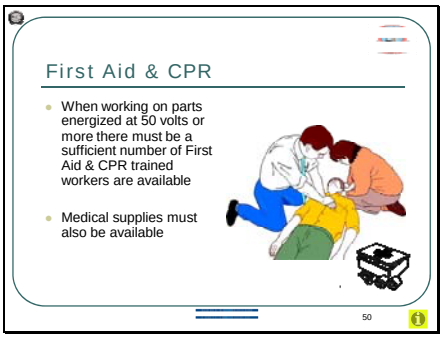


Slide 50



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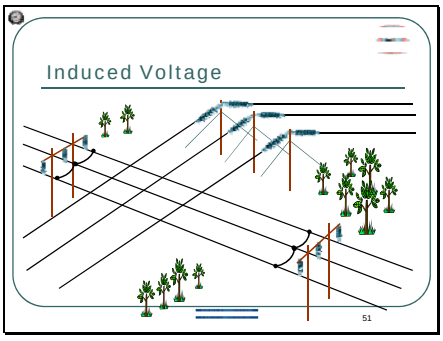
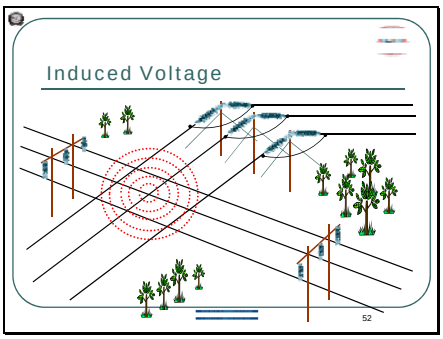


Slide 52



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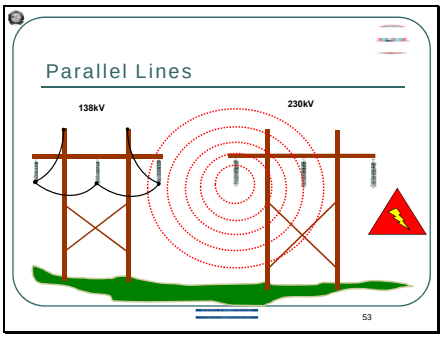

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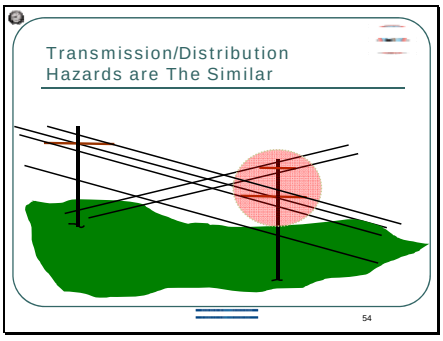

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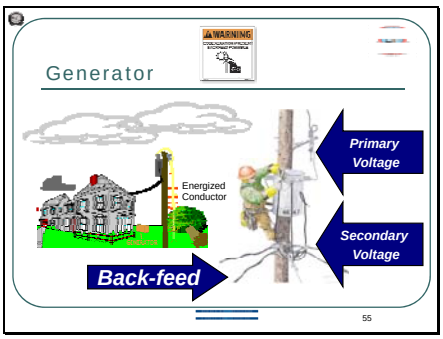

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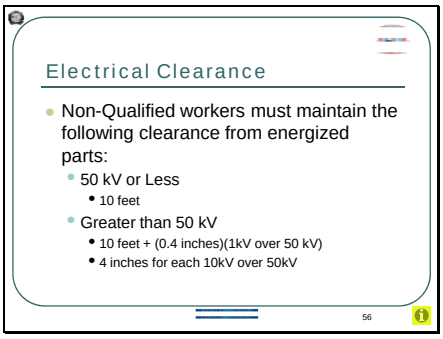

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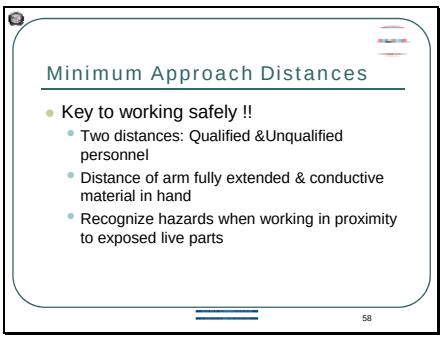

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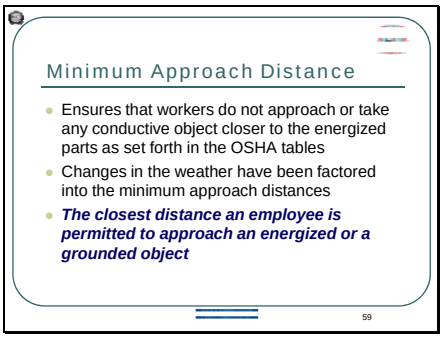

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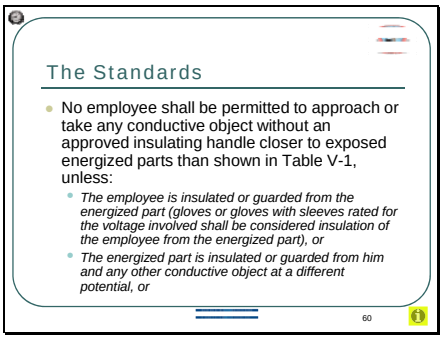

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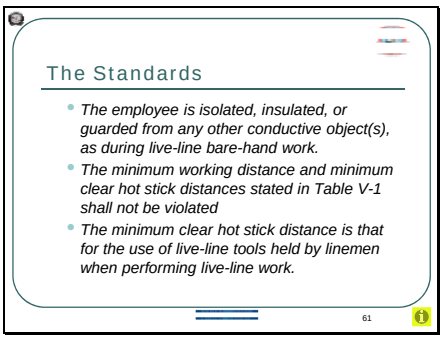

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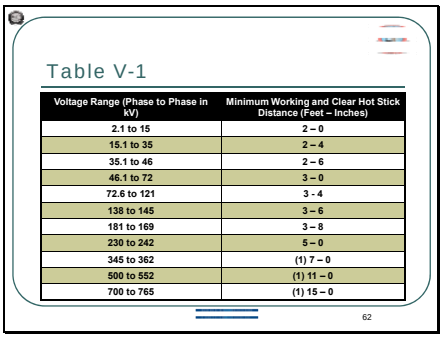

Voltage Range (Phase to Phase in kV)	Minimum Working and Clear Hot Stick Distance (Feet – Inches)
2.1 to 15	2 – 0
15.1 to 35	2 – 4
35.1 to 46	2 – 6
46.1 to 72	3 – 0
72.6 to 121	3 - 4
138 to 145	3 – 6
181 to 169	3 – 8
230 to 242	5 – 0
345 to 362	(1) 7 – 0
500 to 552	(1) 11 – 0
700 to 765	(1) 15 – 0

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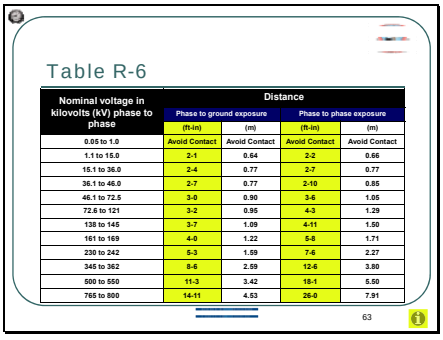

Nominal voltage in kilovolts (kV) phase to phase	Distance			
	Phase to ground exposure		Phase to phase exposure	
	(ft-in)	(m)	(ft-in)	(m)
0.05 to 1.0	Avoid Contact	Avoid Contact	Avoid Contact	Avoid Contact
1.1 to 15.0	2-1	0.64	2-2	0.66
15.1 to 36.0	2-4	0.77	2-7	0.77
36.1 to 46.0	2-7	0.77	2-10	0.85
46.1 to 72.5	3-0	0.90	3-6	1.05
72.6 to 121	3-2	0.95	4-3	1.29
138 to 145	3-7	1.09	4-11	1.50
161 to 169	4-0	1.22	5-8	1.71
230 to 242	5-3	1.59	7-6	2.27
345 to 362	8-6	2.59	12-6	3.80
500 to 550	11-3	3.42	18-1	5.50
765 to 800	14-11	4.53	26-0	7.91

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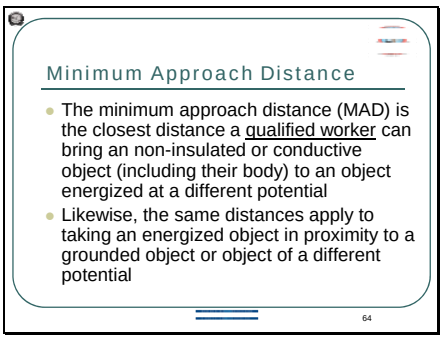

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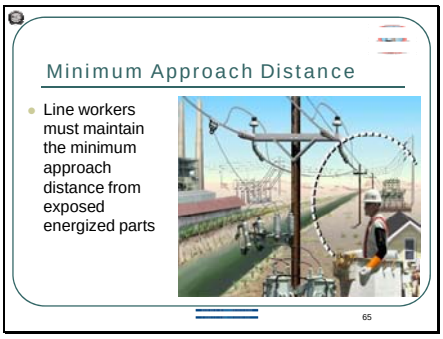
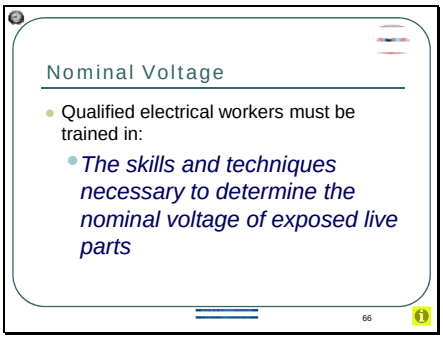


Slide 66



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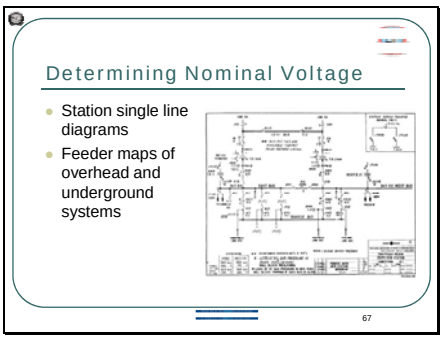

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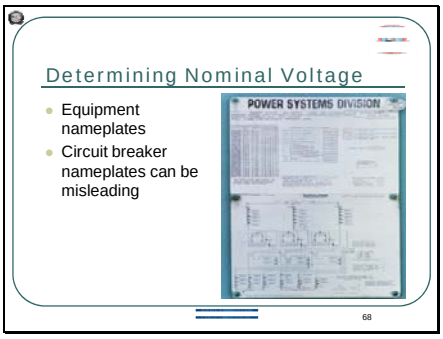

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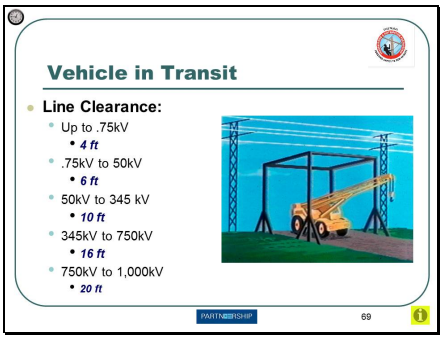

Up to .75kV	4 feet
.75 to 50kV	6 feet
50 to 345kV	10 feet
345 to 750kV	16 feet
750 to 1,000kV	20 feet

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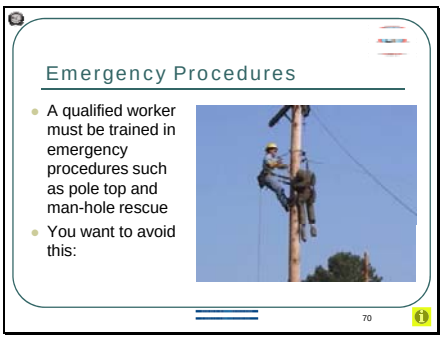

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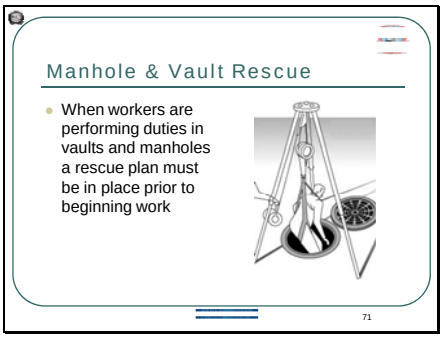

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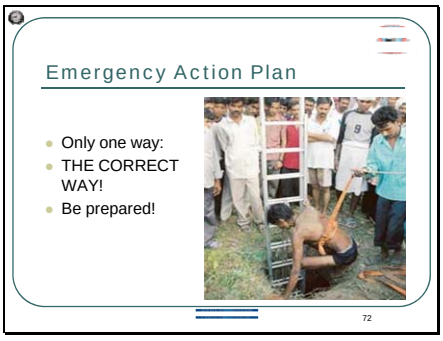

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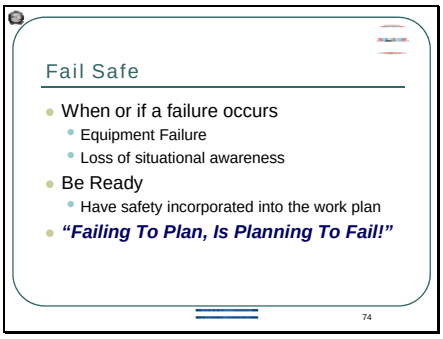

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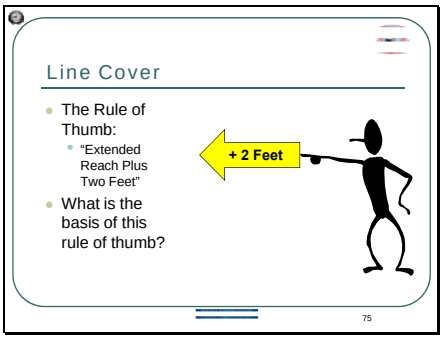

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Table R-6

Nominal voltage in kilovolts (kV) phase to phase	Distance			
	Phase to ground exposure		Phase to phase exposure	
	(ft-in)	(m)	(ft-in)	(m)
0.05 to 1.0	Avoid Contact	Avoid Contact	Avoid Contact	Avoid Contact
1.1 to 15.0	2-1	0.64	2-2	0.66
15.1 to 36.0	2-4	0.77	2-7	0.77
36.1 to 46.0	2-7	0.77	2-10	0.85
46.1 to 72.5	3-0	0.90	3-6	1.05
72.6 to 121	3-2	0.95	4-3	1.29
138 to 145	3-7	1.09	4-11	1.50
161 to 169	4-0	1.22	5-8	1.71
230 to 242	5-3	1.59	7-6	2.27
345 to 362	8-6	2.59	12-6	3.80
500 to 550	11-3	3.42	18-1	5.50
765 to 800	14-11	4.53	26-0	7.91

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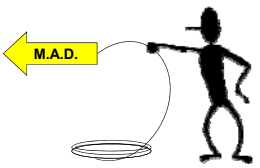
Conductive Objects

- Minimum Approach Distance starts at the end of a conductive object held in the hand



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Insulating Equipment

- Secure the work area
- Remove all hazards
- Protect yourself from those that cannot be removed

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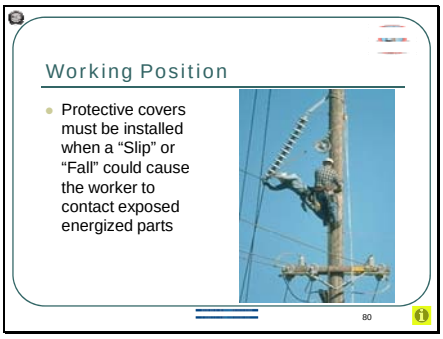

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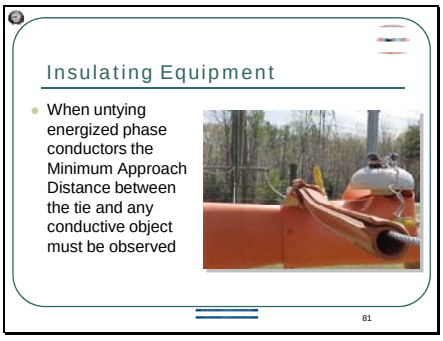

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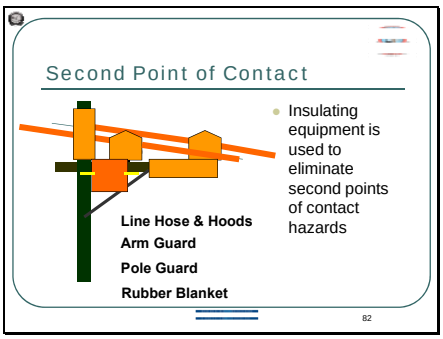

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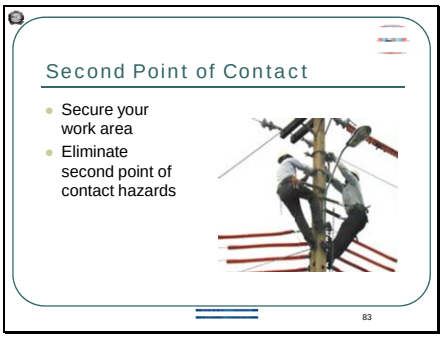

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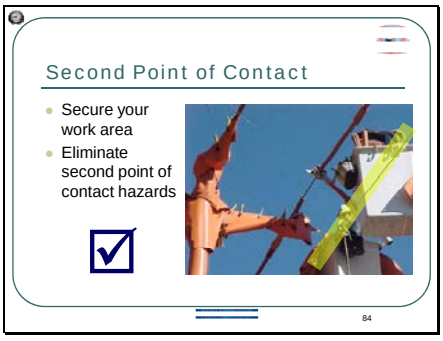

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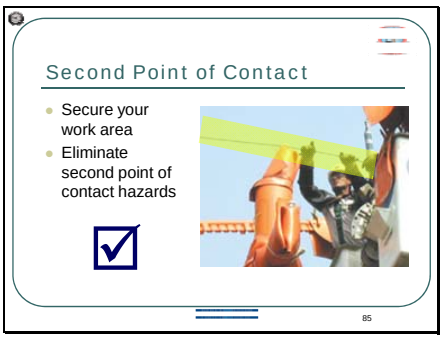

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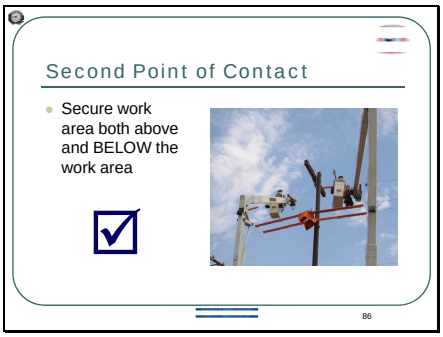

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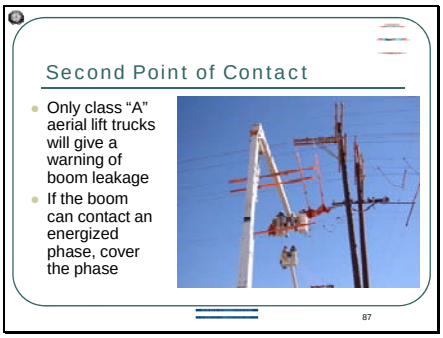

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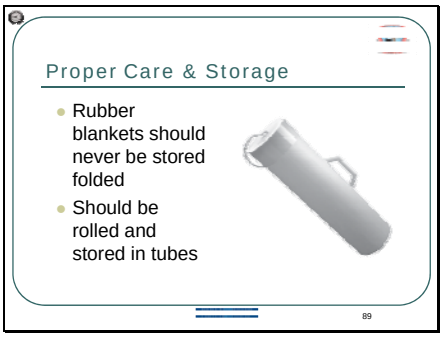

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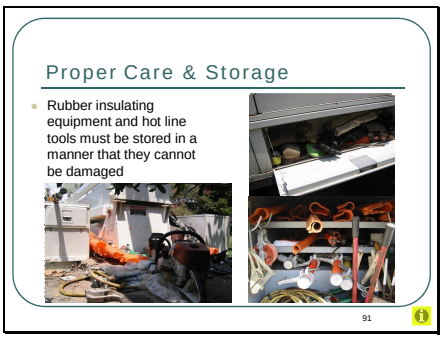

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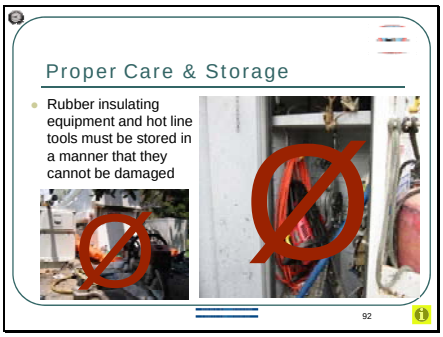

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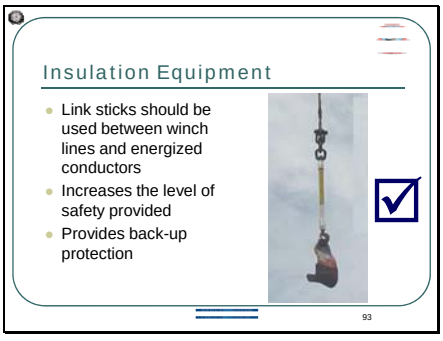

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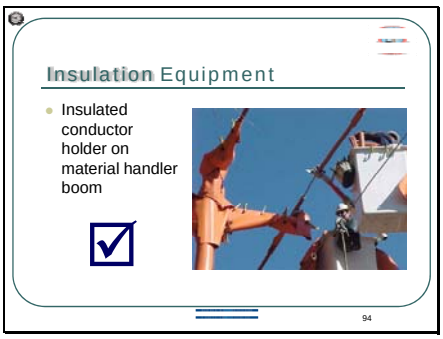

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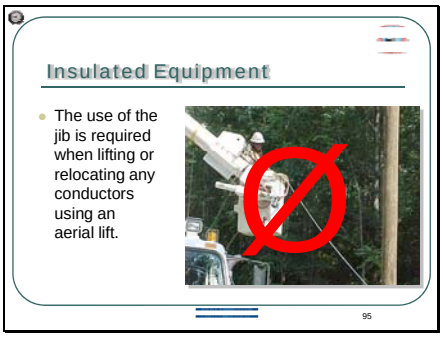

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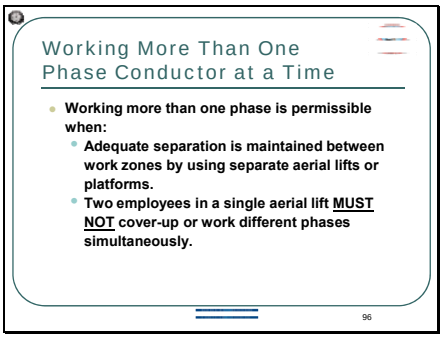

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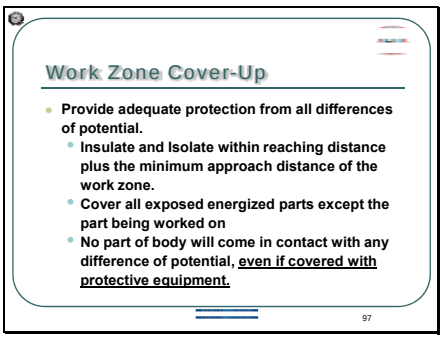

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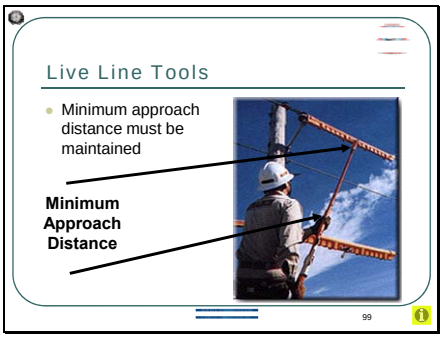

