Electrical Safety
&
LO/TO
Contents

- Introduction and Purpose
- What Standards Apply?
- Examples of Electrical Electricity
- Safe Work Practices
- Lockout/Tagout (LO/TO)
- Summary & Resources
- Q&A
Introduction and Purpose

To provide employees with information and training to create awareness of these hazards and to promote safety-related work practices
What Standards Apply?

Electrical Safety is regulated by many agencies. Some of these include:

- OSHA
- NFPA
- Building Code Standards
- Local and State Governments

Any or all of these standards may apply to your place of work, but since this training program is designed with “worker safety” in mind, the focus will be on OSHA’s rules.
Electrical Hazards

Electrical hazards can cause:

- Fire
- Shock
  - Occurs when body comes in contact with flow of electricity; direct contact is not necessary
  - Example: The boom of a truck contacts overhead power and you touch the vehicle while on ground
- Burns
  - Electrical, arc and thermal
Effects of Electricity on the Human Body

- Minor tingling
- Internal organ damage
- Burns
- Death
What are some examples of potential electrical hazards at the workplace?

- Office setting “rats nests”
- Overloading
- No grounding
- Unlabeled or open equipment
- Improper chemical storage near electrical equipment
- Power lines or other electrified objects
- Many others….too numerous to name
Electrical Hazards - Desk Areas/Work Stations ("rats nests")
Electrical Hazards - Ungrounded Equipment

- Electricity will (sometimes, but not always) take the path of least resistance.
- When equipment is grounded, the current will take a path through the ground wire rather than though the person touching the failed equipment because the human body is more resistant than ground wire.
Electrical Hazards – Overloaded Circuits

- Use a single plug for each electrical connection
- Multiple plugs for additional connections must be avoided
- Do **not** overload circuits
Electrical Hazards –
Unlabeled/Open Equipment

- All panel and circuit boxes must be labeled with maximum voltage on the outside of the front cover
- All circuits and breakers must be labeled....someone should not have to “guess” what circuit goes to which piece of equipment!
- Keep panel doors closed when not being serviced
Electrical Hazards – Improper Chemical Storage

- This is a bottle of xylene...a very flammable and combustible substance
- Flammable and combustible chemicals and materials (including wood and paper) must never be placed or stored near breaker boxes, panels, etc.

An example of where not to store chemicals
Electrical Hazards – Overhead Power Lines

- Keep 10 foot clearance from overhead power lines with 50kV or less; 4 feet more for every 10kV
- Only skilled and trained persons are allowed to work near power lines
Electrical Hazards - Other Common Hazards

- Unplug coffee pots, fans, and other equipment when not in use
- Do the “walk-around” survey before you leave each day to make sure coffee pots and other similar items are unplugged
ELECTRICAL EQUIPMENT SAFETY

Electrical equipment may be maintained ONLY by employees who have been properly trained and authorized to do so.

DANGER
ELECTRICAL HAZARD
AUTHORIZED PERSONNEL ONLY
Determining Energized Parts

How do you determine if something is energized?

- Voltage testers are used to test poles and any associated hardware.
- Visual inspection:
  - Is the circuit open or closed?
  - Are there any visible indicators that the system is energized?
  - Are there audible indicators?

Always assume equipment is energized until proven otherwise!
Grounding

- Ensures there is a path of low resistance to ground if there is an electrical equipment failure
- Grounding is works by connecting all the non-current carrying metal parts together and then connecting them to the ground
- It is important that the grounding conductor is firmly attached
Ground Fault Interrupters (GFIs)

- Detect “leaks” (but not over-current)
- Can be permanently mounted or portable
- Must be used on all 120 volt, single-phase, 15- and 20-ampere receptacle outlets on construction sites, which are not part of permanent wiring
- Must be tested to ensure working properly
- Must be marked with manufacturer’s name and applicable rating
Plugs

- All electrical equipment must be plugged into grounded (three-prong) outlets.
- Do not use adapters that will allow an equipment to be plugged into an ungrounded (two-prong) outlet.
- Never attempt to operate an electrical equipment that has had the grounding prong removed.
- Never modify the polarized blade of 2 prong electrical plugs.
Cord Safety

• Never pull on the cord of an electrical appliance to unplug the device from the wall.

