

## IDENTIFICATION

TOPIC TITLE: Electrical

MINIMUM TIME: 1 hour

## OBJECTIVES

### Terminal Objective:

Given current OSHA and industry information regarding construction worksite illnesses, injuries, and/or fatalities, the student will be able to recognize how to protect themselves from electrical hazards.

### Enabling Objectives:

1. Identify major electrical hazards.
2. Describe types of electrical hazards.
3. Describe electrical protection methods.
4. Recognize employer requirements to protect workers from electrical hazards.

## INSTRUCTOR MATERIALS AND RESOURCES

- PowerPoint presentation: *Electrical*
- Knowledge Check Answer Key: *Electrical*
- Internet access to show videos linked in PPT presentation

## STUDENT MATERIALS

- OSHA Fact Sheet: *Working Safely with Electricity*
- Knowledge Check: *Electrical*

## TEACHING PROCEDURES ---Preparation, Presentation, Application, Evaluation

### Anticipatory Set (Focus Attention/Gain Interest)

***Estimated Time: ?? hours***

Key Points	Methods
Ask class to define electricity; also discuss related terms including: current, resistance, voltage, conductors, insulators, and grounding.  Ask the class if they can give an example of an electrical hazard that could cause a worker to be electrocuted.  Discuss the examples with the class.	PPT slides #1 - #7

# 10-hour General Industry Outreach

Show the below videos identifying two electrical hazards that caused fatalities. Discuss the videos with the class.

[https://www.osha.gov/video/shipyard\\_accidents/08\\_welder\\_electrocuted.html](https://www.osha.gov/video/shipyard_accidents/08_welder_electrocuted.html)

[https://www.osha.gov/video/shipyard\\_accidents/15\\_lockout\\_tagout\\_failure.html](https://www.osha.gov/video/shipyard_accidents/15_lockout_tagout_failure.html)

OSHA videos:

Runtime: 00:02:23

Runtime: 00:01:56

## ***Presentation (Instruction)***

***Estimated Time: ?? hours***

### Key Points

### Methods

#### I. Identify major electrical hazards

##### A. BE SAFE

1. Burns
2. Electrocution
3. Shock
4. Arc Flash/Arc Blast
5. Fire
6. Explosions

##### B. Examples of fatal accidents

1. Case #1 – worker electrocuted when ladder contacts overhead power lines
2. Case #2 – worker electrocuted when mast on drilling truck contacts high voltage overhead lines
3. Case #3 – worker electrocuted while changing energized ballast on light fixture and falls from an 8' ladder onto a concrete floor.

##### C. Statistics

1. 156 electrocutions in 2014
2. 141 electrocutions in 2013

PPT slides #8 - #18

#### **NOTE:**

For the most current statistical data, or for more detail, see:

<http://www.bls.gov/iif/>

[illegible]

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- E. Ensure power tools are maintained in safe condition
- F. Ensure proper guarding
- G. Provide training
- H. Enforce LOTO safety related work practices
- I. Ensure proper use of flexible cords and power strips
- J. Ensure proper identification of power sources

### ***Application (How students apply what they learn)***

***Estimated Time: ?? hours***

Key Points

Methods

Show pictures of electrical hazards and have students explain ways to mitigate the hazards.

PPT #47 - #48

### ***Evaluation/Summary***

***Estimated Time: ?? hours***

Key Points

Methods

Knowledge Check: *Electrical*

PPT #49 - #55

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## References

### OSHA Standard

[https://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=STANDARDS&p\\_id=10135](https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10135)

- [1910.301 - Introduction.](#)
- [1910.302 - Electric utilization systems.](#)
- [1910.303 - General.](#)
- [1910.304 - Wiring design and protection.](#)
- [1910.305 - Wiring methods, components, and equipment for general use.](#)
- [1910.306 - Specific purpose equipment and installations.](#)
- [1910.307 - Hazardous \(classified\) locations.](#)
- [1910.308 - Special systems.](#)
- [1910.331 - Scope](#)
- [1910.332 - Training](#)
- [1910.333 - Selection and use of work practices](#)
- [1910.334 - Use of equipment.](#)
- [1910.335 - Safeguards for personnel protection.](#)

### OSHA Publications

- *Circuit Breakers: Incorrectly Refurbished Circuit Breakers Hazard Alert* (2011) (English: [HTML PDF\\*](#))
- *Electric Power: Electrical Protective Equipment Requirements* (OSHA 3875 - 2016) (English: [PDF\\*](#))
- *Electric Power: Fall Protection Requirements* (OSHA 3874 - 2016) (English: [PDF\\*](#))
- *Electric Power: Major Changes to the Rule* (OSHA 3872 - 2016) (English: [PDF\\*](#))
- *Electric Power: Minimum Approach Distance, Information Transfer and Training Requirements* (OSHA 3873 - 2016) (English: [PDF\\*](#))
- *Electrical Hazards: Controlling Electrical Hazards* (OSHA 3075 - 2002) (English: [HTML PDF\\*](#))
- *Electrical Hazards: Downed Electrical Wires Fact Sheet* (2005) (English: [HTML PDF\\*](#))
- *Electrical Safety Hazards of Overloading Cable Trays Fact Sheet* (2006) (English: [HTML PDF\\*](#))
- *Electrical Safety QuickCard™* (OSHA 3294 - 2013) (English: [HTML PDF\\*](#)) (OSHA 3294 - 2013) (Spanish: [PDF\\*](#))
- *Electricity: Working Safely with Electricity Fact Sheet* (English: [HTML PDF\\*](#)) (Spanish: [PDF\\*](#))
- *Farmworker Electrocution: Fatal Facts* (OSHA 3817 - 2015) (English: [PDF\\*](#))
- *Generator Safety QuickCard™* (OSHA 3277 - 2005) (English: [HTML PDF\\*](#)) (Spanish: [HTML PDF\\*](#))

- *Hazards of Improper Elevator Controller Wiring* (2004, August 16) (English: [HTML](#) [PDF\\*](#))
- *Lockout/Tagout Fact Sheet* (2002) (English: [PDF\\*](#))
- *Possible Failure of Metal Halide Lamps* (2000, September 13) (English: [HTML](#) [PDF\\*](#))
- *Potential for Feed Water Pipes in Electrical Power Generation Facilities to Rupture Causing Hazardous Release of Steam and Hot Water* (1996, October 31) (English: [HTML](#))
- *Potential Hazards of Mislabeled Steel Toe Logger Boots* (2004, September 30) (English: [HTML](#) [PDF\\*](#))
- *Safely Installing, Maintaining and Inspecting Cable Trays* (2009, January 16) (English: [HTML](#) [PDF\\*](#))
- *Snow Removal: Falls and Other Hazards to Workers Removing Snow from Rooftops and Other Elevated Surfaces* (OSHA 3513 - 2012) (English: [HTML](#) [PDF\\*](#))
- *Special Purpose Particle Accelerators* (2009, July 31) (English: [HTML](#) [PDF\\*](#))
- *Tree Care Work: Electricity and Tree Care Work Pamphlet* (OSHA 3861 - 2016) (English: [PDF\\*](#)) (OSHA 3861 - 2016) (Spanish: [PDF\\*](#))
- *Work Practices Employed by the Electric Utilities Industry Regarding Sulphur Hexafluoride Gas-Insulated Circuit Breakers* (1989, January 30) (English: [HTML](#))

## OSHA References/Resources

Electrical Safety eTool:

[http://www.osha.gov/SLTC/etools/construction/electrical\\_incidents/mainpage.html](http://www.osha.gov/SLTC/etools/construction/electrical_incidents/mainpage.html)

Electrical Safety and Health Topics:

<http://www.osha.gov/SLTC/electrical/index.html>

Electrical Safety-Related Work Practices – Inspection Procedures and Interpretation Guidelines

[https://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=DIRECTIVES&p\\_id=1750](https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=DIRECTIVES&p_id=1750)

Electric Power Generation, Transmission, and Distribution; Electrical Protective Equipment; Corrections,

[https://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=FEDERAL\\_REGISTER&p\\_id=24734](https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=FEDERAL_REGISTER&p_id=24734)

## Other Resources

Preventing Worker Deaths and Injuries from Contacting Overhead Power Lines with Metal Ladders,

<http://www.cdc.gov/niosh/docs/wp-solutions/2007-155/pdfs/2007-155.pdf>

Preventing Electrocutions of Crane Operators and Crew Members Working near Overhead Power Lines,

<http://www.cdc.gov/niosh/docs/95-108/>

Preventing Injuries and Deaths from Metal- Reinforced Hydraulic Hoses,

<http://www.cdc.gov/niosh/docs/93-105/>

Preventing Electrocutions during Work with Scaffolds near Overhead Power Lines,

<http://www.cdc.gov/niosh/docs/91-110/>

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Preventing Electrocutions from Contact between Cranes and Power Lines,

<http://www.cdc.gov/niosh/docs/85-111/>

Electrical Safety:

<http://www.cdc.gov/niosh/topics/electrical/>

Electrical Safety: Safety and Health for Electrical Trades Student Manual:

<http://www.cdc.gov/niosh/docs/2009-113/default.html>

Electrocutions during Work with Scaffolds near Overhead Power Lines:

<http://www.cdc.gov/niosh/91-110.html>

Fatality Assessment and Control Evaluation (FACE) Program:

<http://www.cdc.gov/niosh/face/>

NFPA 70E: Standard for Electrical Safety in the Workplace®

<http://www.nfpa.org/aboutthecodes/AboutTheCodes.asp?DocNum=70E>

NIOSH Electrical Safety Manual:

<http://www.cdc.gov/niosh/docs/2009-113/>

NIOSH Face Reports:

<http://www.cdc.gov/niosh/face/stateface.html>

Portable Generator Safety Tips OSHA Quick Card:

Preventing Fatalities of Workers Who Contact Electrical Energy:

<http://www.cdc.gov/niosh/87-103.html>

Preventing Electrocutions Due to Damaged Receptacles and Connectors:

<http://www.cdc.gov/niosh/87-100.html>