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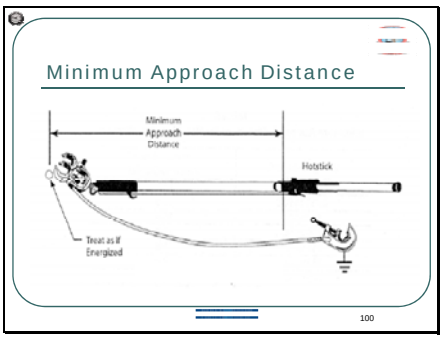

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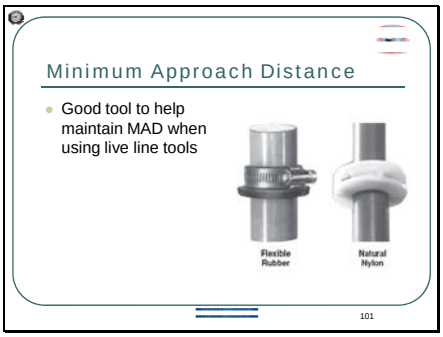

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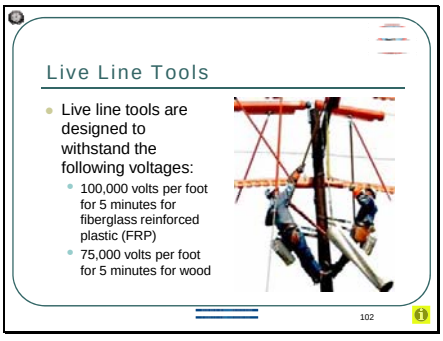

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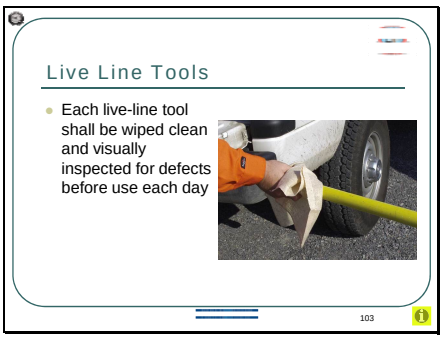

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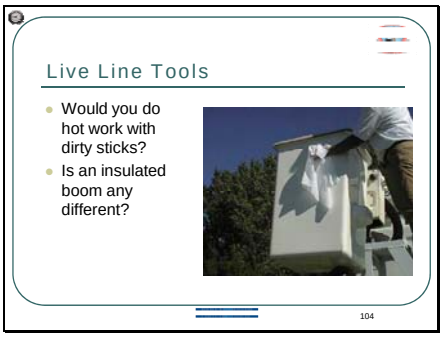

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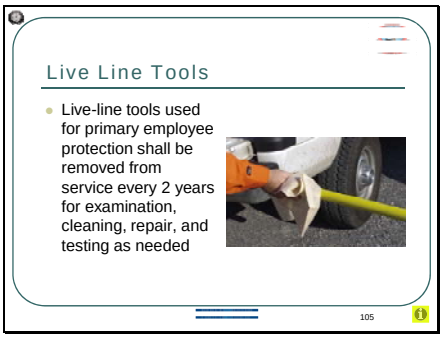

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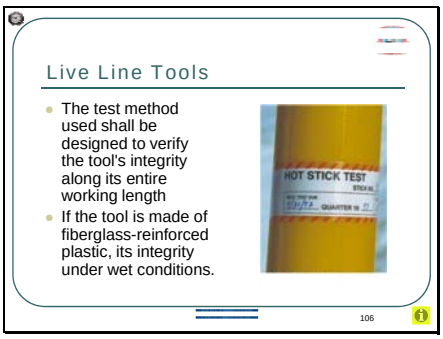

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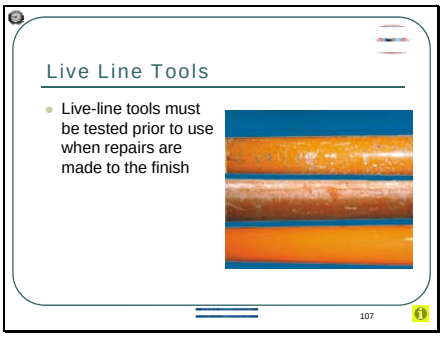

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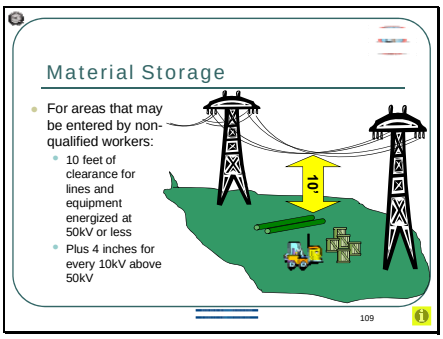

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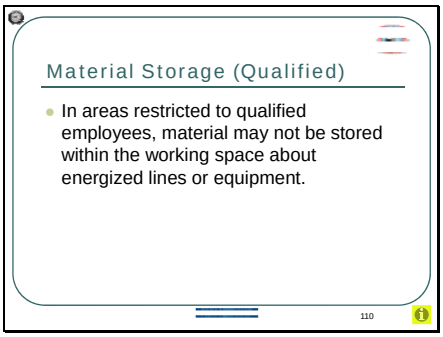

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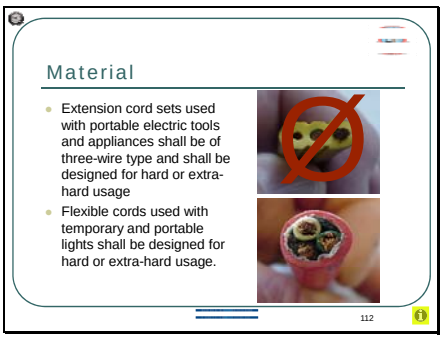

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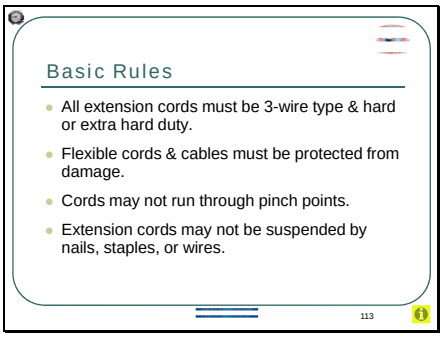

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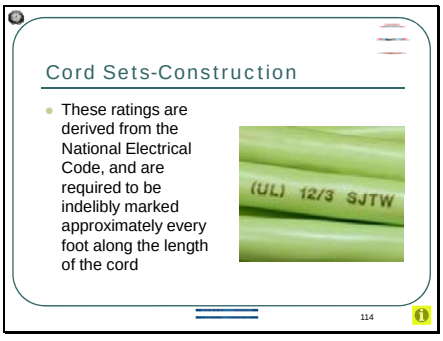

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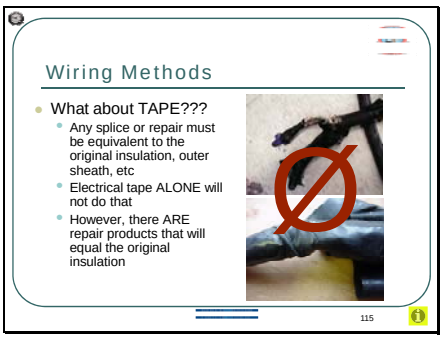

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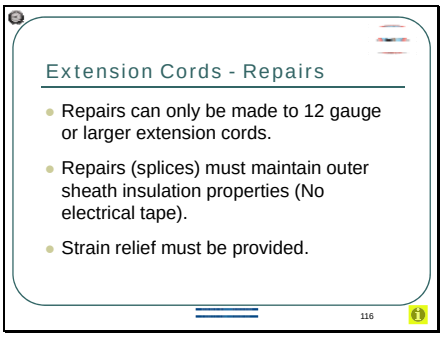

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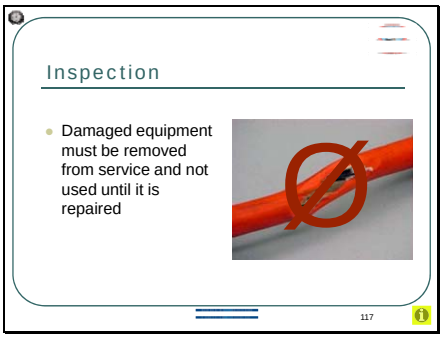

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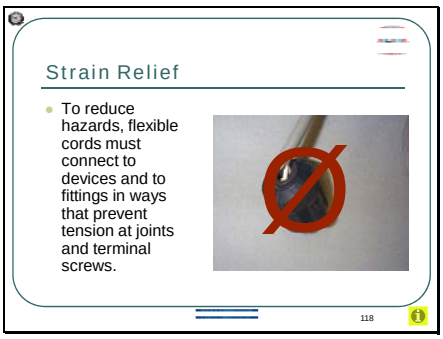

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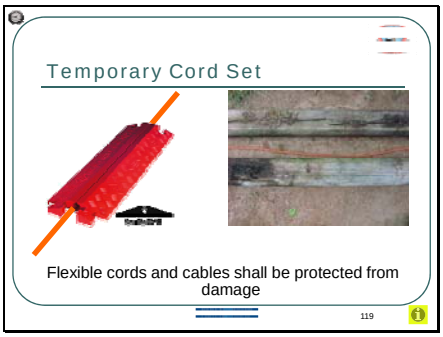

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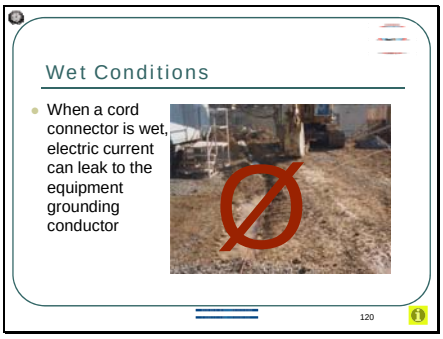

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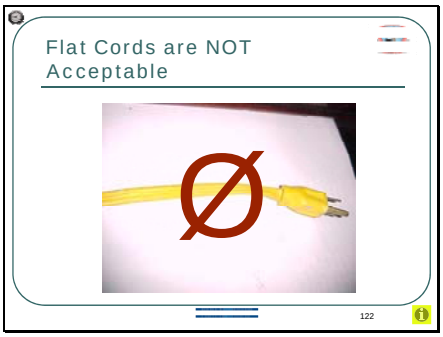

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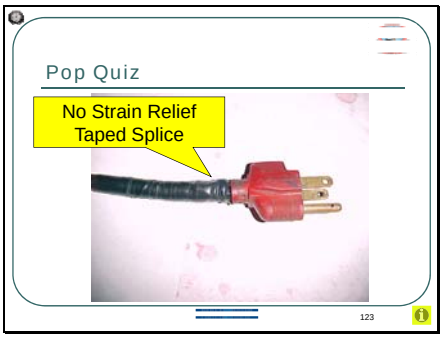

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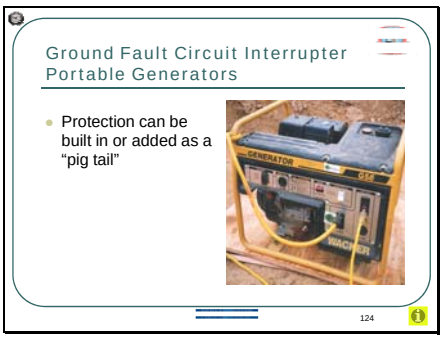

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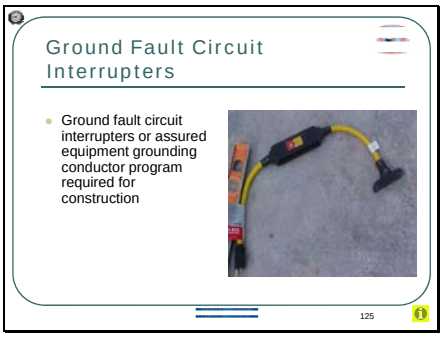

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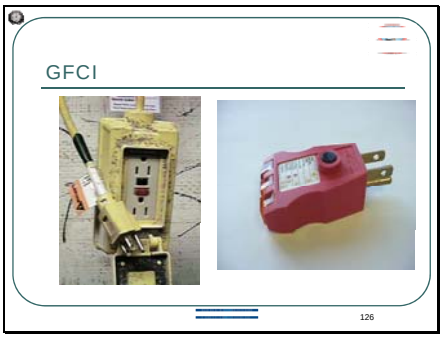

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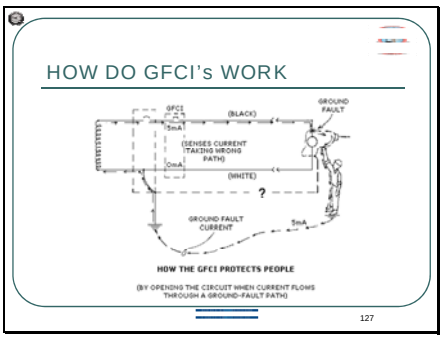

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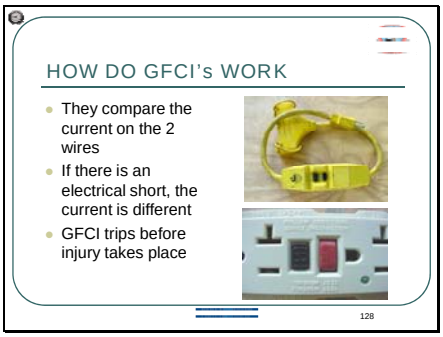

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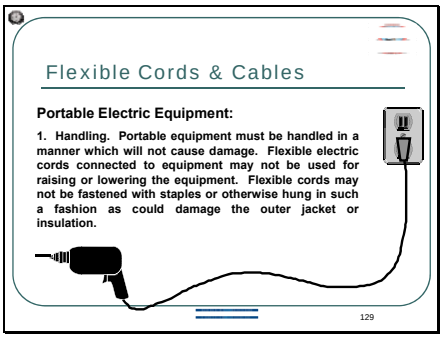

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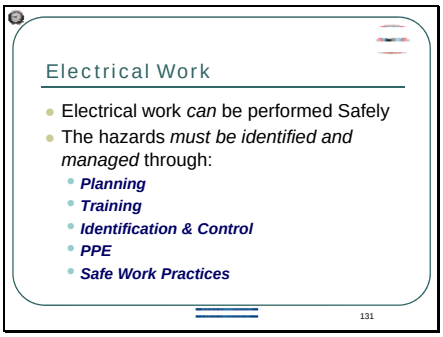
Slide 131



	Electrical Transmission & Distribution Partnership 10-Hour OSHA Training Course	PARTNERSHIP An OSHA Cooperative Program
	Personal Protective Grounding	

Objectives

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

Define the three basic properties of electrical theory

i) Voltage, current, and resistance

Discuss the reasons for installing temporary protective grounds

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

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

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

Discuss both step and touch potential

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

Discuss terms associated with temporary protective grounding and bonding

Discuss grounding and bonding equipment selection and performance

Discuss steps to de-energize a system or circuit

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

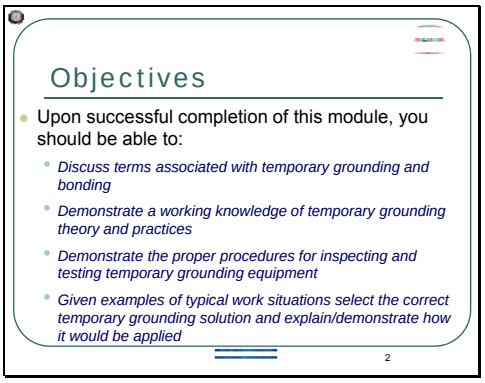
Discuss various methods to establish an equal potential work zone

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

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

Slide 1

Slide 2



Slide 3

Slide 4

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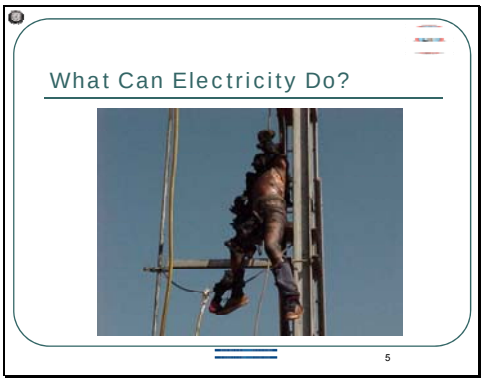

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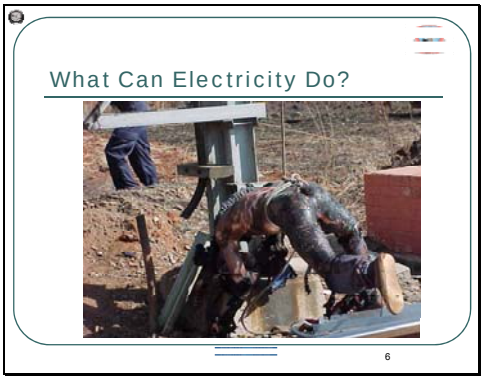

Slide 7

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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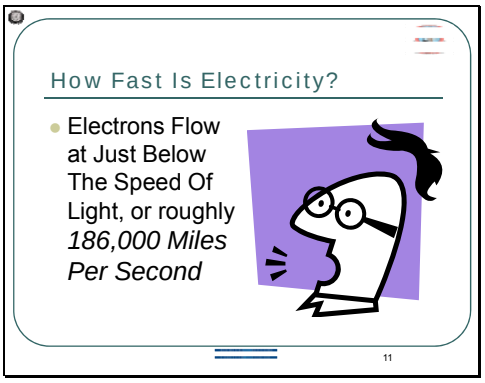
Slide 9

The End Result of Not Working Safely With Electricity

9

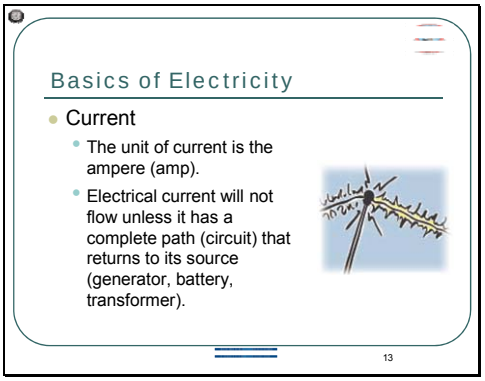
Slide 10

Slide 11



Slide 12

Slide 13



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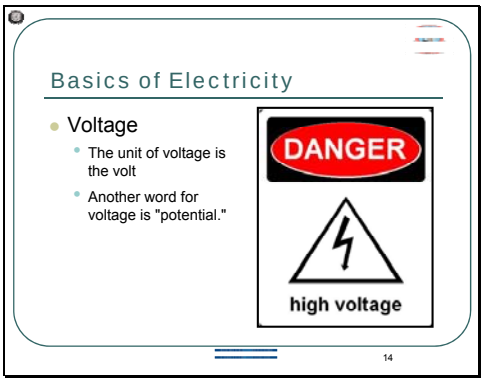

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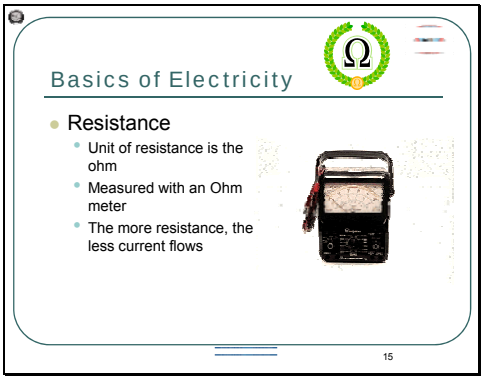

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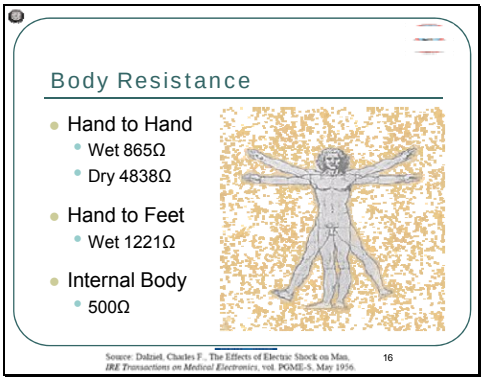

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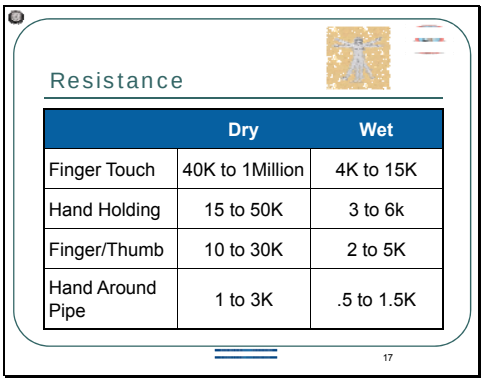
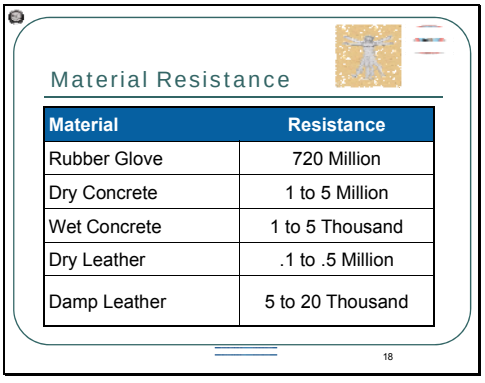


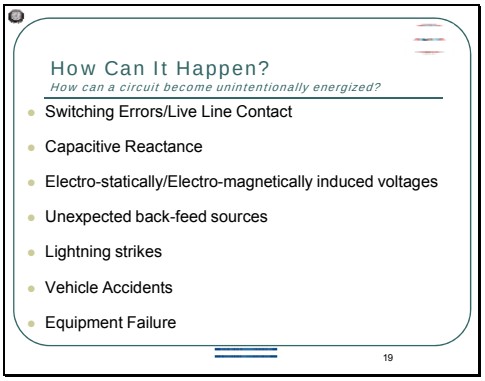
	Dry	Wet
Finger Touch	40K to 1Million	4K to 15K
Hand Holding	15 to 50K	3 to 6k
Finger/Thumb	10 to 30K	2 to 5K
Hand Around Pipe	1 to 3K	.5 to 1.5K

Slide 18



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

Slide 19



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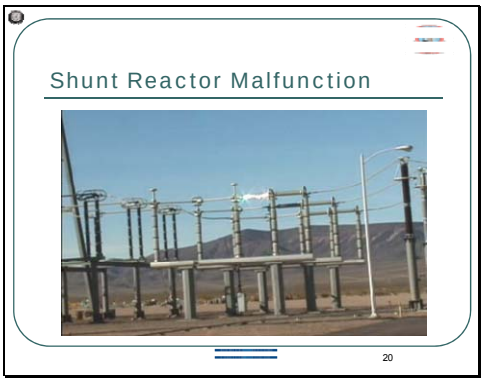

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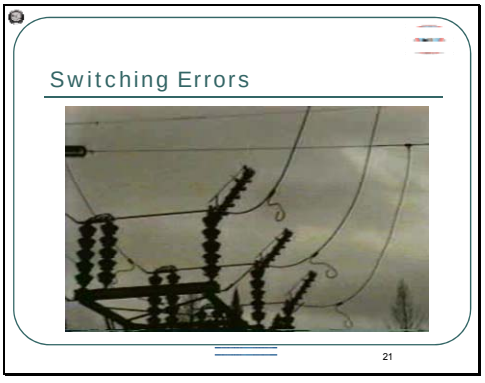

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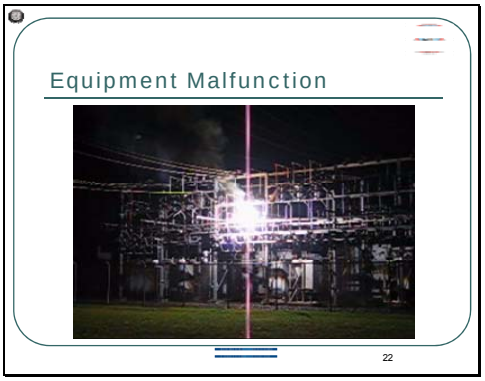

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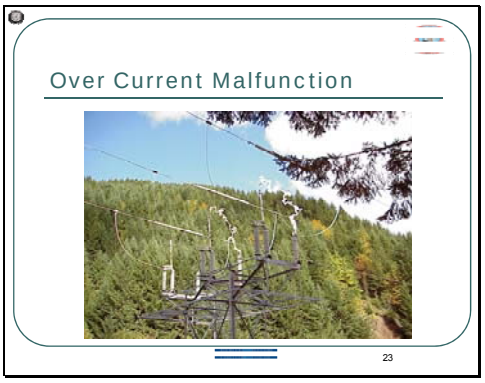

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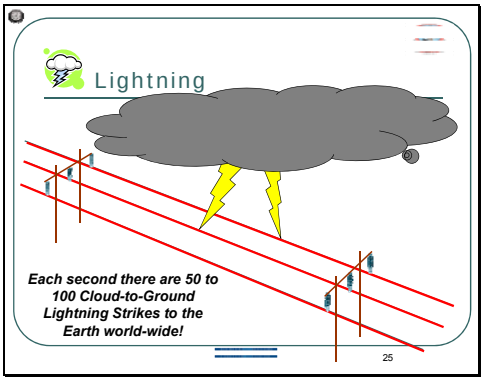

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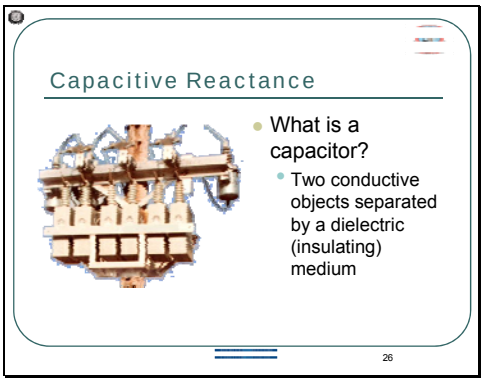

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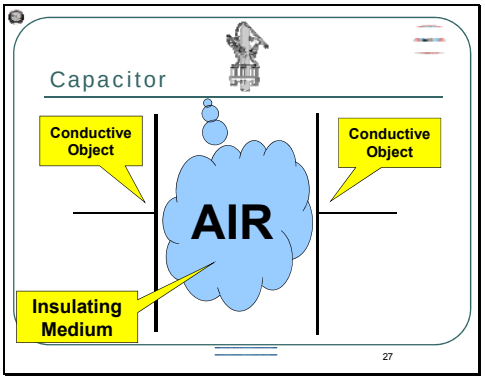

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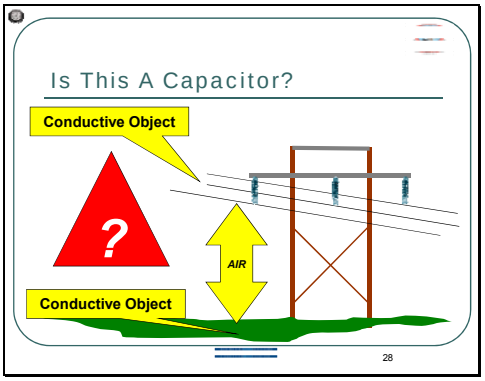

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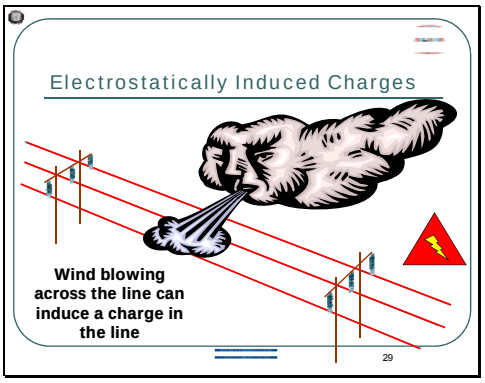

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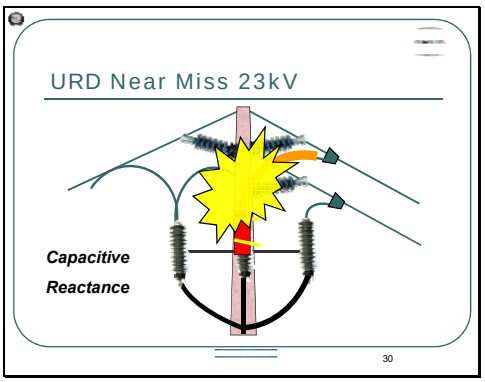

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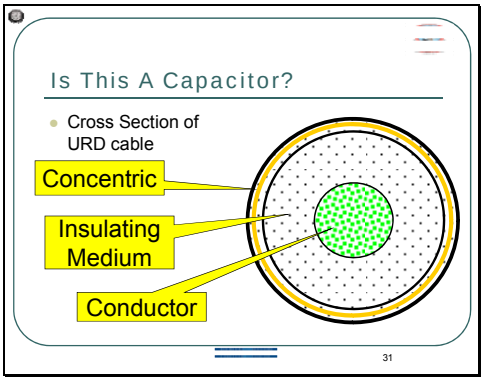

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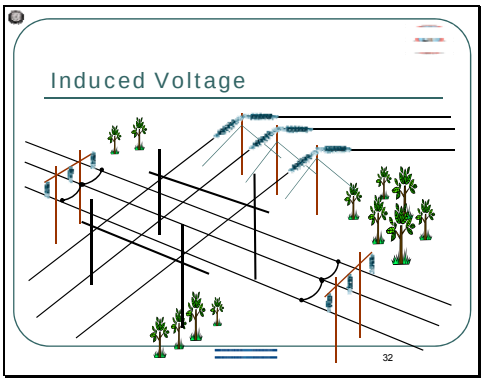

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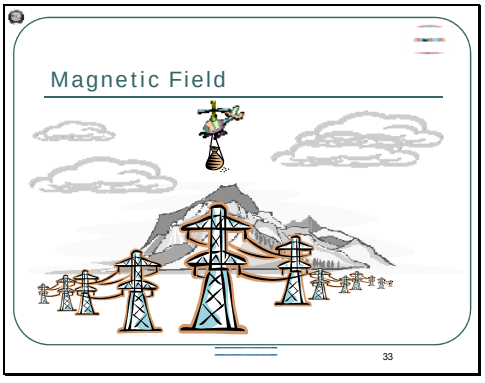

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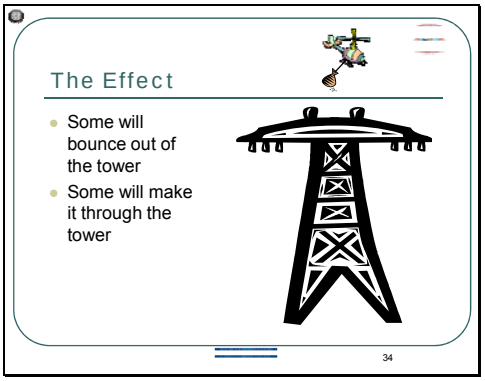

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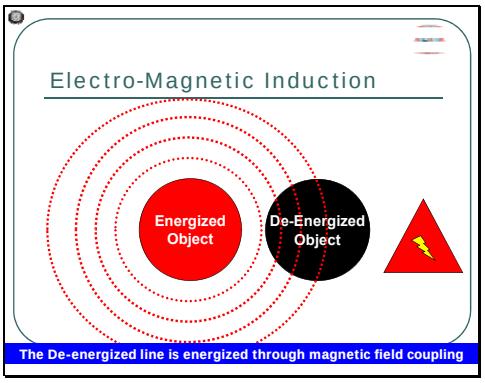

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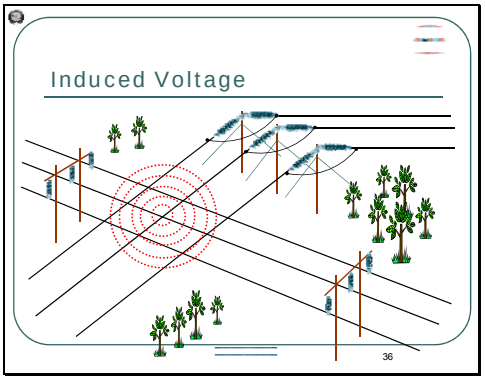

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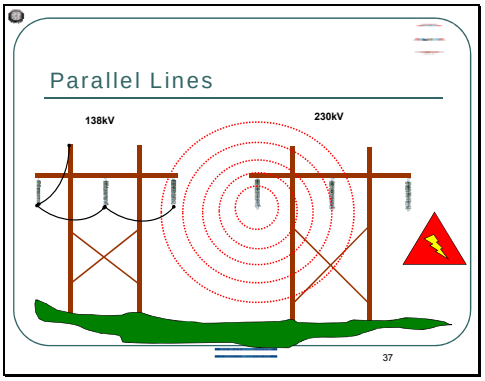

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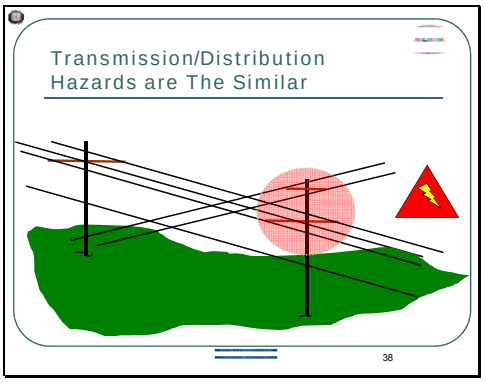

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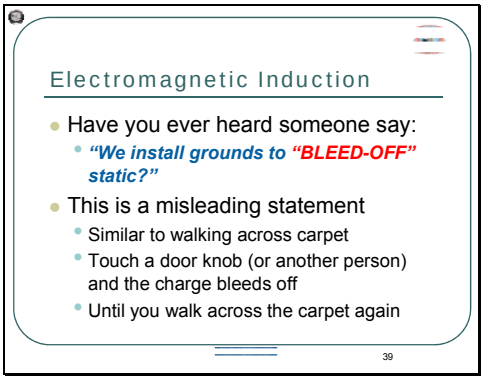

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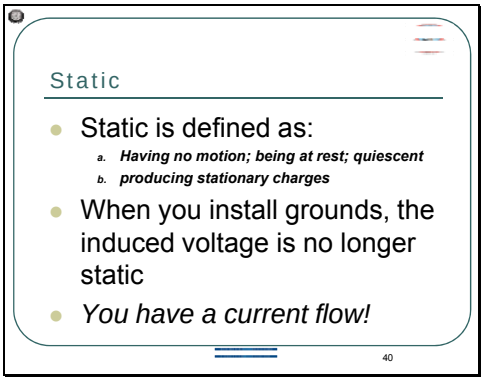

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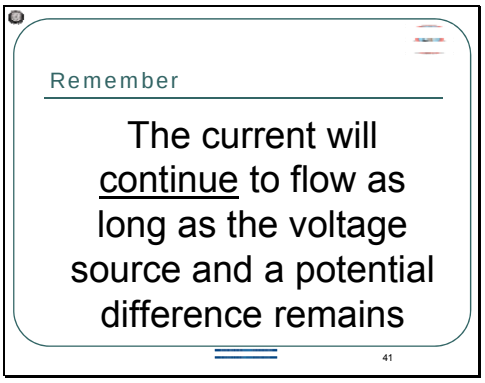

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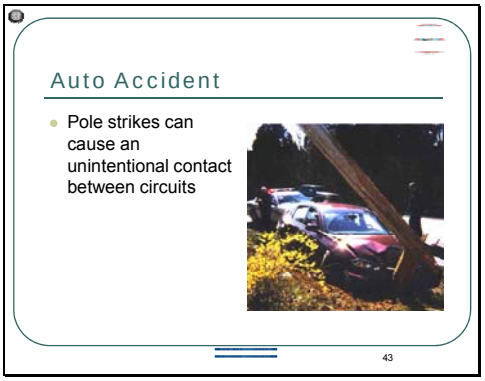

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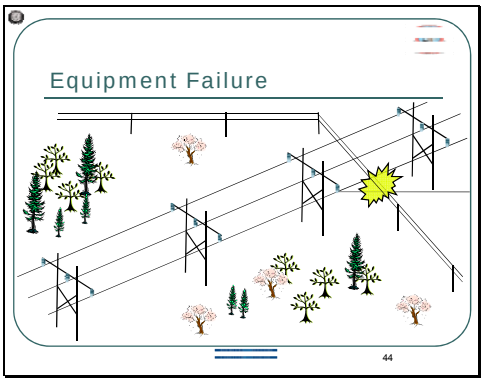

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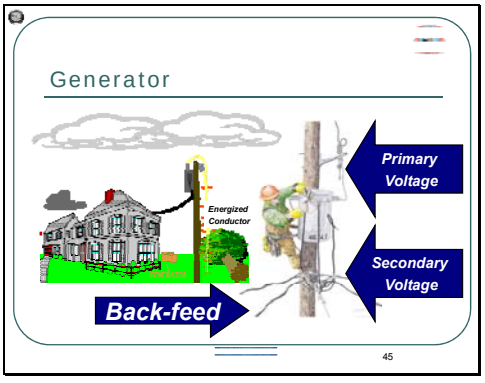

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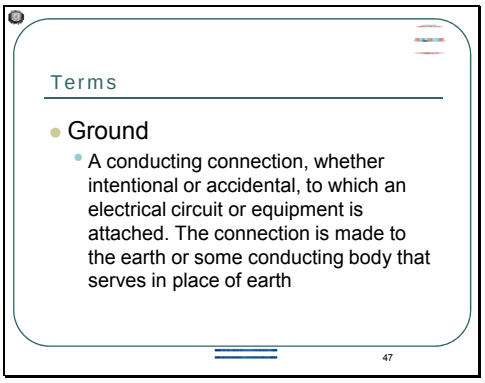

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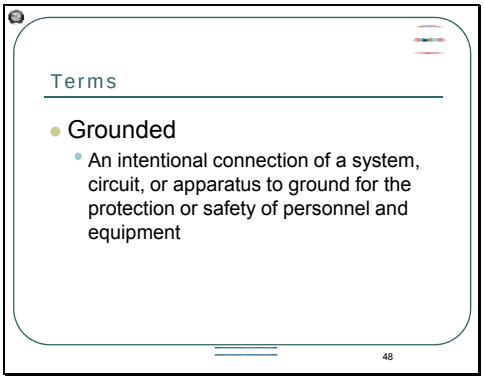

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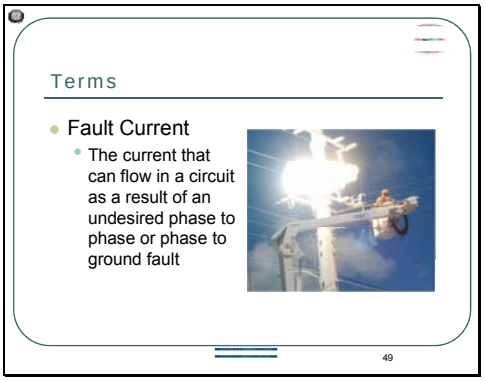

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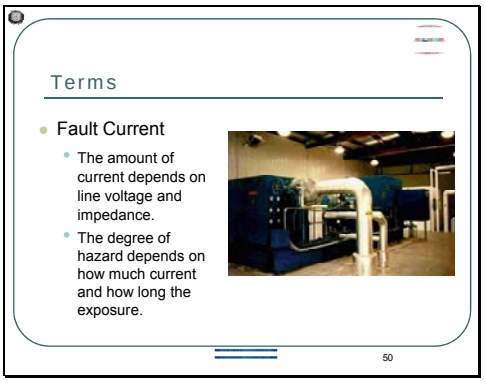

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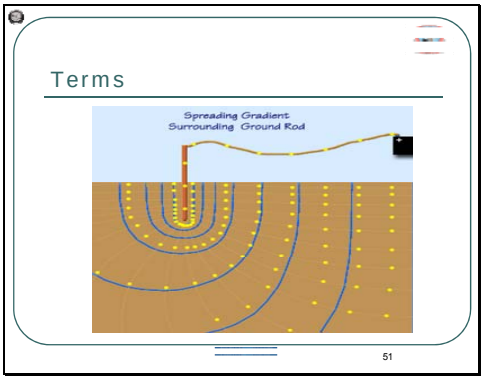

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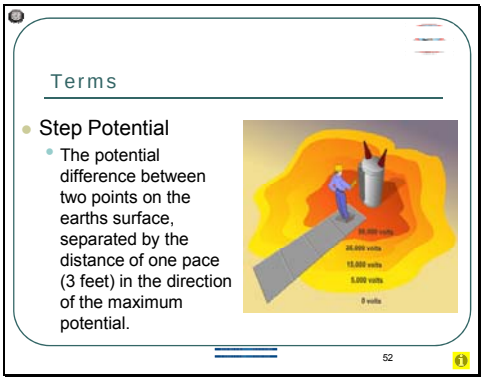

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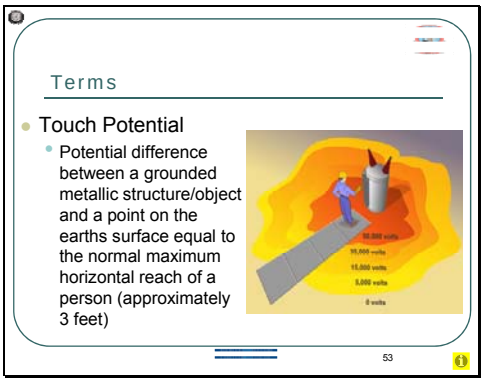

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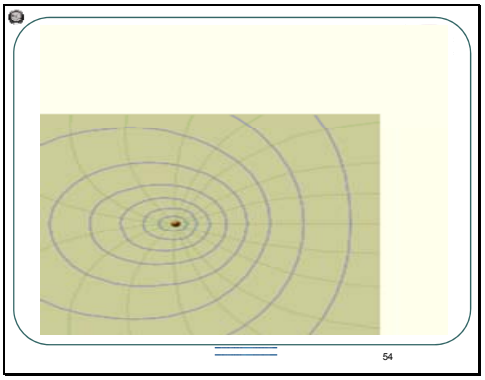

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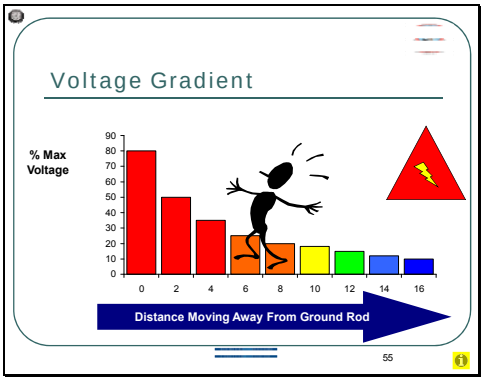

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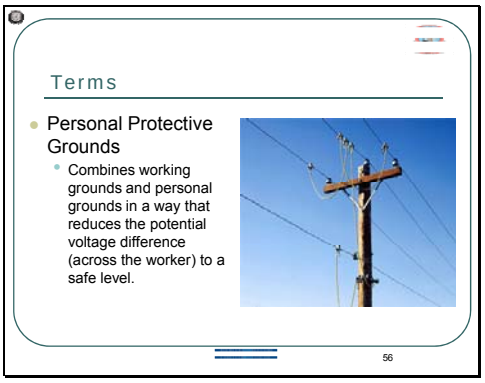

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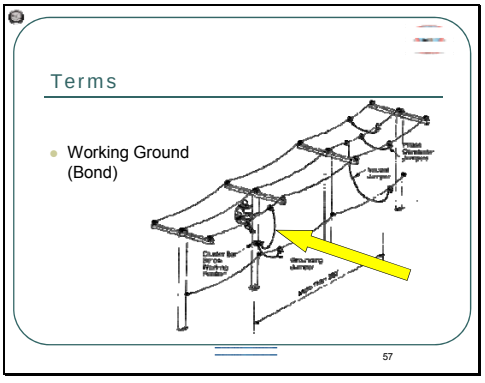

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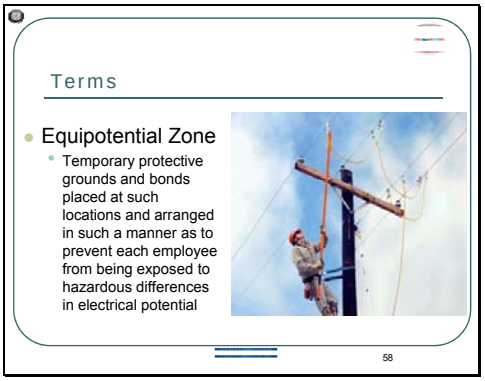

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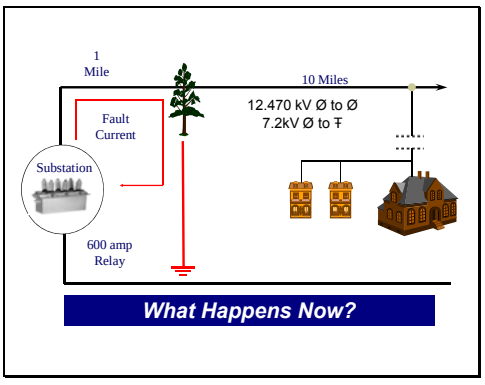

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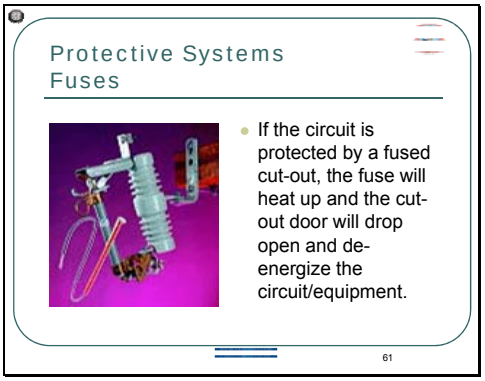

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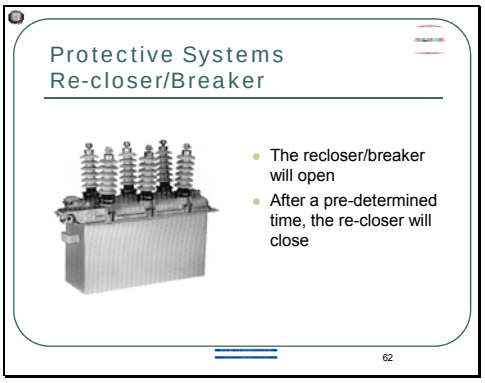

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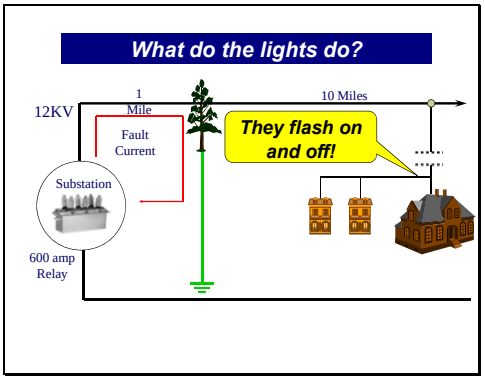

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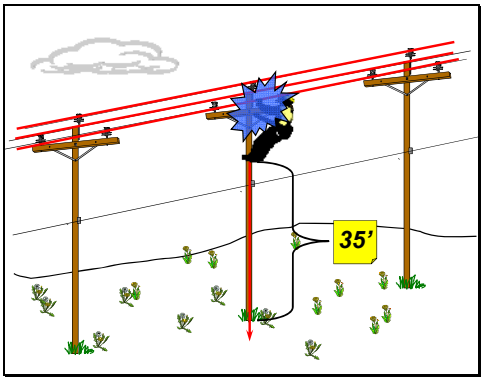

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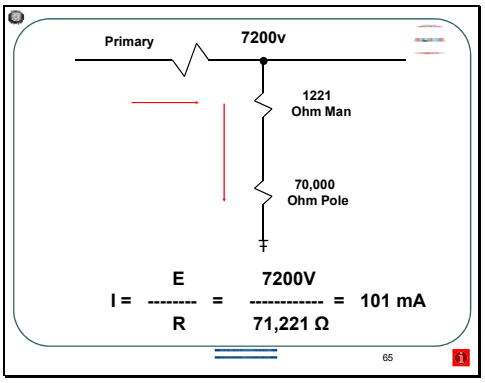

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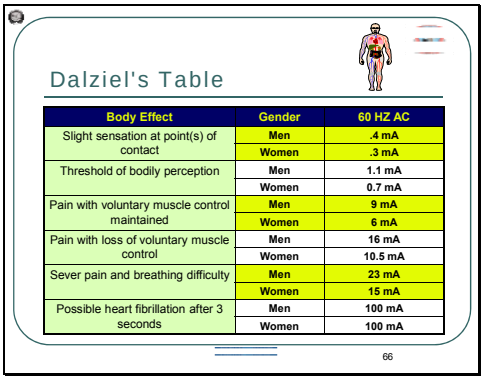

Body Effect	Gender	60 HZ AC
Slight sensation at point(s) of contact	Men	.4 mA
	Women	.3 mA
Threshold of bodily perception	Men	1.1 mA
	Women	0.7 mA
Pain with voluntary muscle control maintained	Men	9 mA
	Women	6 mA
Pain with loss of voluntary muscle control	Men	16 mA
	Women	10.5 mA
Sever pain and breathing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

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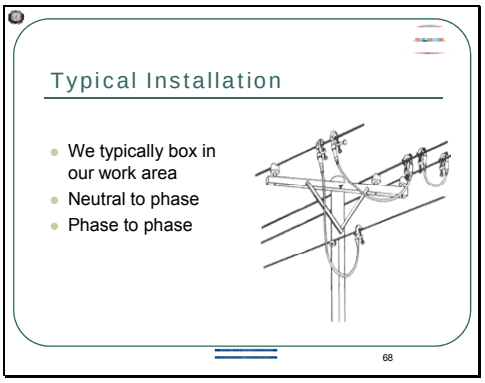

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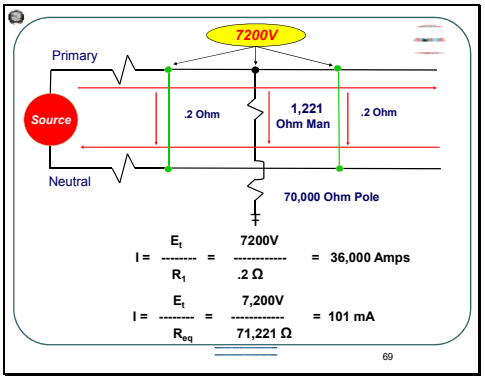

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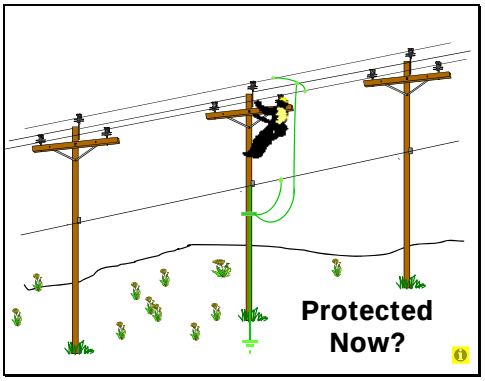

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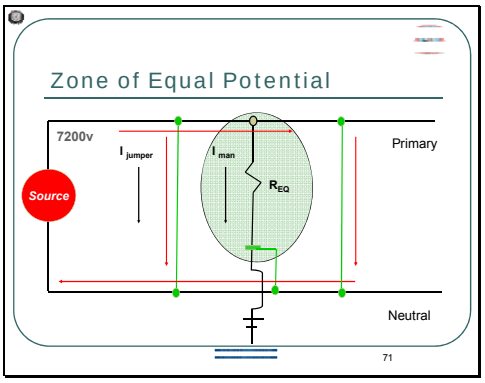

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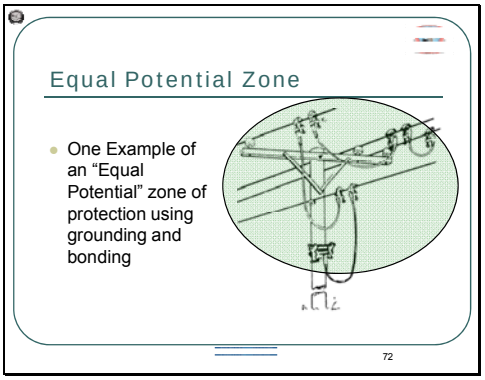

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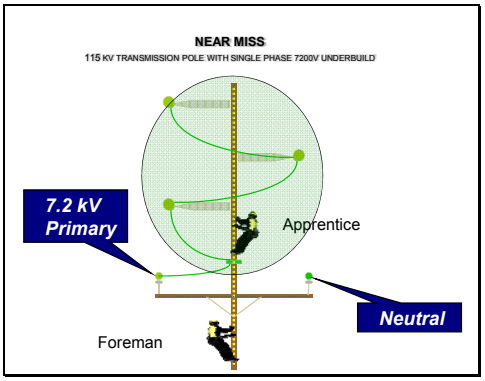

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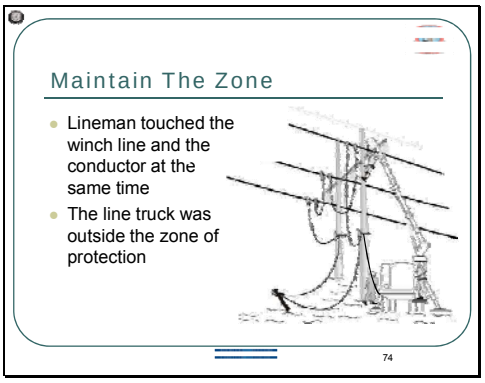

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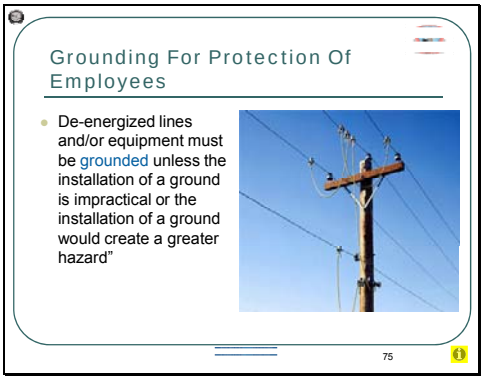

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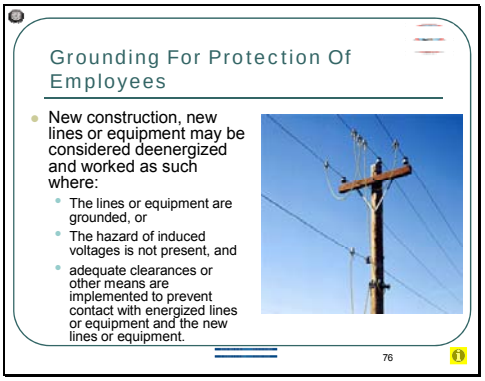

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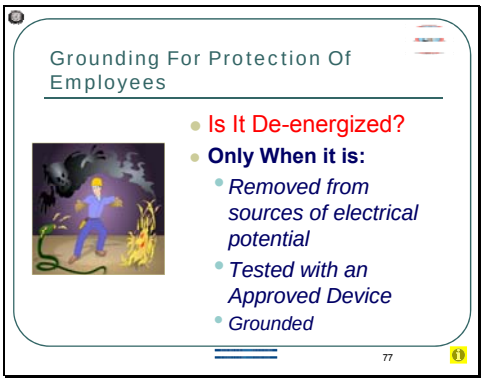

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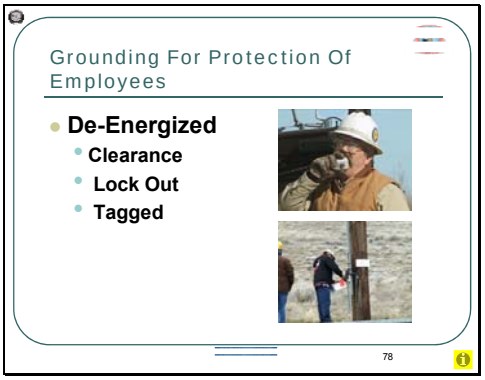

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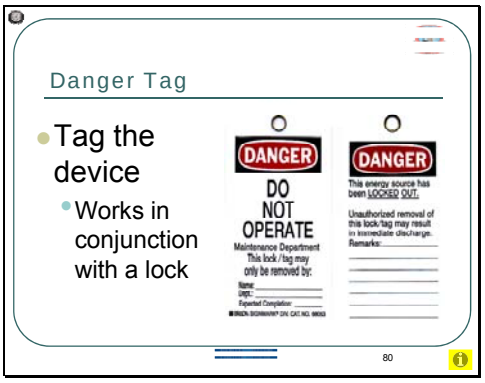

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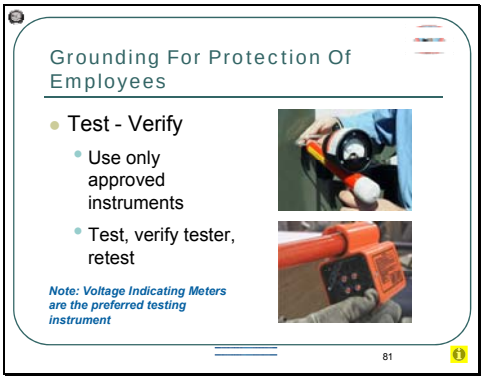

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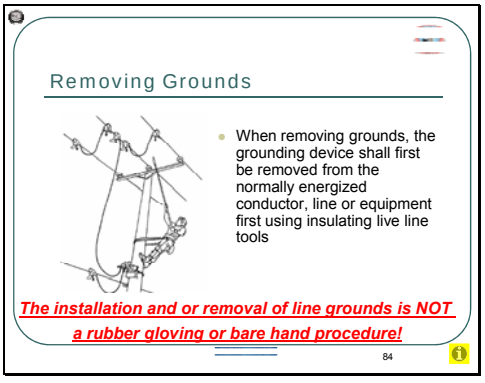

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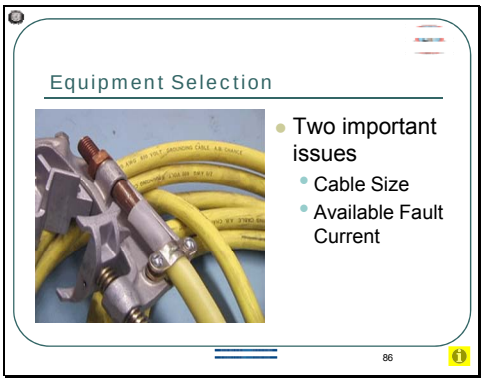

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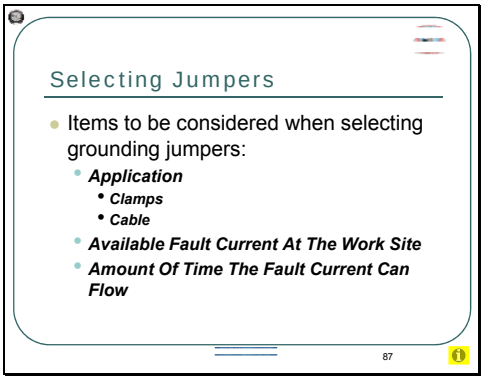

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Maximum Fault Current Capability for Grounding Cables

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

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Protective Equipment

Clamps

C Style | Duck Bill | Flat Style | Socket

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Protective Equipment

- Cluster Bracket

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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

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Safe Work Practices

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

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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

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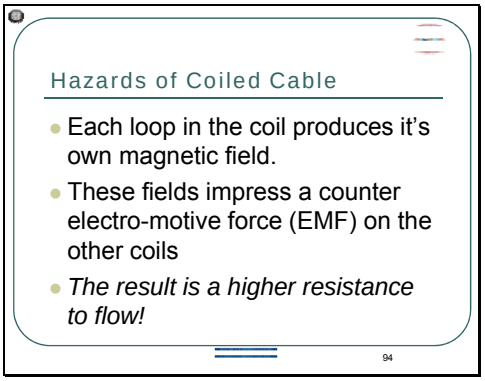

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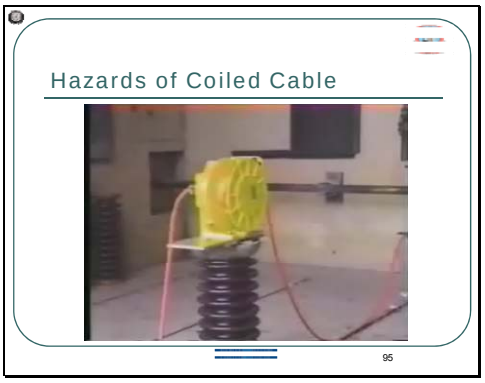

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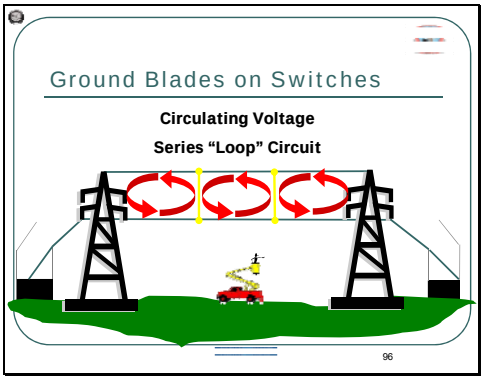

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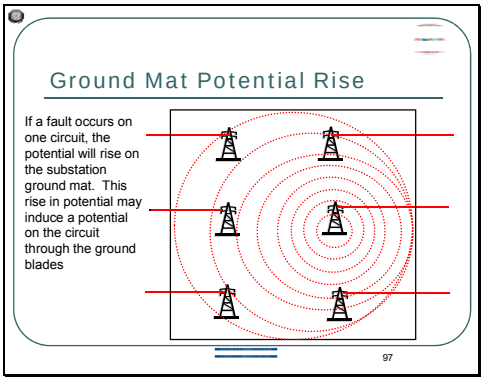

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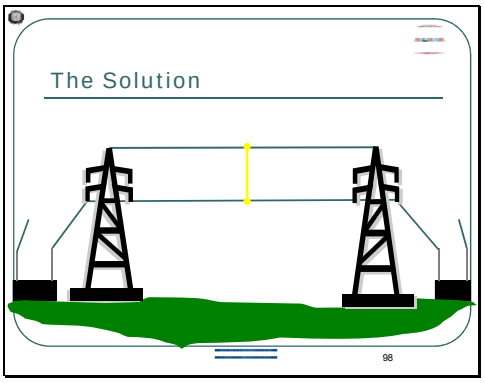

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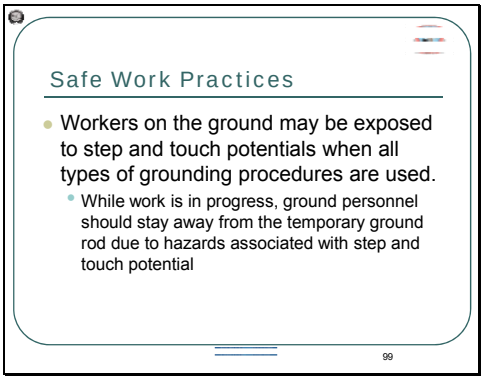

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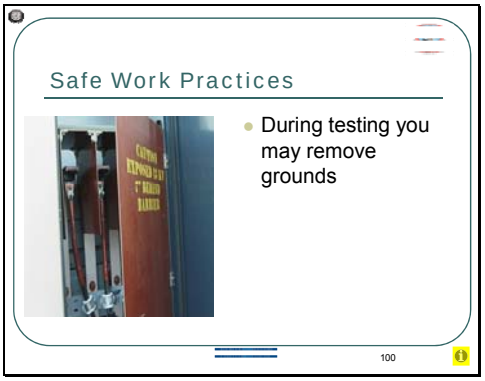

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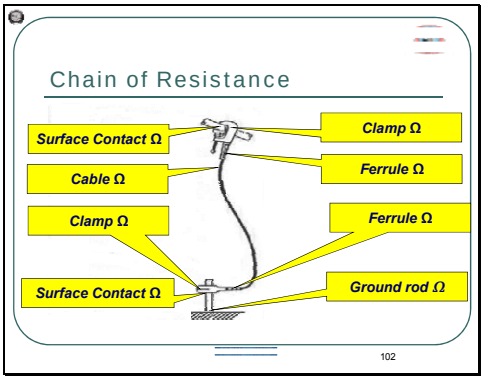

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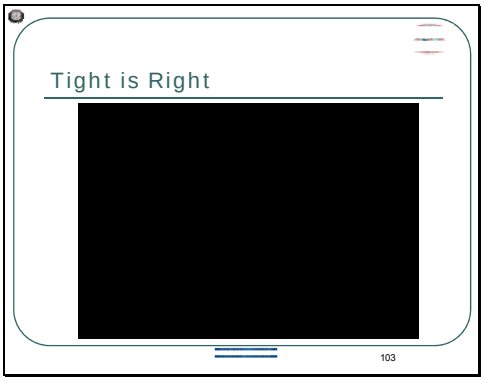

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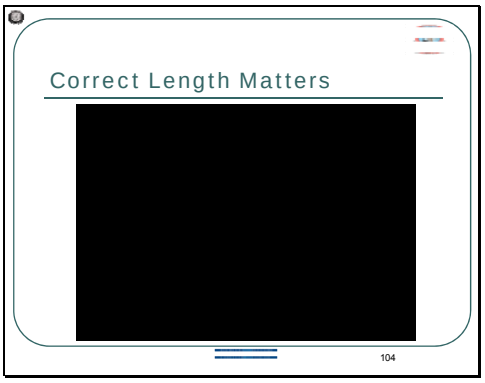

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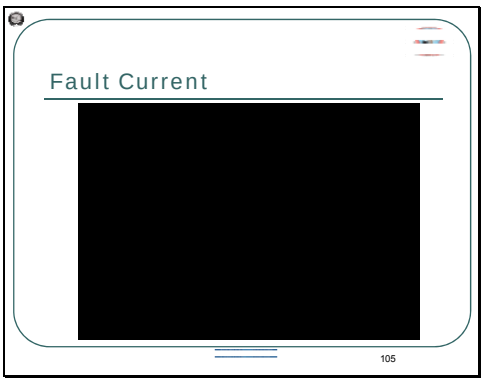

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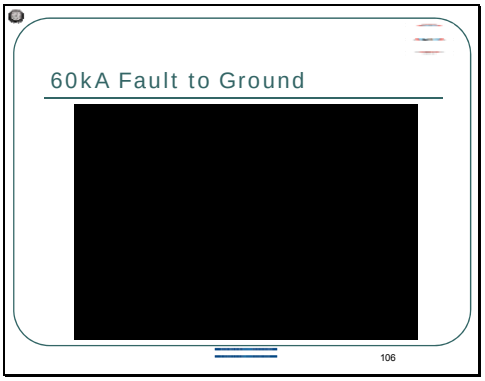

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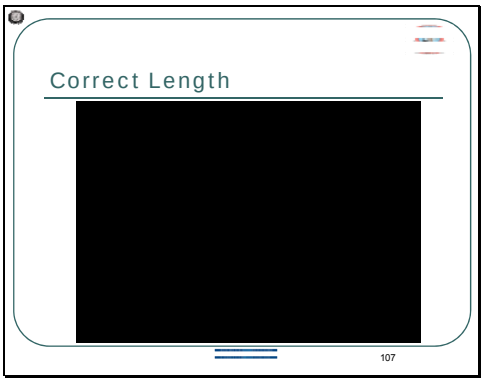

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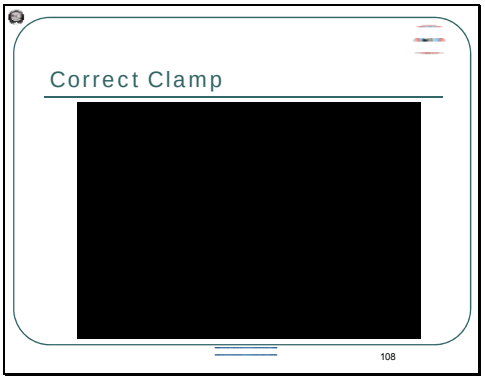

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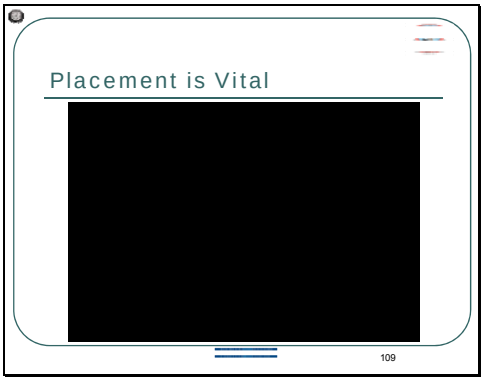

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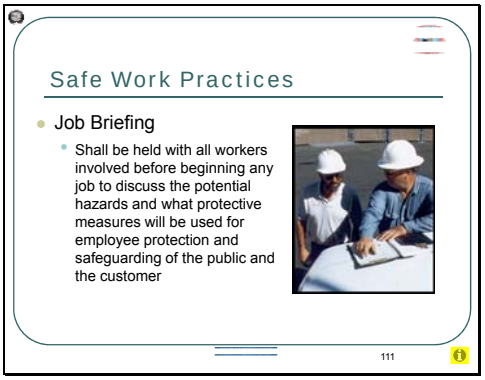

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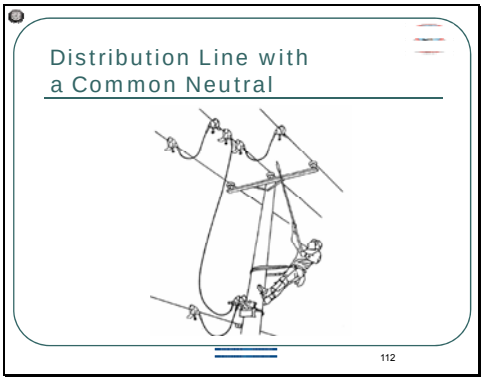

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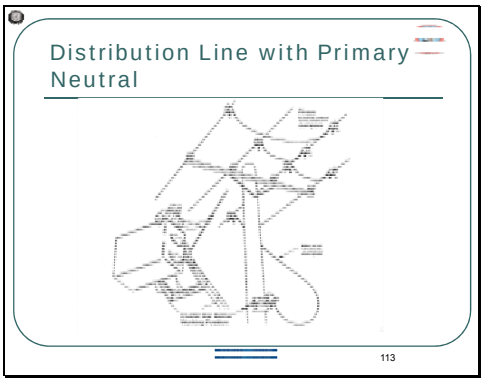

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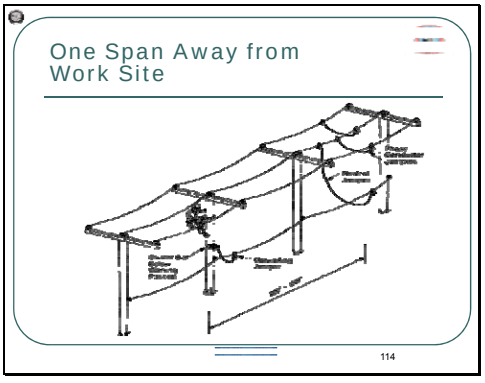

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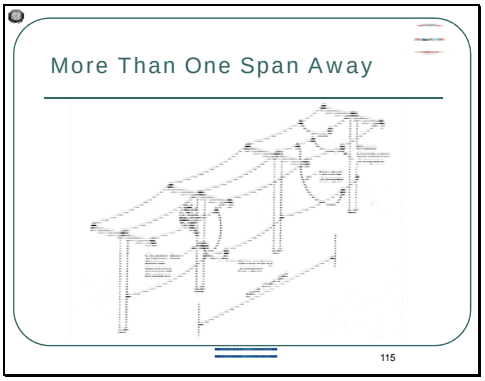

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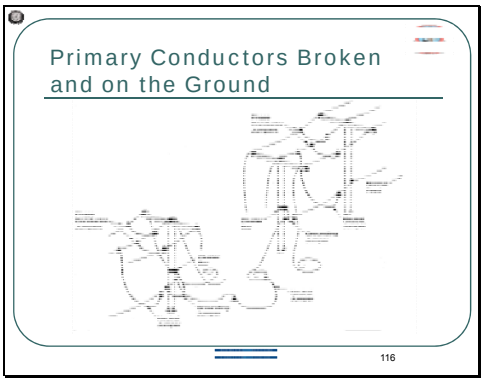

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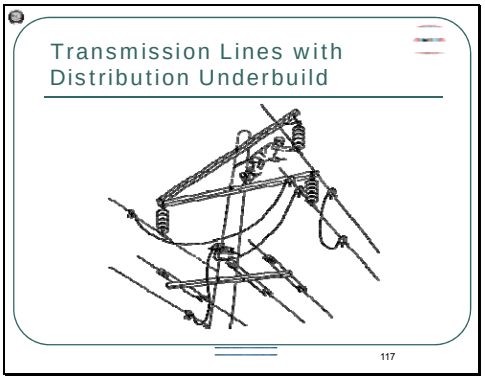

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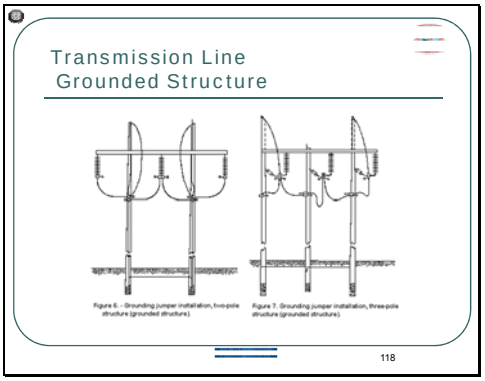

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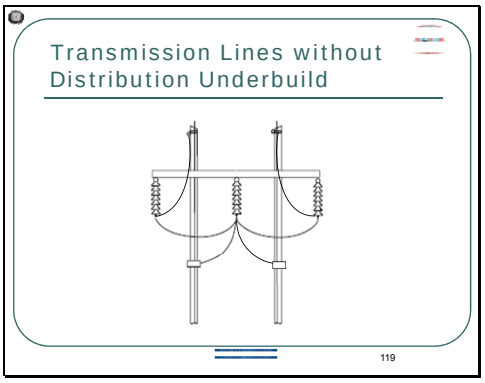

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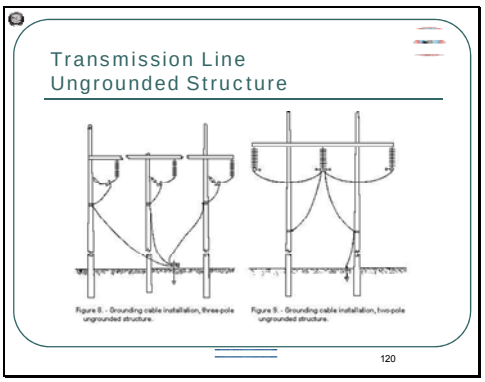

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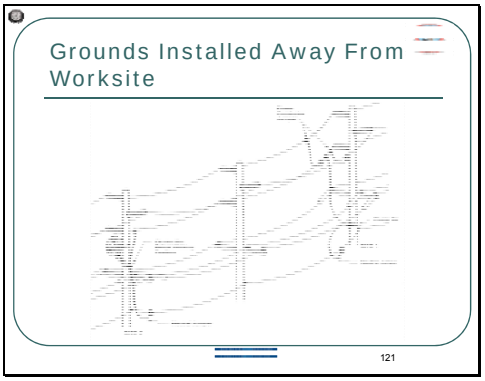

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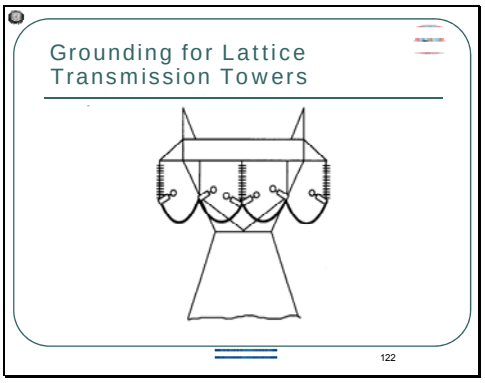

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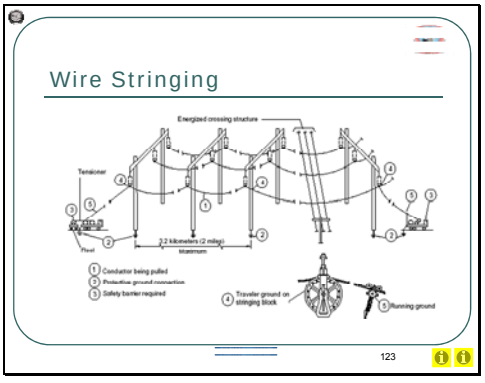

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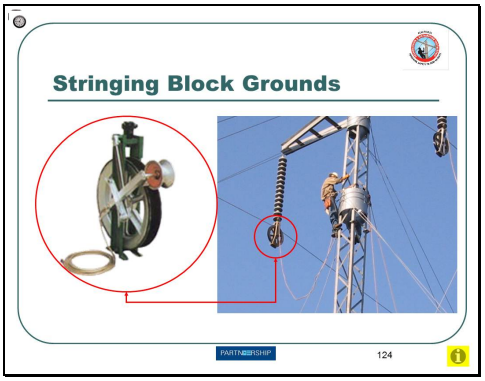

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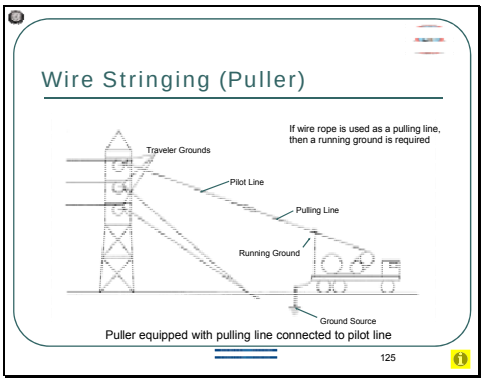

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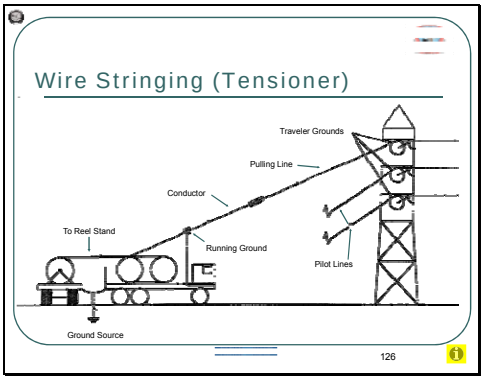

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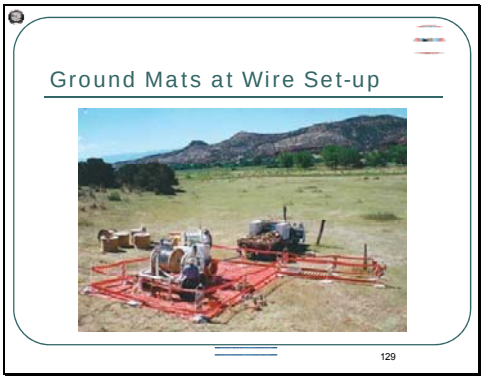

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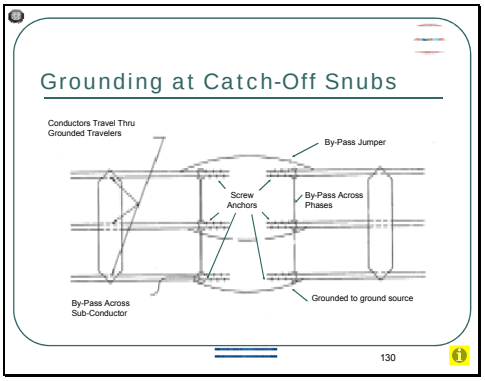

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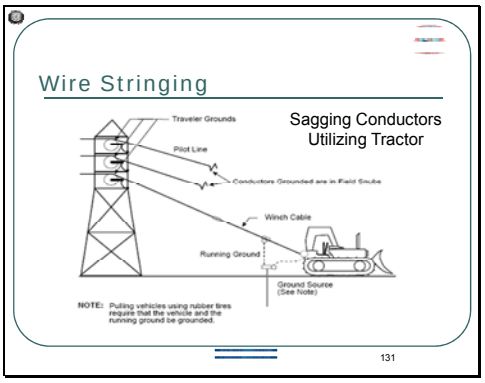

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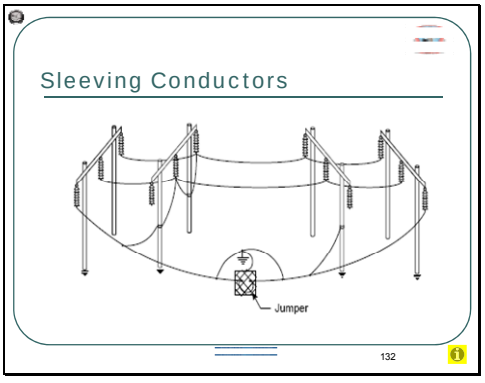

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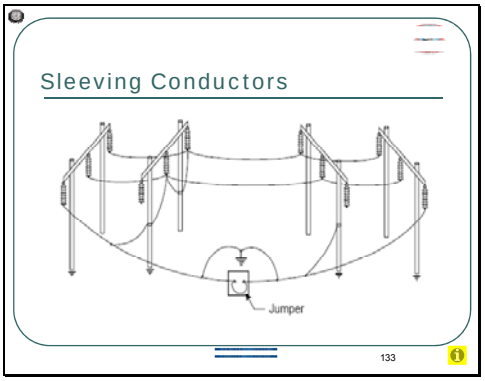

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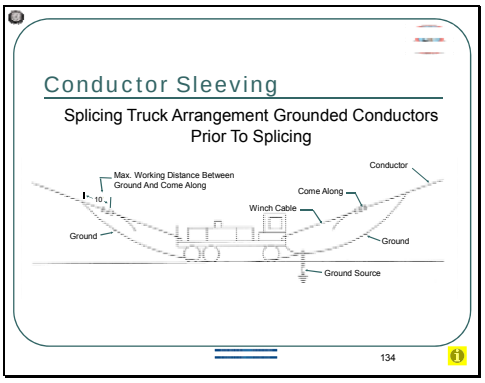

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Ground Mats For Equipment Operations

- 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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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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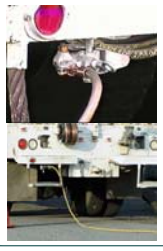
Vehicle Grounding



- 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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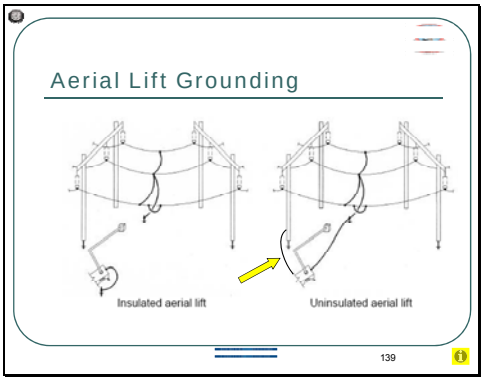

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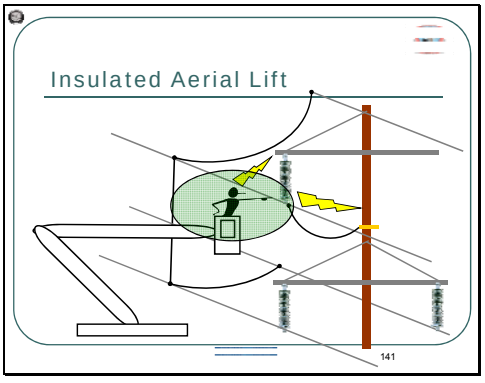

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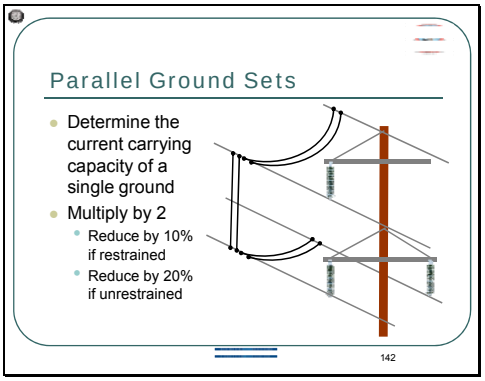

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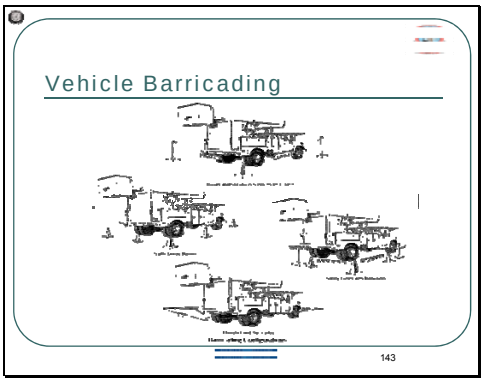

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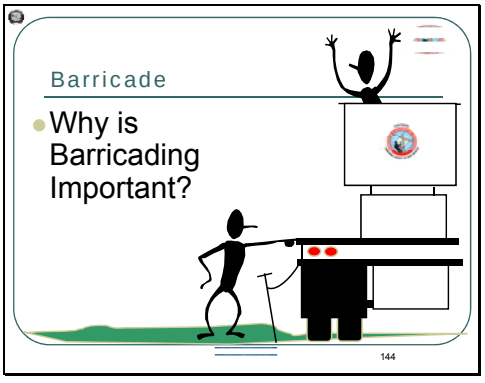

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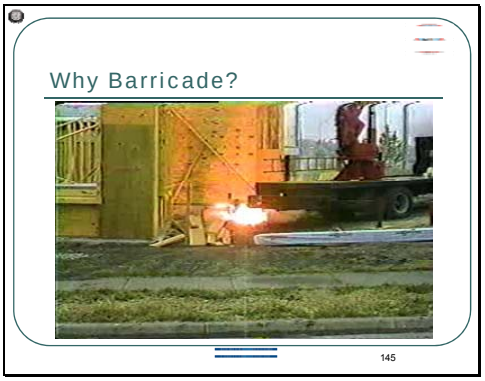

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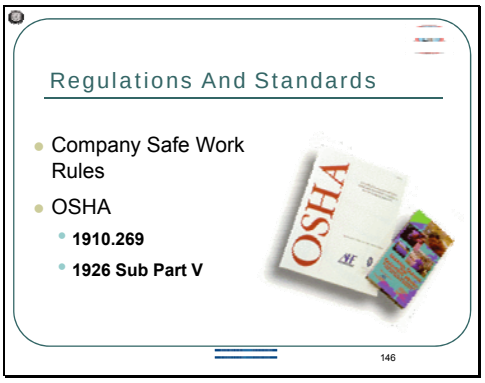

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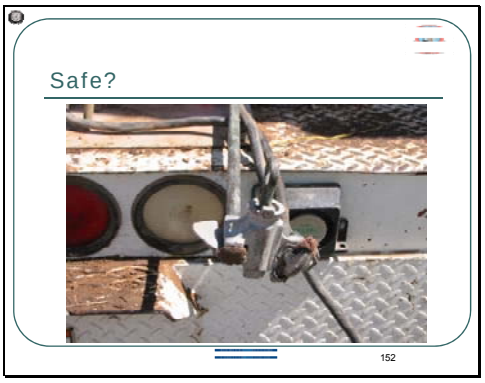

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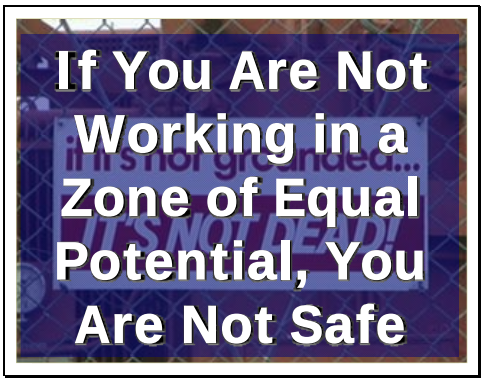

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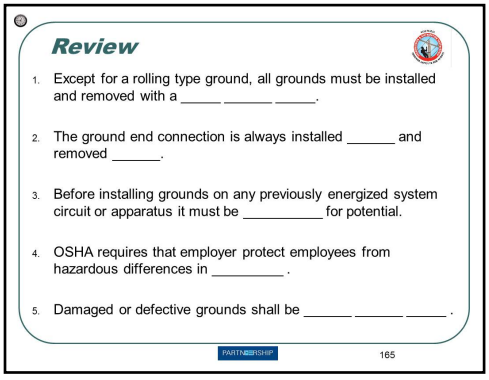

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	Electrical Transmission & Distribution Partnership 10-Hour OSHA Training Course	PARTNERSHIP An OSHA Cooperative Program
	Lifting and Rigging	

Objectives

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

Define the main causes of crane incidents

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

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

i) All lifting an 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

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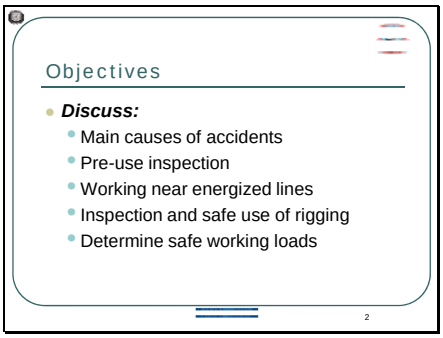

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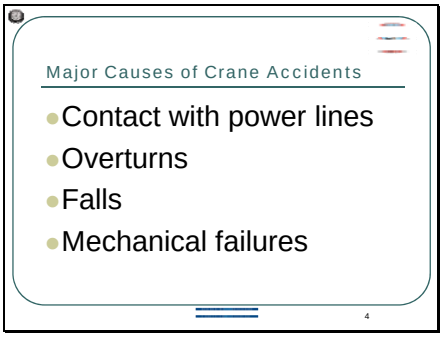

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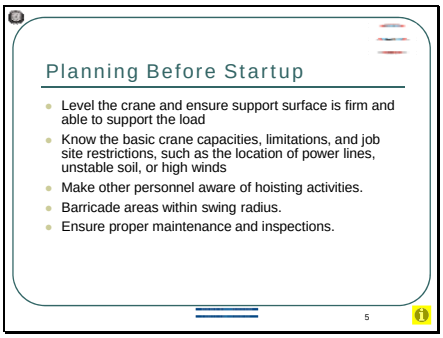

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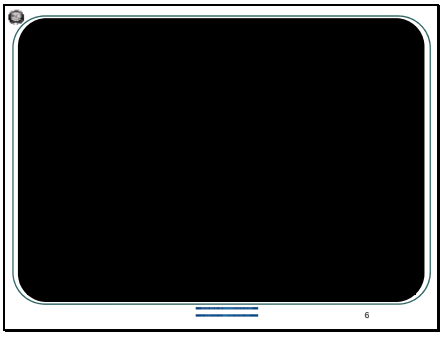

Altec video clip

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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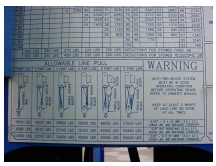
Slide 9

Load Charts

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



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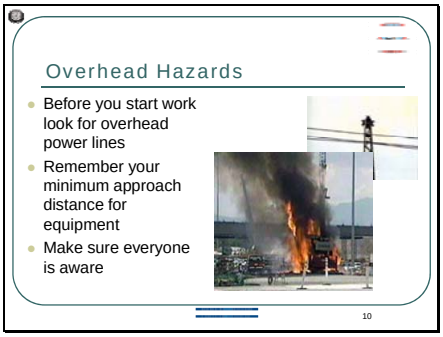

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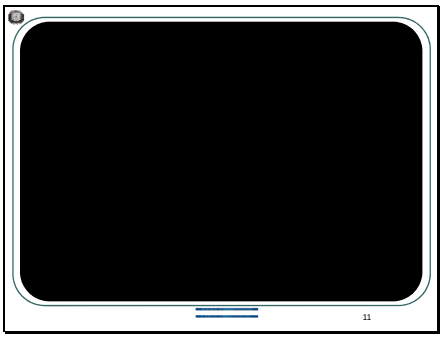

Stephen's Crane Incident video clip

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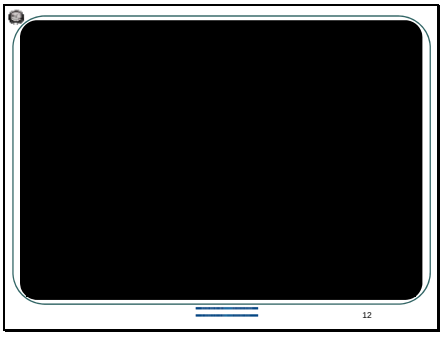

Big Blue video clip

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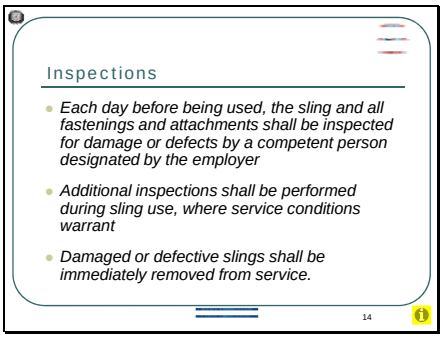

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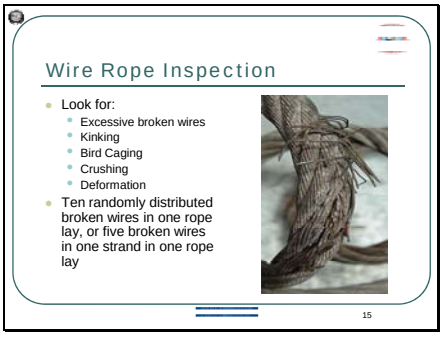

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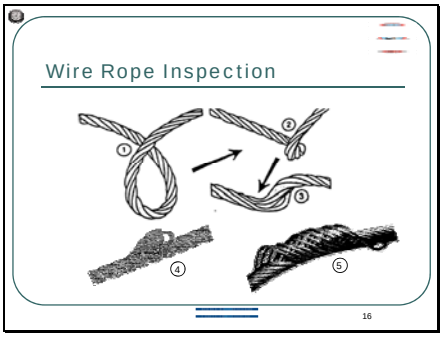

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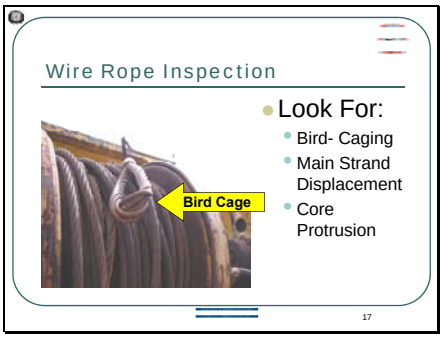

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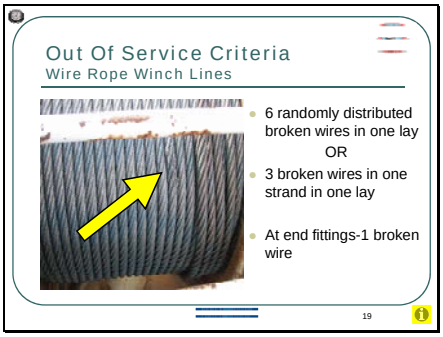

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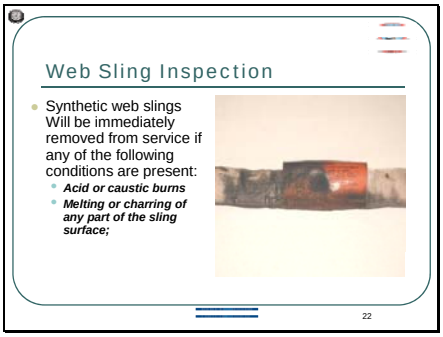

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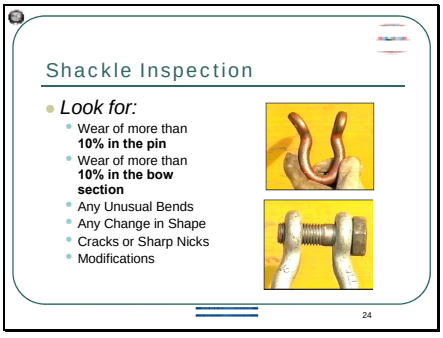

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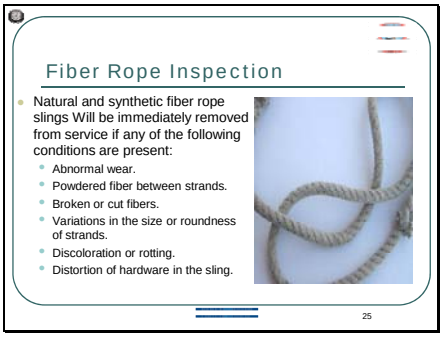

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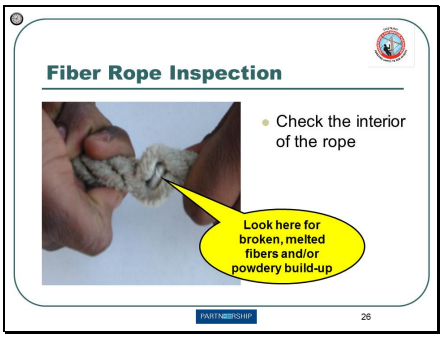

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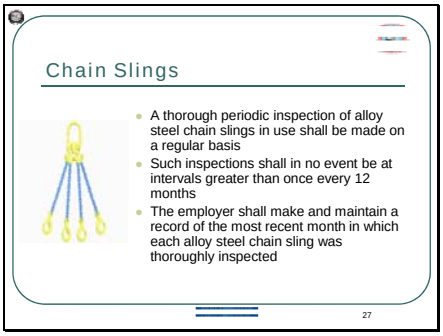

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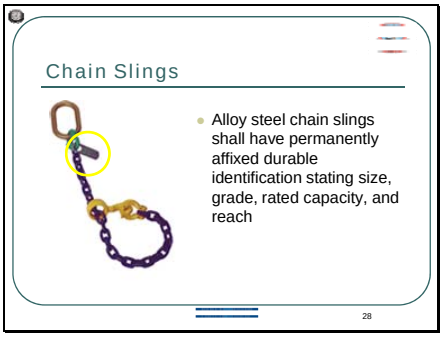

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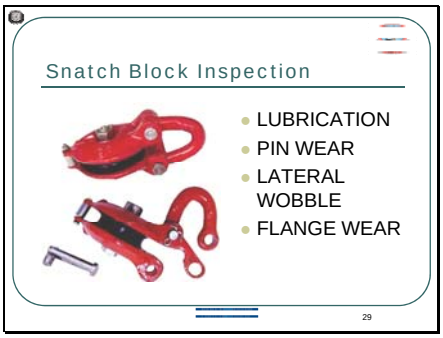

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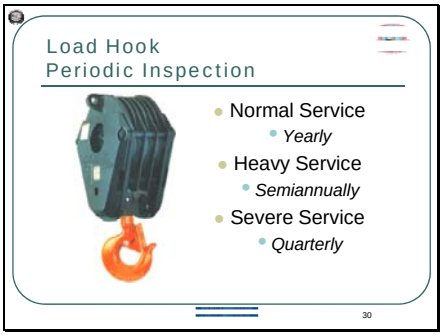

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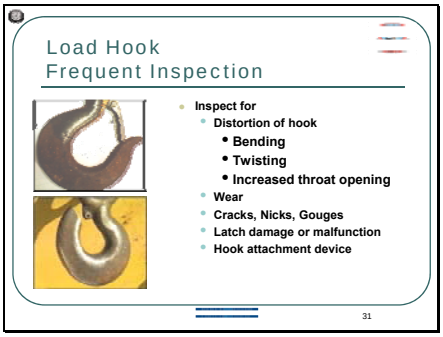

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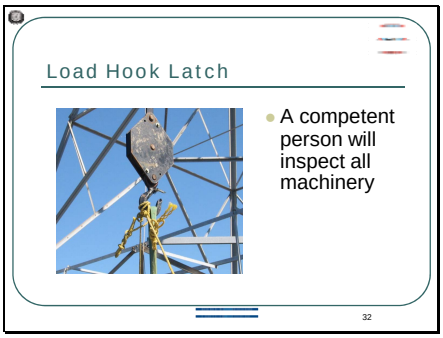

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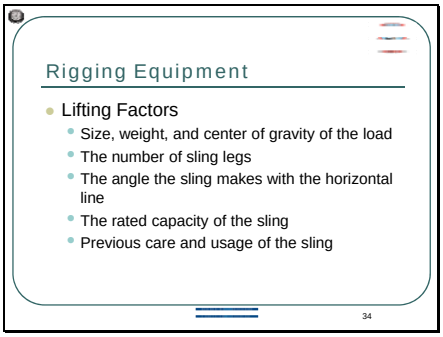

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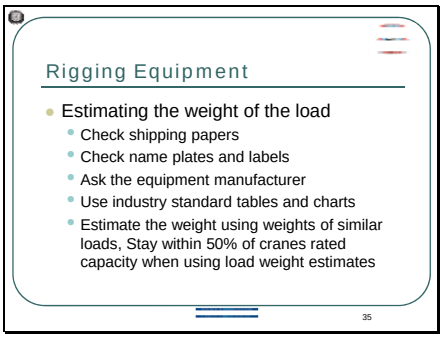

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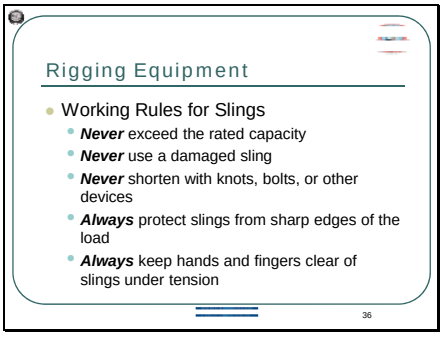

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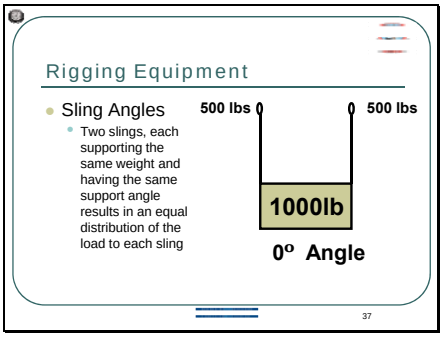

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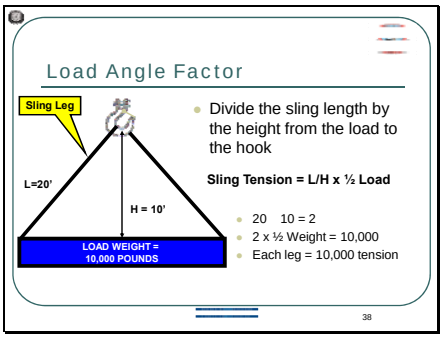

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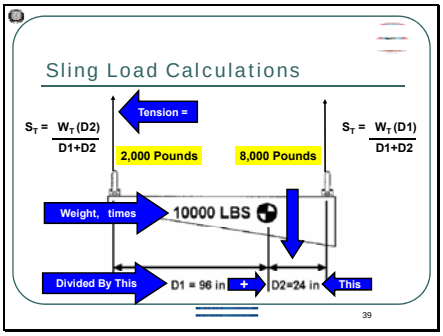

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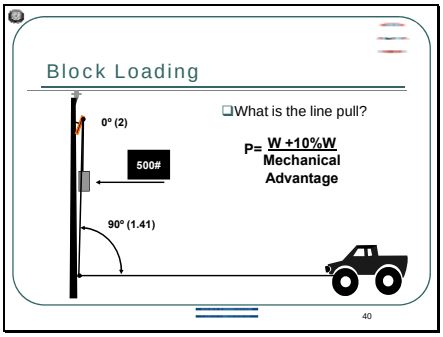

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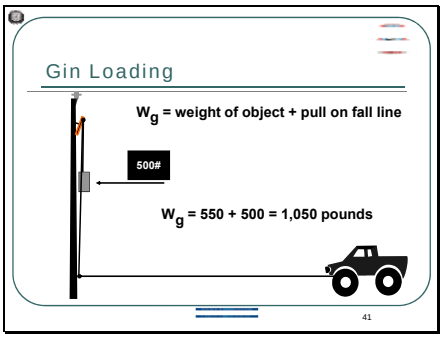

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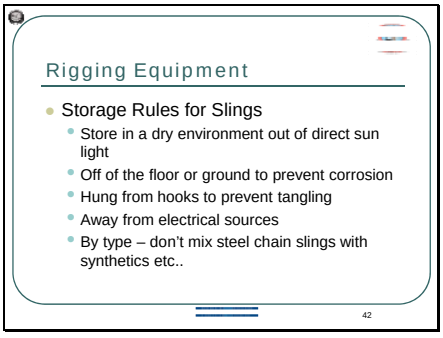

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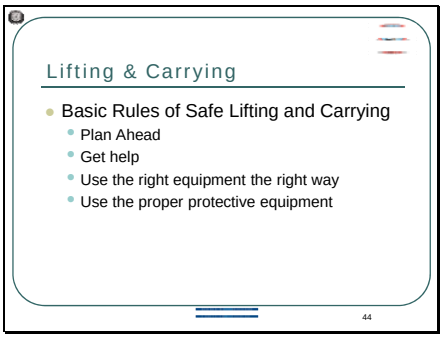

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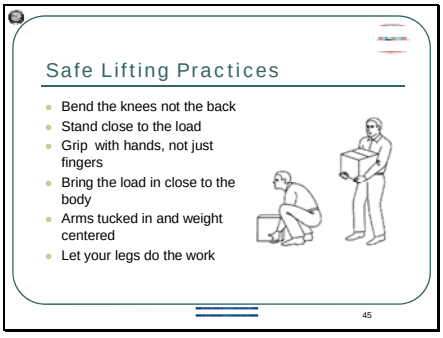

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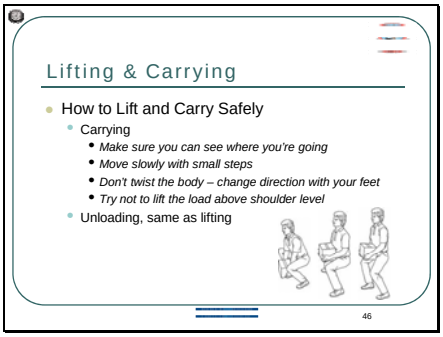

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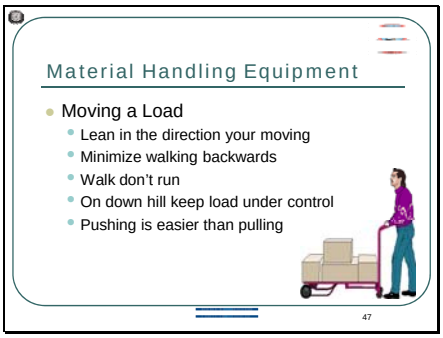

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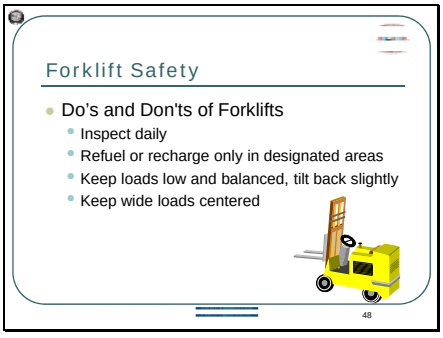

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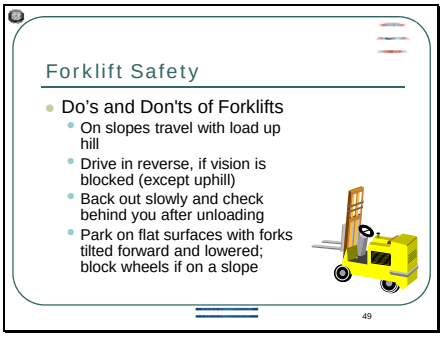

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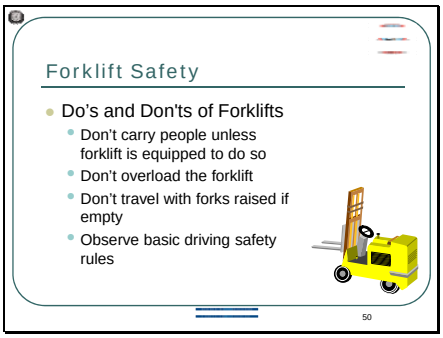

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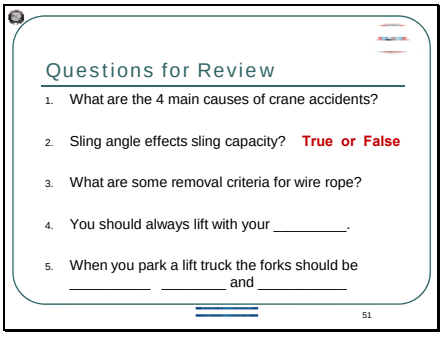

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	Electrical Transmission & Distribution Partnership 10-Hour OSHA Training Course	PARTNERSHIP An OSHA Cooperative Program
	Personal Protective Equipment	

Objectives

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

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

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

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

Explain the employer responsibilities regarding P.P.E.

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

Explain employer responsibilities regarding job briefings

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

Explain employee responsibilities regarding P.P.E. use

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

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

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

Explain methods to identify P.P.E.

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

Explain how to field test rubber gloves and sleeves

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

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

i) Protective clothing
ii) OSHA's requirements for apparel
iii) Injuries from electrical burns
iv) Arc Thermal Protective Value (ATPV)
v) Thermal values of arcs in calories/cm^2

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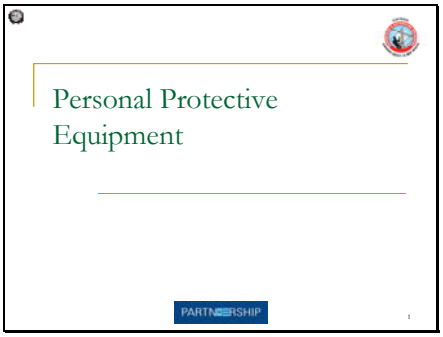

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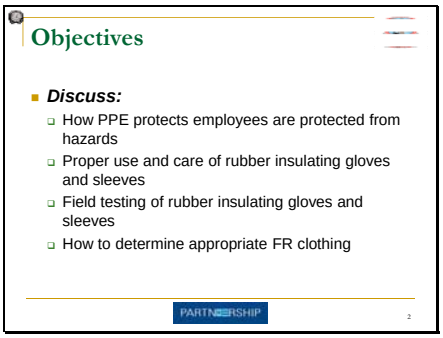

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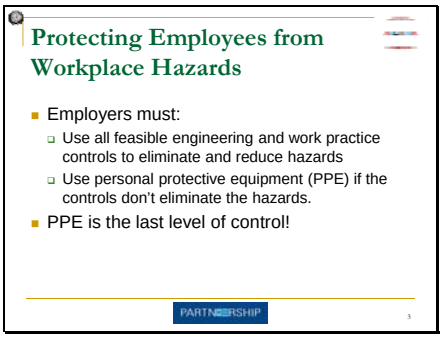

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Hierarchy of Control

- *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

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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

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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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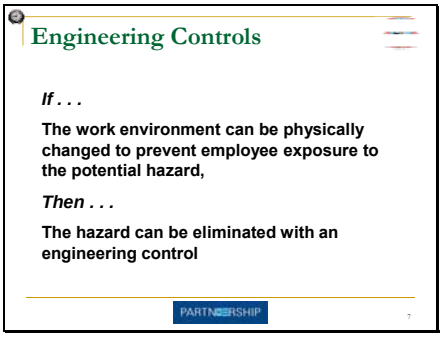
Slide 7



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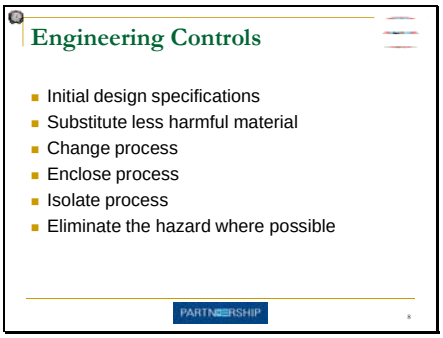

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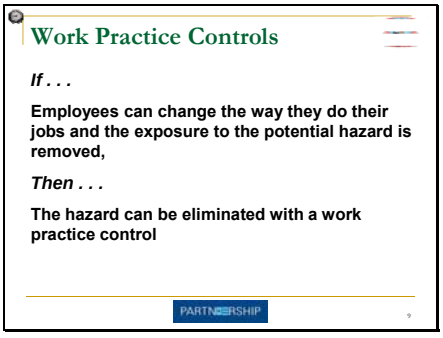

Slide 10

Work Practice Controls -- Examples

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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

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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

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Eye Protection

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

PARTNERSHIP 13

Slide 14

Head Protection

PARTNERSHIP 14

Slide 15

Causes of Head Injuries

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

PARTNERSHIP 15

Slide 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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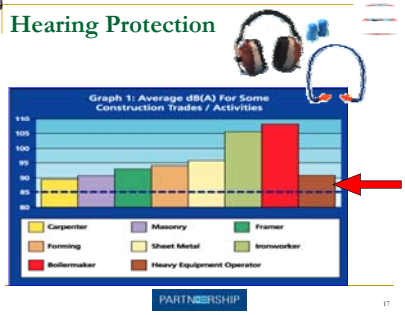
Hearing Protection



PARTNERSHIP

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Hearing Protection

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

PARTNERSHIP

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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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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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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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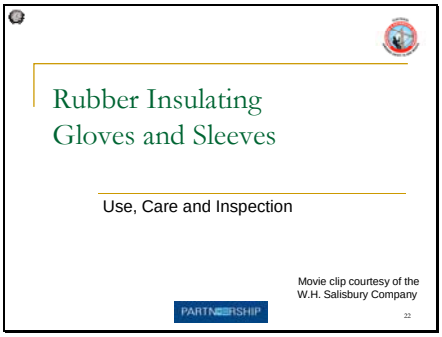

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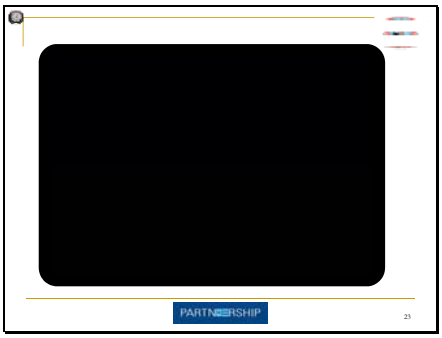

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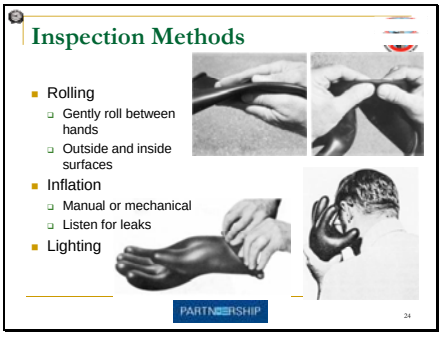

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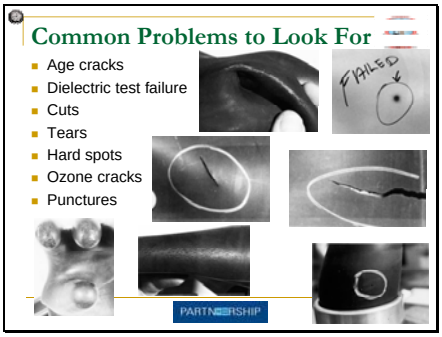

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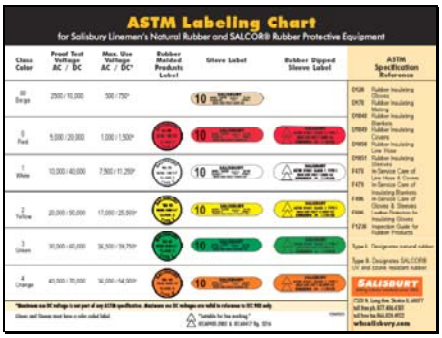

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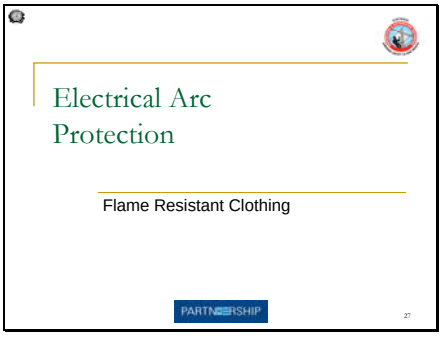

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At Risk Employees

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

PARTNERSHIP

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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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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.

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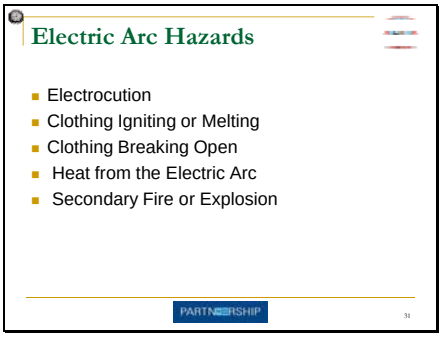

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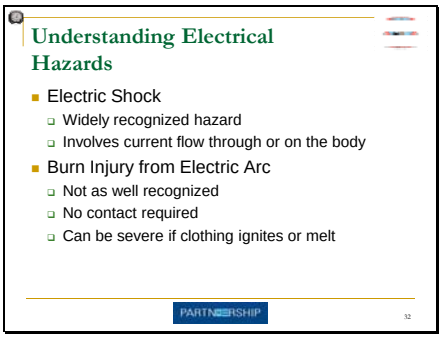

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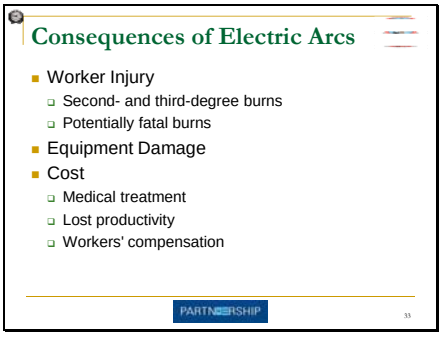

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Factors Affecting Worker Injury

- 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

PARTNERSHIP

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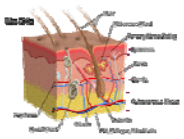
Burn Injury Principles

- **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***



PARTNERSHIP

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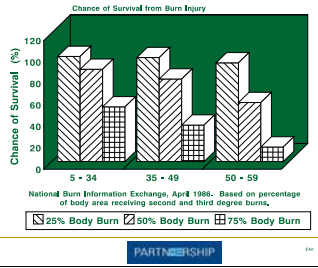
Chance of Survival



PARTNERSHIP

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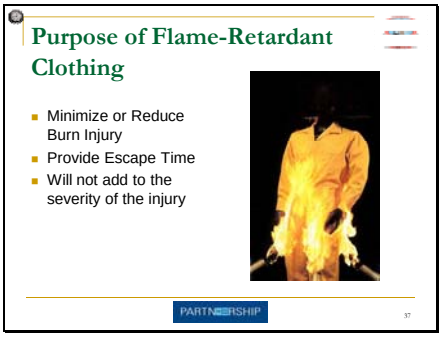

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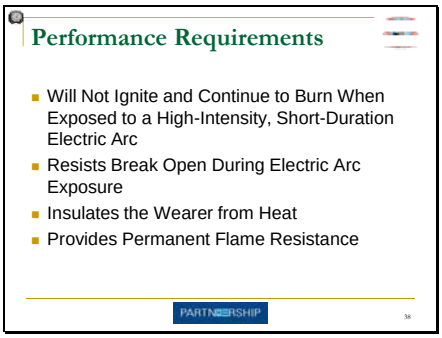

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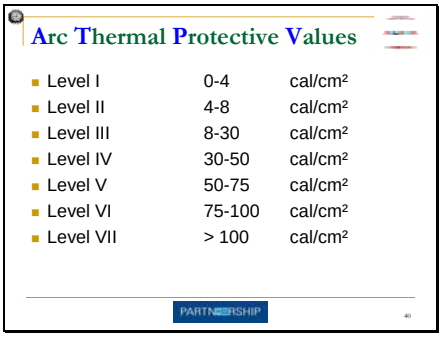

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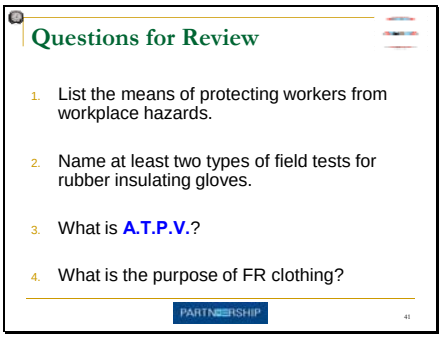

	Electrical Transmission & Distribution Partnership 10-Hour OSHA Training Course	
	Job Briefings	

Objectives

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

Explain when pre-job briefings should be conducted

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

Explain the items to be discussed in the job briefing

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

Explain employer responsibilities regarding job briefings

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

Explain employee responsibilities regarding job briefings

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

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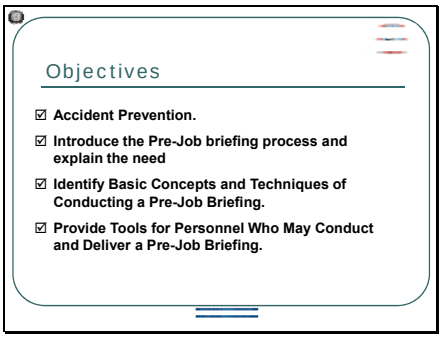

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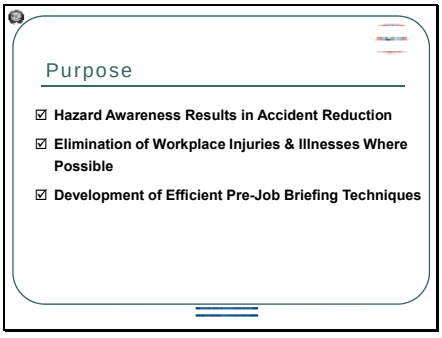

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Job Briefings

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

Slide 5

Three Basic Steps

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

Slide 6

Employer Requirements

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

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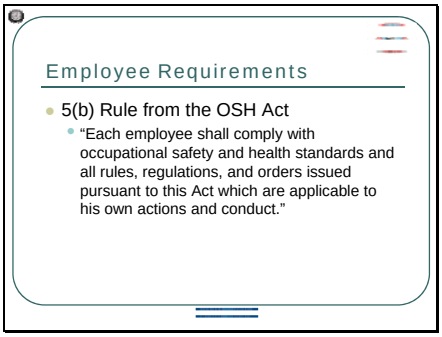

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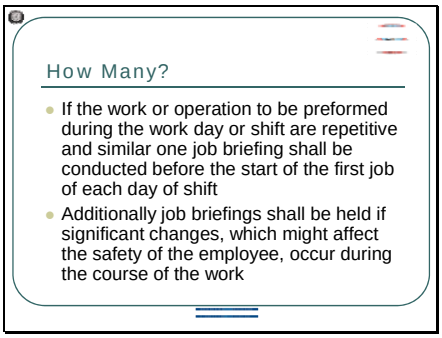

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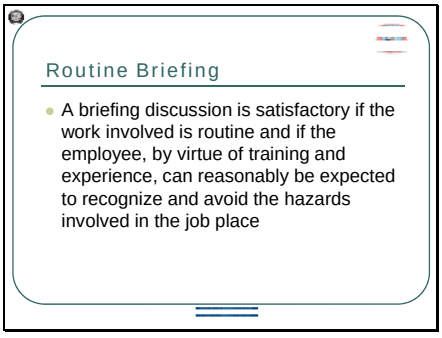

Slide 10

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

Slide 11

Other Issues

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

Slide 12

Personal Protective Equipment

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

Slide 13

Working Alone

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

Slide 14

Emergency Procedures

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

Slide 15

Another Name

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

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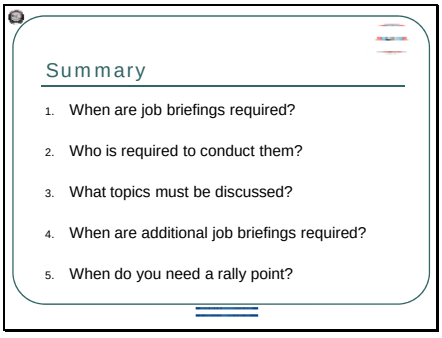

	Electrical Transmission & Distribution Partnership 10-Hour OSHA Training Course	PARTNERSHIP An OSHA Cooperative Program
	Trenching & Excavations	

Objectives

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

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

i) The OSHA Construction Standard defines a competent person as someone who is:
   a. Capable of identifying existing and predictable hazards in the surroundings, or
   b. Working conditions which are unsanitary, hazardous, or dangerous to employees, and
   c. Who has authorization to take prompt corrective measures to eliminate them

ii) Duties: Protective Systems or Equipment
   a. Monitoring water removal equipment and operations Inspecting excavations subject to runoff from heavy rains to determine need for diversion ditches, dikes, or other suitable protection
   b. Determining cave-in potential to assess need for shoring or other protective system
   c. Examining damaged material or equipment used for protective systems to determine its suitability for continued use Classifying soil and rock deposits, by both visual analysis and by testing, to determine appropriate protection; re-classifying, if necessary, based on changing conditions
   d. Determining the appropriate slope of an excavation to prevent collapse due to surcharge loads from stored material or equipment, operating equipment, adjacent structures, or traffic, and assuring that such slope is achieved

iii) **Duties: Inspecting Trench and Protective Systems**
   a. Authorizing immediate removal of employees from the hazardous area where evidence of possible cave-in, failure of protective systems, hazardous atmospheres, or other hazardous conditions exists

iv) **Duties: Unsafe Access/Egress**
   a. Design structural ramps that are used solely by employees as a means of access or egress. Structural ramps used for access or egress of equipment must be designed by a competent person qualified in structural design

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

i) 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 assess and egress

i) Ladders, Ramps, Stairways

Describe "One-Call" requirements

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

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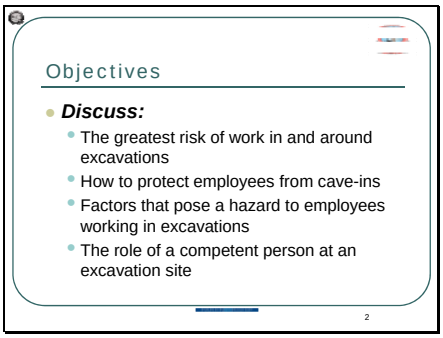

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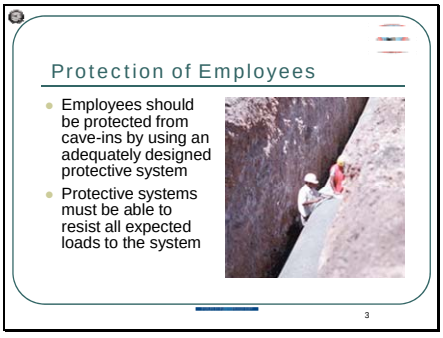

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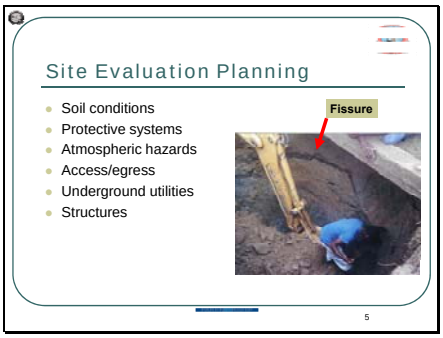

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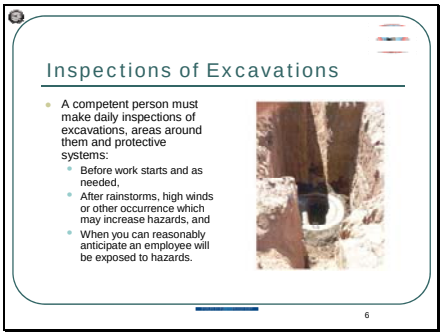

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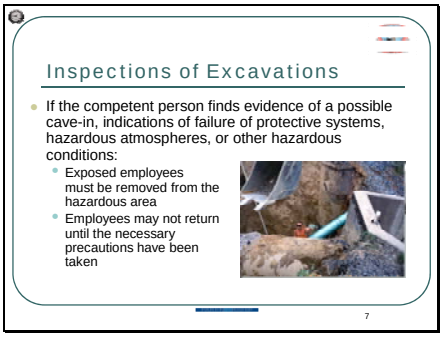

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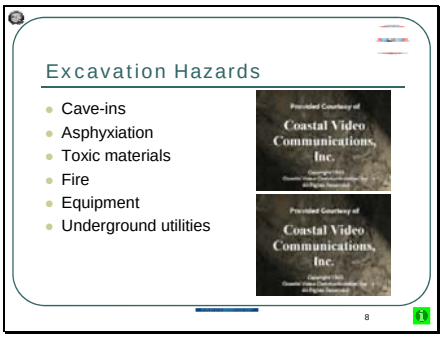

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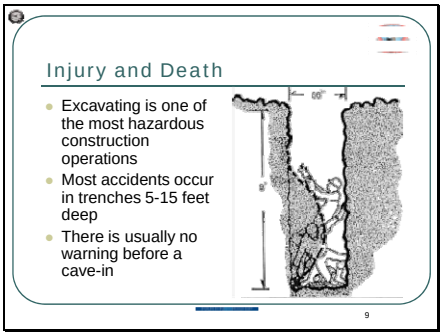

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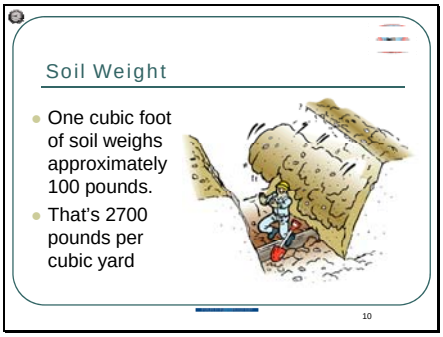

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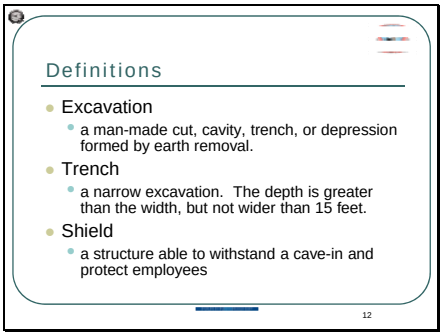

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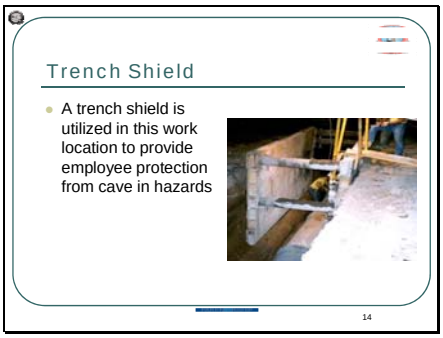

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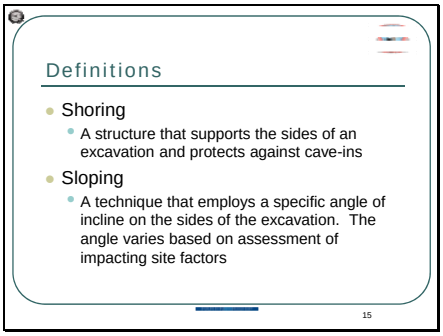

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Shoring

- 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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Hydraulic Trench Support

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

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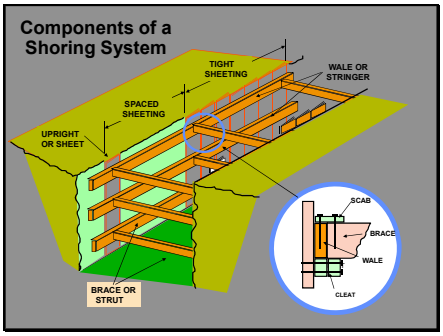

Timber Shoring

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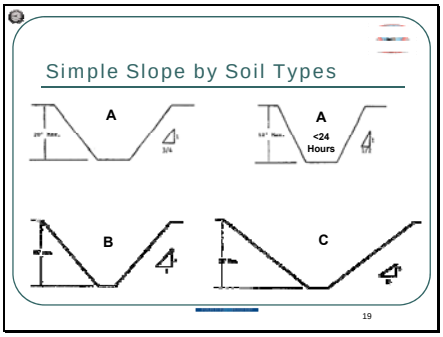

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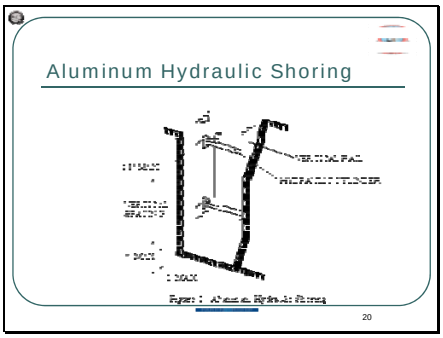

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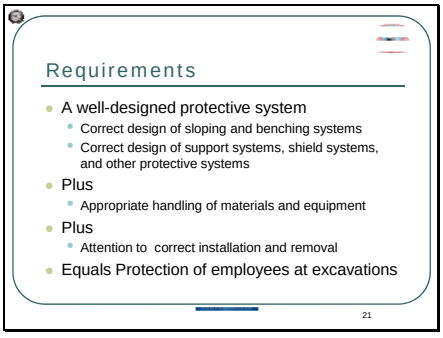

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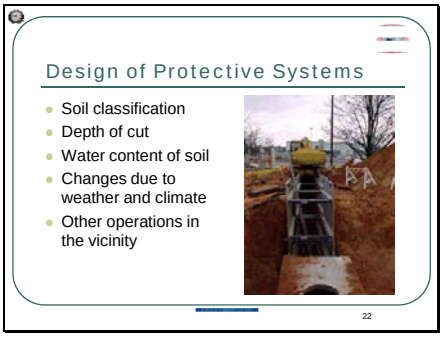

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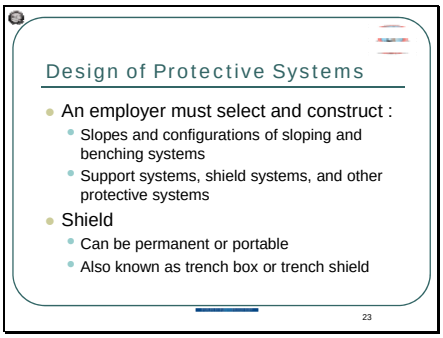

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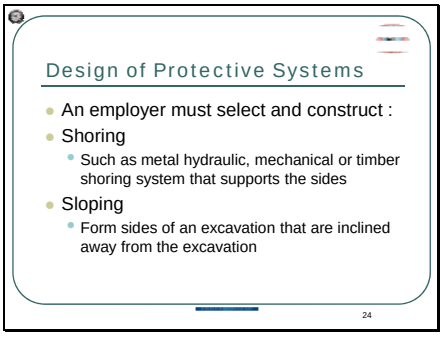

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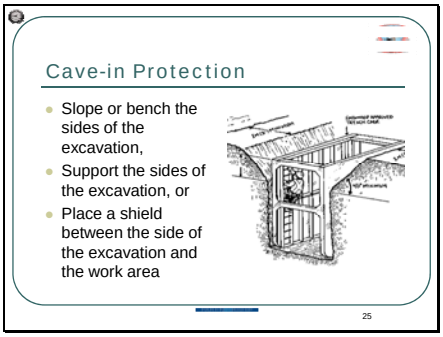

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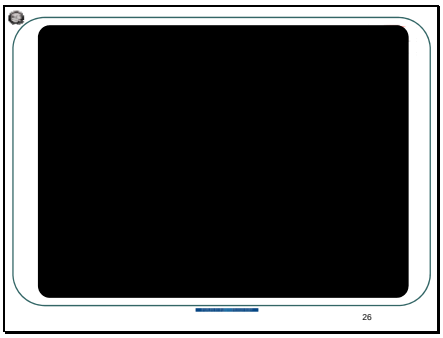

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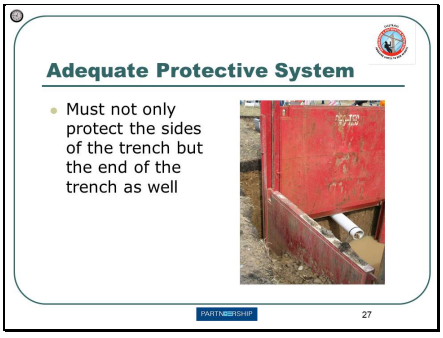

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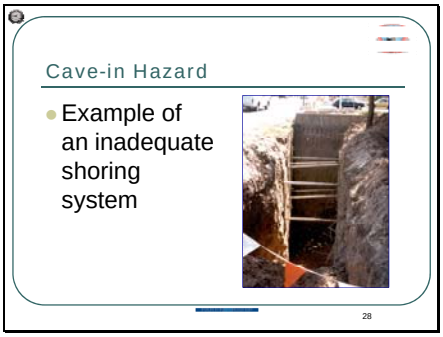

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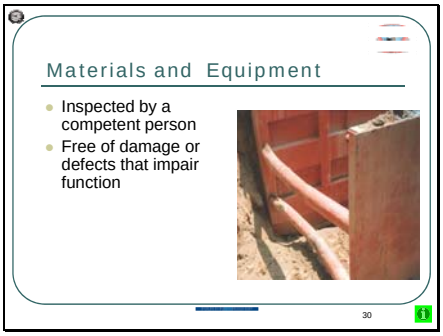

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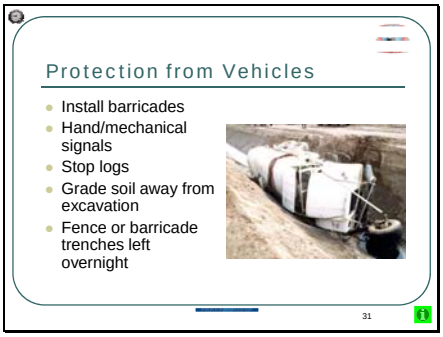

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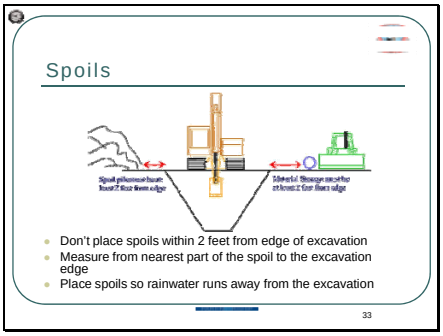

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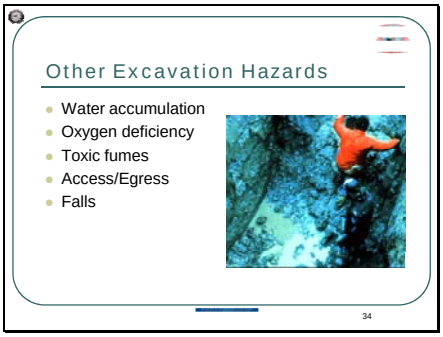

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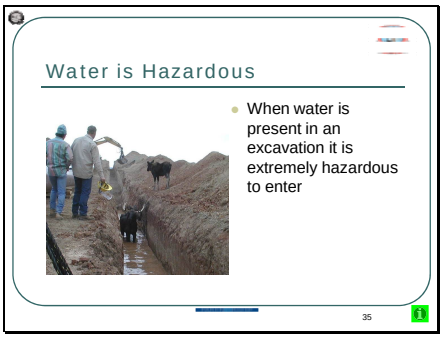

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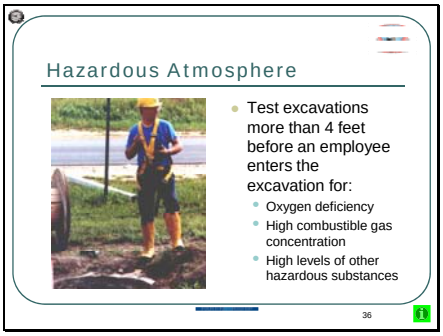

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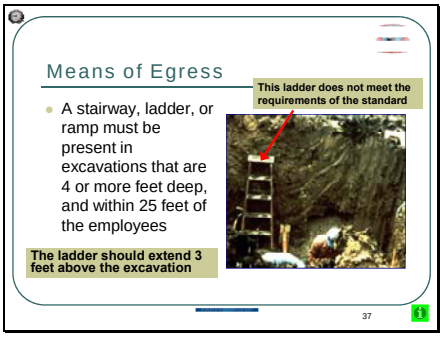

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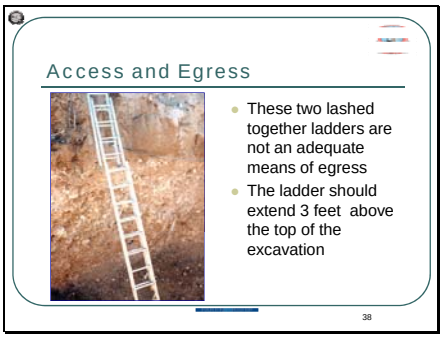

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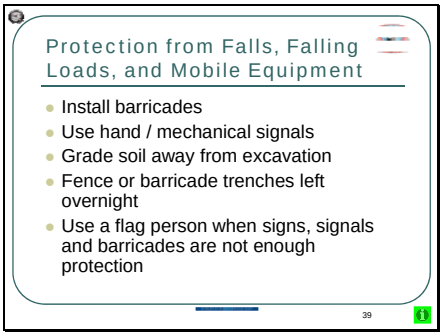

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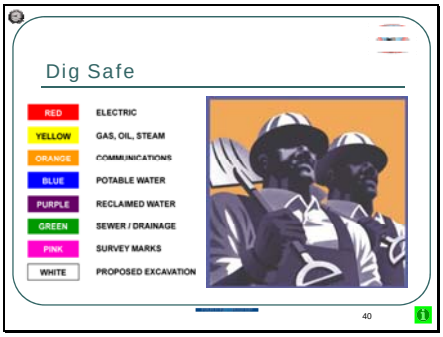

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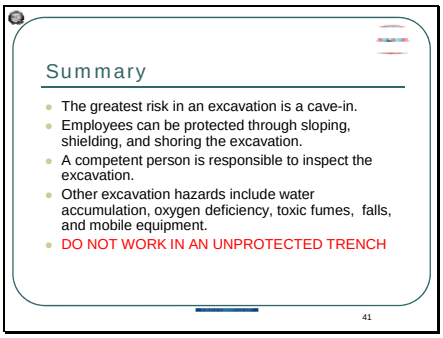

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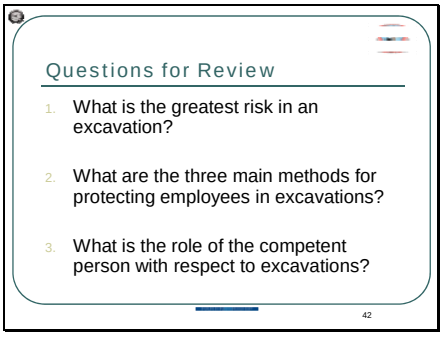

	Electrical Transmission & Distribution Partnership 10-Hour OSHA Training Course	PARTNERSHIP An OSHA Cooperative Program
	Confined and Enclosed Spaces	

Objectives

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

Define a confined and an enclosed space

i) A confined space has limited or restricted means for entry or exit, and it is not designed for continuous employee occupancy. Confined spaces include, but are not limited to underground vaults, tanks, storage bins, manholes, pits, silos, process vessels, and pipelines.

ii) An enclosed space is similar to a confined space as to having limited or restricted means for entry or exit, and it is not designed for continuous employee occupancy. The prime difference is that an enclosed space contains only electrical hazards. *Review 1910.269(e)*

Explain the pre-entry requirements

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

Explain training requirements

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

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

i) Attendants
   a. First aid training
   b. Immediately available outside the enclosed space

ii) Entry supervisor
   a. Determine if acceptable entry conditions are present entry is planned
   b. Authorizing entry and overseeing entry operations
   c. Terminating entry

iii) Qualified Worker
   a. Employees that are trained in and familiar with the safety-related work practices, safety procedures, and other safety requirements that pertain to their respective job assignments
   b. Employees that are trained in and familiar with any other safety practices, including applicable emergency procedures (such as pole top and manhole rescue), that are not specifically addressed the OSHA standards but that are related to their work and are necessary for their safety

iv) Qualified employees are also trained and competent in:
   a. The skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment
   b. The skills and techniques necessary to determine the nominal voltage of exposed live parts
   c. The minimum approach distances specified in this section corresponding to the voltages to which the qualified employee will be exposed
   d. The proper use of the special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools for working on or near exposed energized parts of electric equipment.