• Report all damaged cords to you supervisor for repair.
Cords

- Extension cords must **not** be used to provide power for permanent installations
- Never string an extension cord across a walkway
- Never use equipment that has a damaged cord
- Repair or dispose of damaged cord immediately
Extension Cords

- Make sure cord is rated for the load it will carry and is the 3-wire type
- Inspect cords for signs of defects
- Use ground fault interrupts when possible
- Never drape cord over metal ductwork or piping
- Never alter a cord to perform a task
- Never remove the grounding prong to fit the plug into a two-pronged receptacle
Batteries included...

- For equipment powered by rechargeable batteries follow manufacturers instructions.
- Always use the recharging device supplied with the equipment.
Repair and Maintenance

- All portable electrical appliances must be unplugged before disassembling, cleaning or reassembling.

- Operate electrical appliances with all guards and safety devices in place.
Safe Work Practices - Other

- All electrical work must comply with the National Electrical Code
- Use non-conductive ladders around electrical equipment
- Never exceed the capacity by overloading circuits
- Never reach blindly into an electrical cabinet
- Use illumination when needed
- Secure doors or openings that could bump you into an energized part
Electrical Safety-Lockout/Tagout (LO/TO)

• Lockout and Tagout is a technique used to prevent the release of hazardous energy, or to prevent the hazardous energy from escaping.

• It is a very specific and stringent OSHA program.

• It covers electrical energy sources, as well as other types of energy such as steam, pressure, weighted objects, and moving machinery parts.
Even office equipment can require some sort of LO/TO controls to prevent energization of moving parts or electrical shock.

Many types have “automatic” LO controls; if you open a tray of service door, the equipment will not run (e.g., sort of a combination of LO and machine guarding in one).
The “Fatal Five” Main Causes of Lockout/Tagout Injuries

- Failure to stop equipment
- Failure to disconnect from power source
- Failure to dissipate (bleed, neutralize) residual energy
- Accidental restarting of equipment
- Failure to clear work areas before restarting
Normal Production Operations That Are Covered Under the LO/TO Standard

- The following operations are covered under LO/TO whenever:
  - The employee must either remove or bypass machine guards or other safety devices are bypassed and could present an exposure to hazards at the point of operation
  - An employee places any part of his/her body in contact with the point of operation of the operational machine or piece of equipment
  - An employee places part of his or her body into a danger zone associated with a machine operating cycle
  - Set-up or tear-down of equipment present potential energized-source hazards
Operations Not Requiring LO/TO

• Normal production operations (e.g., during usual production operations)
• Minor tool changes and adjustments provided the work is performed using alternative measures that give effective protection
• Work on cord or plug connected equipment when plug is under exclusive control of the employee performing maintenance
Operations Not Requiring LO/TO

- Remember......cord and plug procedures do not generally require a “procedure” under the LO/TO standard, but employees still have to be trained on how to perform proper disconnect of the energy source and maintain control
Lockout & Tagout Devices
(used to isolate the energy source)
Items that are NOT LO/TO Devices

- Push buttons, selector switches and other control circuit type devices are not energy isolating devices
Who Is Affected By a Lockout/Tagout Program?

• An **Authorized Employee** (e.g., you are authorized and trained to perform a LO/TO procedure), or
• You are either an **Affected Employee** (e.g., you may be working near/on a piece of equipment that may become energized at the wrong moment), or
• **Both**
Roles and Responsibilities - Authorized Employee of LO/TO

- Properly plan the job
- Notify all affected employees in the area of work
- Shut down the equipment at the operating controls
- Isolate all energy sources to equipment
- Lock and tag all isolating devices
- Dissipate all stored or residual energy sources
- Verify the isolation

ONLY a person “authorized” to perform LO/TO may do so, and must receive training for their specific LO/TO tasks.
Roles and Responsibilities - Affected Employee of LO/TO

• Stay clear of the area as much as possible of the LO/TO operation
• Never attempt to assist
• Never interfere or tamper with a lock or tag
• Report all unusual situations to your supervisor
• As an affected employee you:
  - Are instrumental in helping protect the safety of yourself and your co-workers by understanding your limits in the program
  - May save someone or yourself from grave injury or even death by doing what you are supposed to do
Personal Protective Equipment (PPE)

If you perform work on electrified equipment, you may need to use some of the following types of PPE:

- Leather gauntlet gloves over rubber insulated gloves
- Hard hats (rated for electrical work)
- Eye protection
- Rubber or non-conductive clothing
- Rubber-soled shoes or boots
- Rubber blankets

*Warning*: Metal jewelry should never be worn when working around exposed energized parts.
Summary

OSHA has many standards related to electrical safety.

- You can find more information about these regulations on OSHA's website at: