

ELECTRICAL SAFETY Protecting Employees from Electrical Hazards







Introduction

There are roughly 150 workplace fatalities annually due to exposure to electricity, with an average of 2,428 non-fatal injuries.











workplace.

something about it.

By controlling or eliminating the hazard, you have made the workplace safer.

Injury Prevention

A safe work culture will help make a safer work

Hazard recognition is the first step in having a safe

Once you recognize the hazard, you must do





Ask yourself the question "What IF I could go my entire career injury free?"

Injury Free is a cultural attitude. It is a way of thinking that prevents injuries, making safety a high priority at both the personal and organizational levels.

https://doli.virginia.gov/what-if/





Electrical safety focuses on preventing electrocution and other electrical hazards by establishing standards for electrical equipment, work practices, and training, with a strong emphasis on lockout/tagout procedures and safe distances from energized lines.

Electrical Safety

Electrical Standards

- VOSH's electrical standards are based on the National Fire Protection Association Standards NFPA 70, National Electric Code, and NFPA 70E, Standard for **Electrical Safety for Employee Workplaces.**
- Only qualified employees may conduct electrical work.
- Special training is required for qualified employees:
 - Safe Work Practices
 - Isolation of Electrical Sources
 - Test Equipment
 - Tools & PPE





Common Causes of Electrocution

Contact with Live Circuits

Poorly Maintained Extension Cords

Defective Power Tools



- **Contact with Overhead Power lines**
- Not following Lock/Tag-out procedures

Electrical Hazard Exposures

The 10 occupations with the highest number of electrical fatalities

- electricians
- laborers
- construction laborers
- electrical power installers & repairers
- tree trimming
- electricians' apprentices
- HVAC mechanics
- roofers
- heavy truck drivers
- painters in construction or maintenance

In 2020, 44% of electrical fatalities involved workers in construction, while 20% involved those in installation, maintenance, and repair.



Types of Direct Injuries

When an electrical shock enters the body it may produce different types of injuries. Electrical shock results in internal and external injury to body parts or the entire body – often resulting in death. Internal or external burns may result from contact with electricity. Indirect injuries could also include falls or fire.







Burns

Shock Severity





Severity of the shock depends on:

- Path of current through the body • Amount of current flowing through the body (amps) • Duration of the shocking current through the body • LOW VOLTAGE DOES NOT MEAN LOW HAZARD

- Other factors that may affect the severity of the shock are: The voltage of the current. ullet
 - The presence of moisture
 - The general health of the person before the shock.

the circuit.

Low voltages can be extremely dangerous because, all other factors being equal, the degree of injury increases the longer the body is in contact with

Arc Blast/Flash





arc blast.



• When an arc fault occurs, the result is a massive electrical explosion. The light and heat emitted by the explosion is known as the arc flash, and the pressure wave is known as the

• Pressure waves generated by an arc flash explosion can carry a force up to thousands of pounds per square inch.

• Powerful enough to knock down or throw nearby workers, and cause damage to the eardrums, lungs, brain and other organs. Other effects of arc blast include high temperatures.

Signs that Electrical Hazards Exist



- Tripped circuit breakers or blown fuses • Warm tools, wires, cords, connections, or junction boxes
- GFCI that shuts off a circuit
- or connection
- Worn or frayed insulation around wire

Overhead Power Line Hazards

Workers must maintain a safe distance (typically 10 feet) from overhead power lines and other energized equipment.

Examples of equipment that can contact power lines:

- Crane
- Ladder
- Scaffold
- Backhoe
- Scissors lift
- Raised dump truck bed
- Aluminum paint roller

Overhedd Power Line Requirements

The VOSH requirements limit crane operations to a minimum clearance of 10 feet for lines rated at 50 kilovolts (kV).

Follow safe distance operating instructions for all power lift equipment.