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

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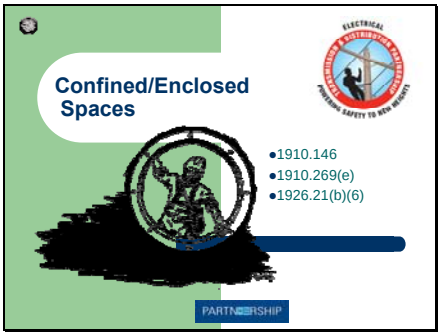

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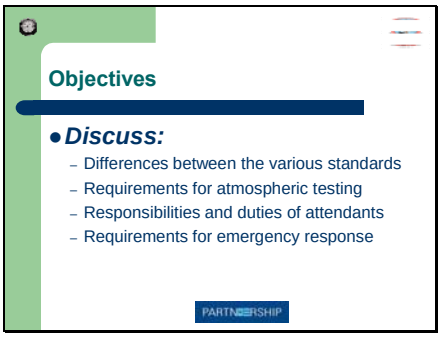

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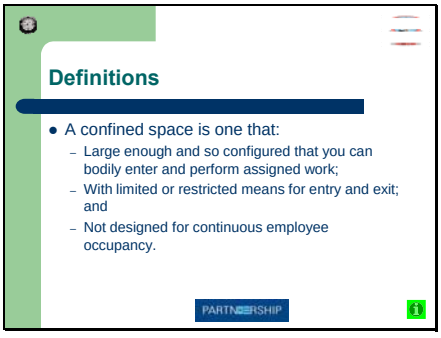

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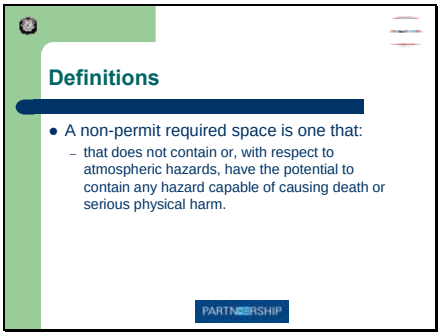

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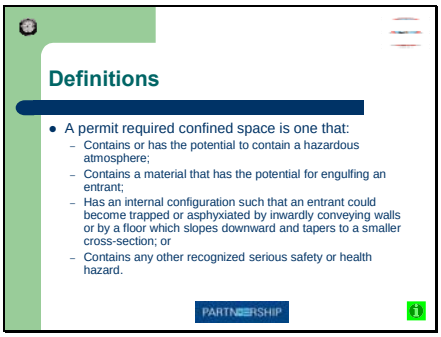

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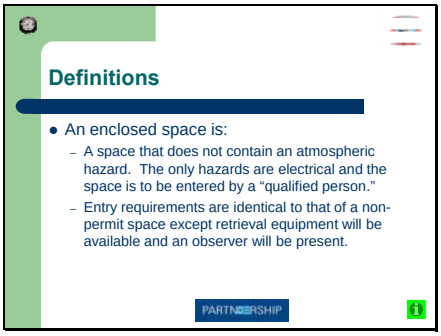

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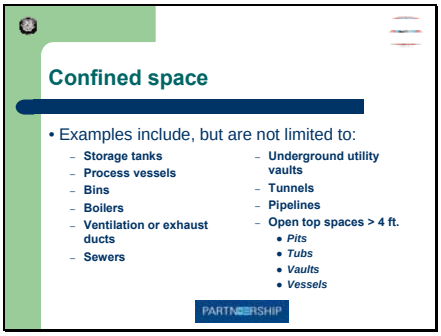

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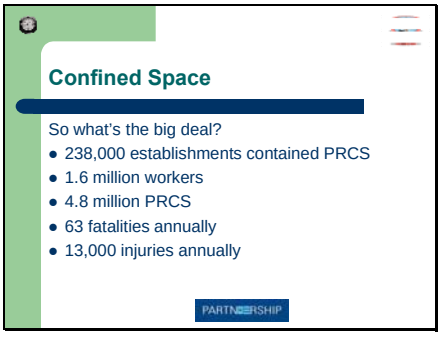


Slide 10

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

PARTNERSHIP

Slide 11

Confined Space

Hazards Present

- Oxygen deficiency
- Flammability
- Toxic contaminants
- Physical hazards

PARTNERSHIP

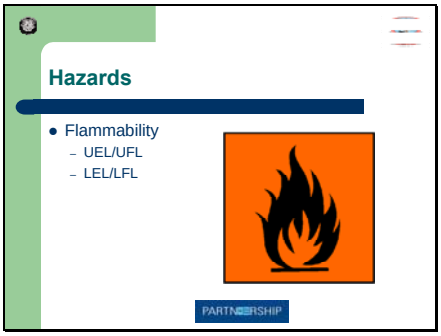
Slide 12

Hazards

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

PARTNERSHIP

Slide 13



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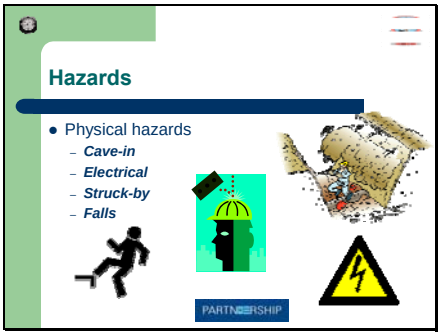

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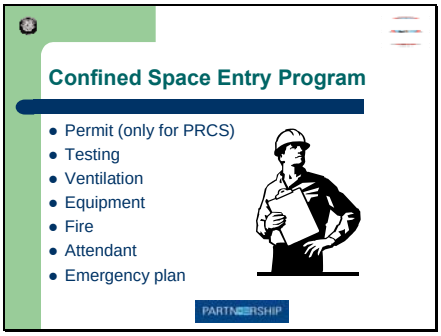

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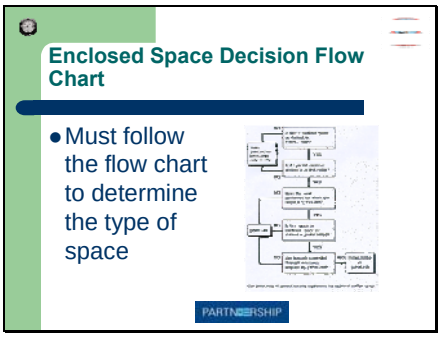

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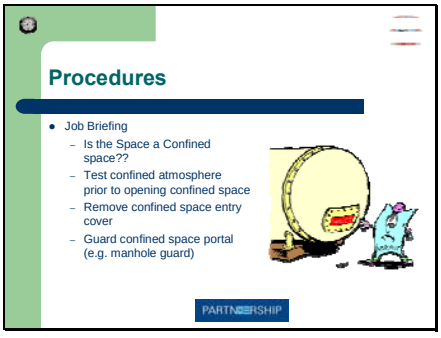

Slide 19

Procedures

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

PARTNERSHIP

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."*

PARTNERSHIP

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

PARTNERSHIP

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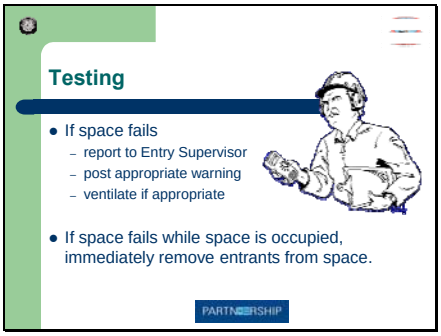

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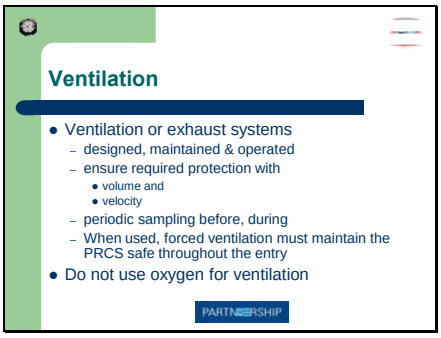

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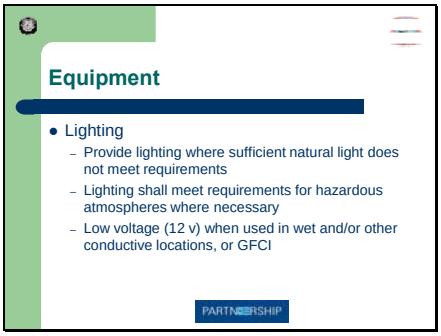

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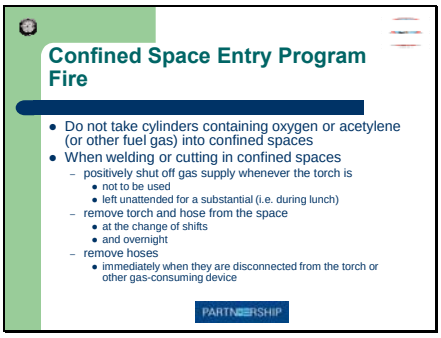

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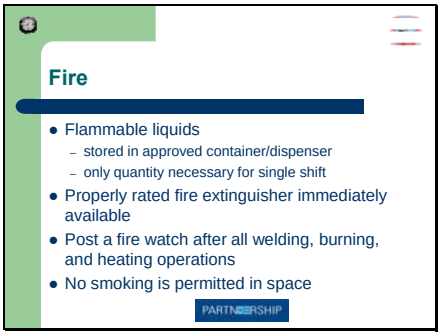

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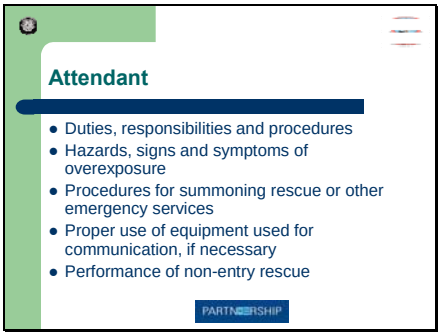

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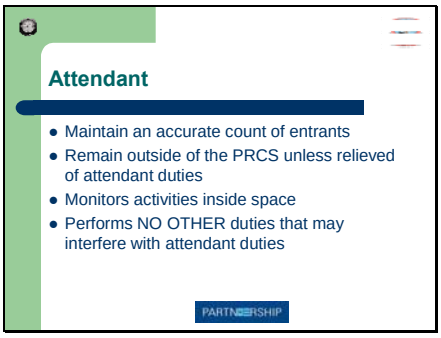

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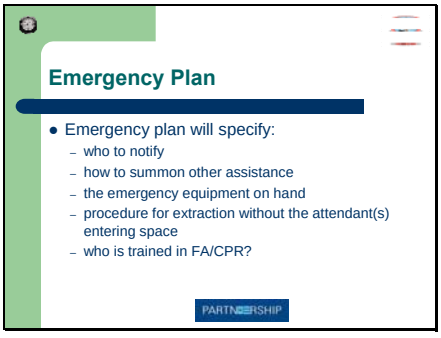

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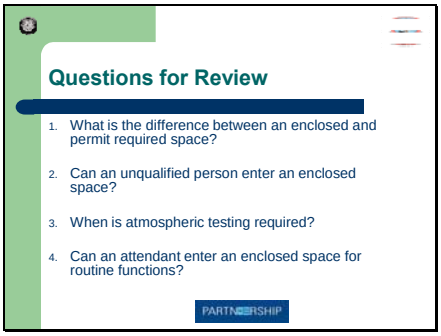
Questions for Review
1. What is the difference between an enclosed and permit required space?
2. Can an unqualified person enter an enclosed space?
3. When is atmospheric testing required?
4. Can an attendant enter an enclosed space for routine functions?
PARTNERSHIP

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	Electrical Transmission & Distribution Partnership 10-Hour OSHA Training Course	PARTNERSHIP An OSHA Cooperative Program
	Fall Protection	

Objectives

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

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

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

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

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

Discuss requirements for employees working from aerial lift devices.

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

Explain requirements for qualified employees climbing power-line support structures

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

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

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

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

Explain anchorage requirements

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

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

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

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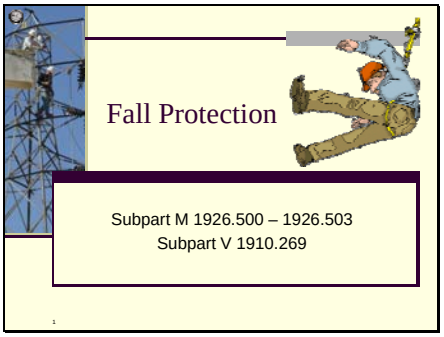

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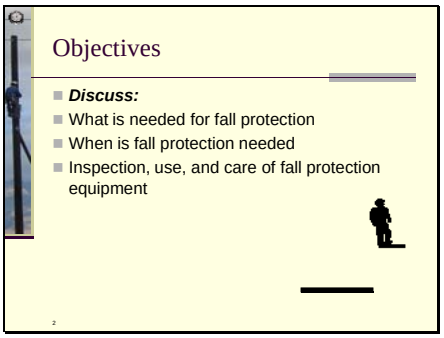

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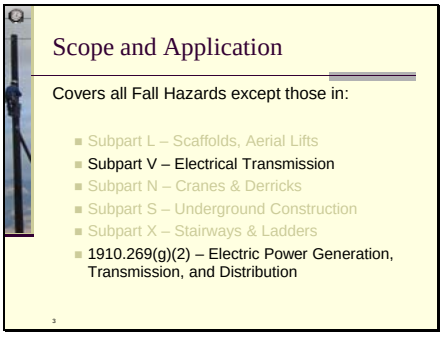

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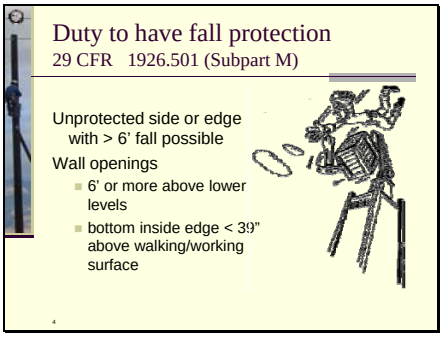

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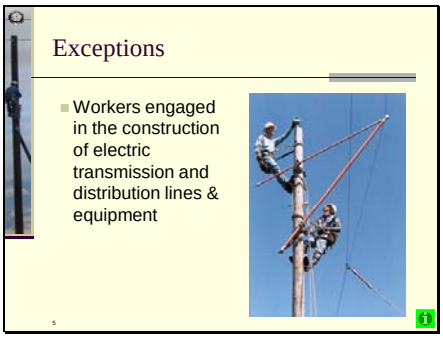

Slide 6

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)

8

Slide 9

Systems
1926.502

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

9

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

11

Slide 12

Roll-out

Caused by non-compatible connections

Eliminated by using locking snap hooks

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Slide 13

Body Harness Inspection

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

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Slide 14

Damaged/Defective Equipment

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

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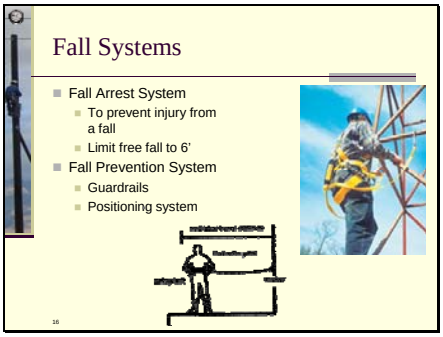
Slide 15

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

Slide 16



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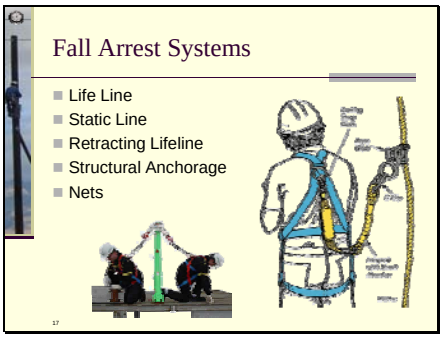

Slide 18

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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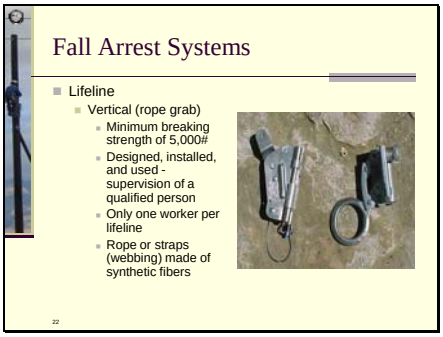
Slide 22



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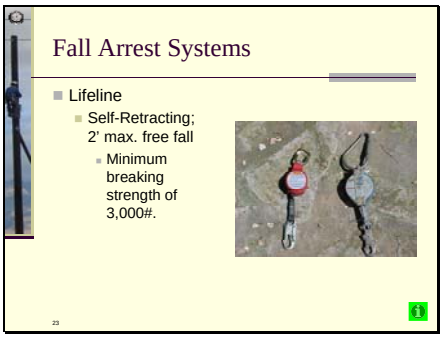

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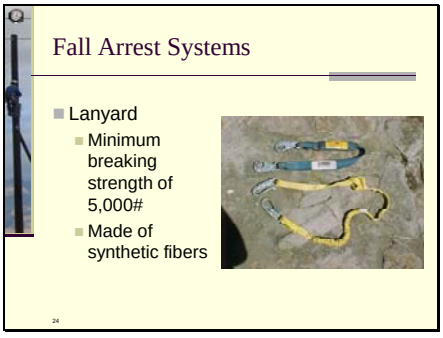

Slide 25

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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Slide 28

Tie Back

Snap hooks shall not be engaged directly to webbing

Must be designed for that application

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Slide 29

Fall Arrest Systems

- Performance
  - rigged such that free fall is not more than 6',
  - and no contact is made with a lower level,
  - and bring employee to full stop within 3.5',
  - lanyard & harness by same manufacturer,
  - worn snugly,
  - provide for prompt rescue,
  - Std based on employee + tools of 310 pounds.

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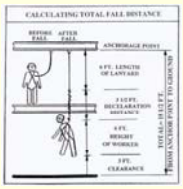
Fall Clearance Distance

- To ensure an employee does not strike the floor or other structure – 12.5 to 19.5 feet of clearance distance is typically needed.



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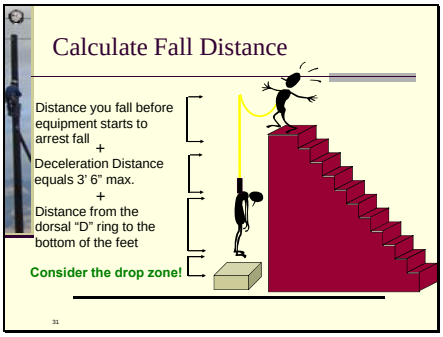

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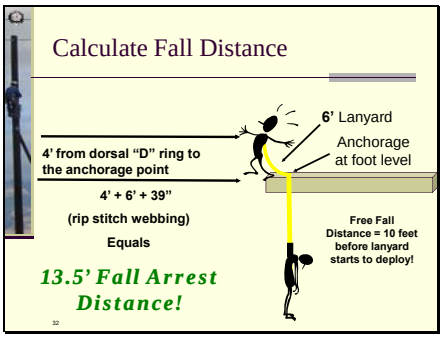

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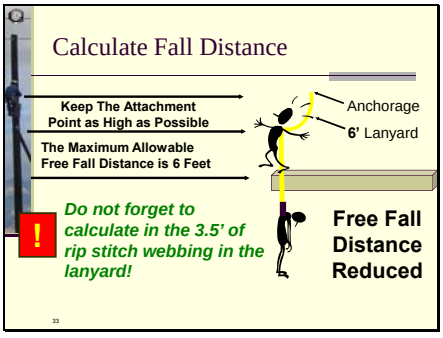

Slide 34

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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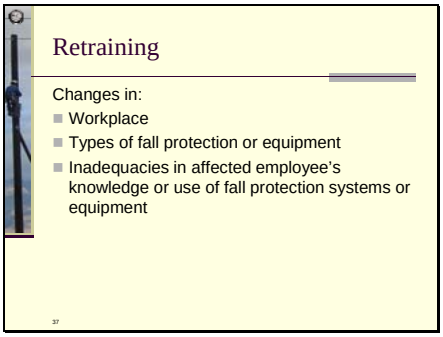
Slide 37



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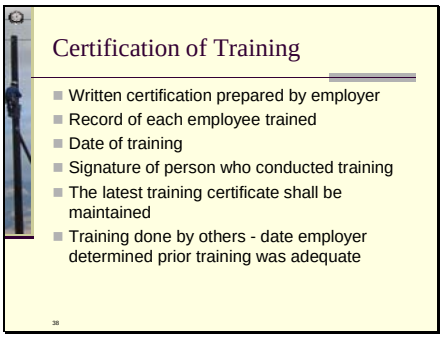

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