29 CFR 1926.1408 **Table A**

Volta Up to Abov Abov Abov Abov

age
50 kV
e 50-200 kV
e 200-350 kV
e 350-500 kV
e 500-750 kV

35 feet ۷v Above 750-1000 kV 45 feet Above 1000 kV (As established by the utility owner/

10 feet

15 feet

20 feet

25 feet

operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution)

Minimum Clearance Distance

Figure 1. OSHA's minimum clearance distances.

Electrical Hazard Controls

• Qualified Personnel:

- Only qualified employees should work on or near energized electrical equipment.
- Proper Use of Equipment:
 - Electrical equipment must be used according to its intended purpose, and damaged or defective equipment should not be used.
- Grounding:
 - Electrical equipment and systems must be properly grounded to prevent shock hazards.



Safety Related Work Practices

Employees must not work near any part of an electric power circuit that the employee could contact in the course of work, unless the employee is protected against electric shock by de-energizing the circuit and grounding it or by guarding it effectively by insulation or other means.



Use barriers and guards to prevent passage through areas of exposed energized equipment



Pre-plan work, post hazard warnings and use protective measures



Keep working spaces and walkways clear of cords



Lockout/Tagout (LOTO)

The OSHA standard for The Control of Hazardous Energy (Lockout/Tagout)

29 CFR 1910.147

Lockout-tag-out (LOTO) is a safety procedure which is used in industry to ensure that dangerous machines are properly shut off and not able to be started up again prior to the completion of maintenance or servicing work

Locks and Tags

Lock & Tag all energy sources

- Place Lock & Tag on each disconnecting means used to de-energize circuits
- Attach a lock to prevent operating the disconnecting means
- Place a Tag with each lock
- Only the person who places the lock may remove it.

LOTO Program

An electrical Lockout/Tagout (LOTO) program is a safety procedure that ensures equipment is properly shut down and cannot be unexpectedly restarted during maintenance or servicing, preventing accidents caused by the release of hazardous energy.



List all Equipment

Identify all energy sources, hazards, and control measures



Describe energy control method for each piece of equipment or task



LOTO Program

function of the energy control program including a policy that includes

- Authorized employees
- Affected employees
- Other employees
- Locks vs. Tags
- Steps for energy isolation and removal of isolation.

- Workers must understand the purpose and

Authorized Employees

Special Training is required for work on electrical equipment. Such training is for Authorized Employees and it covers:

- Safe Work Practices
- Isolation of Electrical Sources
- Test Equipment
- Tools & PPE







Portable Electrical Tools and Cords

- Portable equipment must be handled in a manner that will not cause damage.
- Flexible electric cords connected to equipment may not be used for raising or lowering the equipment.
- Flexible cords may not be fastened with staples or otherwise hung in such a fashion as could damage the outer jacket or insulation.
- Have a three-wire cord with ground plugged into a grounded receptacle, or be double insulated



Ground Fault Circuit Interrupters (GFCI)

- Protects you from shock
- wires
- of a second
- Use GFCI's on all 120-volt, single-phase, 15- and 20-ampere receptacles, or have an assured equipment grounding conductor program.

Detects a difference in current between the black and white

If ground fault detected, the GFCI shuts off electricity in 1/40th

Ground-Fault Circuit Interrupter





GFCIS

- Protects you from shock
- GFCIs can be used on portable generators
- 1926.404(b)(1)



Electrical Safety PPE



100% cotton long sleeve shirts

- Heavy duty Leather Coat
- Heavy duty cotton long pants
- Safety glasses or arc flash shield
- Hearing protection
- Leather work book –non-steel toe
- Gloves rated for the electrical work with outer leather DO NOT WEAR polyester clothing or clothes that are
- highly flammable







Employees must receive adequate training on electrical safety procedures and hazards.

Qualified employees, such as engineers, electricians, electronic technicians, and power line workers work with electricity directly.

Affected employees, such as office workers and sales people work with it indirectly.

Training



Your Responsibility

Know the hazards of electricity

Know the equipment

Use safe work practices

Inspect your PPE before each use

Only qualified employees are trained and qualified to work on energized circuits

VOSH Consultation Services

For more information about this training or any of our free consultation services, please contact us





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