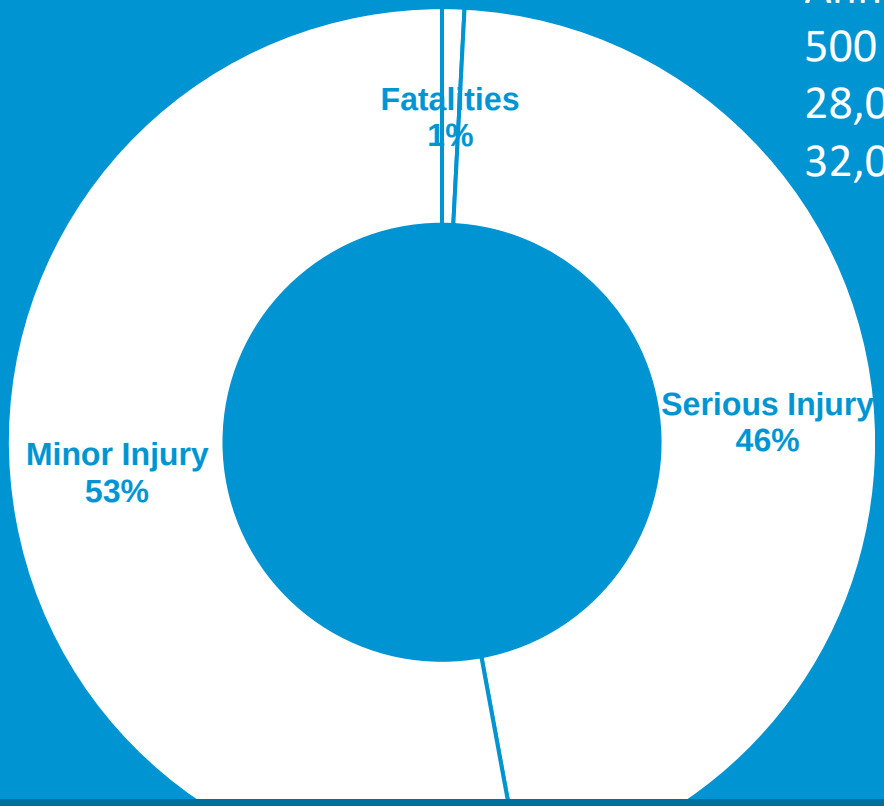
Electrical Safety & LOTO

Agenda

- Statistics
- 4 Types of Electrical Injury
- Effects of Electric shock
- Understand the potential effects of electricity on the human body
- Samples of Electrical Hazard signs
- Be able to recognize common electrical hazards
- Qualified/Unqualified Persons
- Lockout/Tagout - LOTO

Statistics

ELECTRICAL INJURY STATISTICS



Annually:
500 – Fatalities
28,000 – Serious Injuries
32,000 – Minor Injuries

Electrocution is the fifth leading cause of workplace fatalities.

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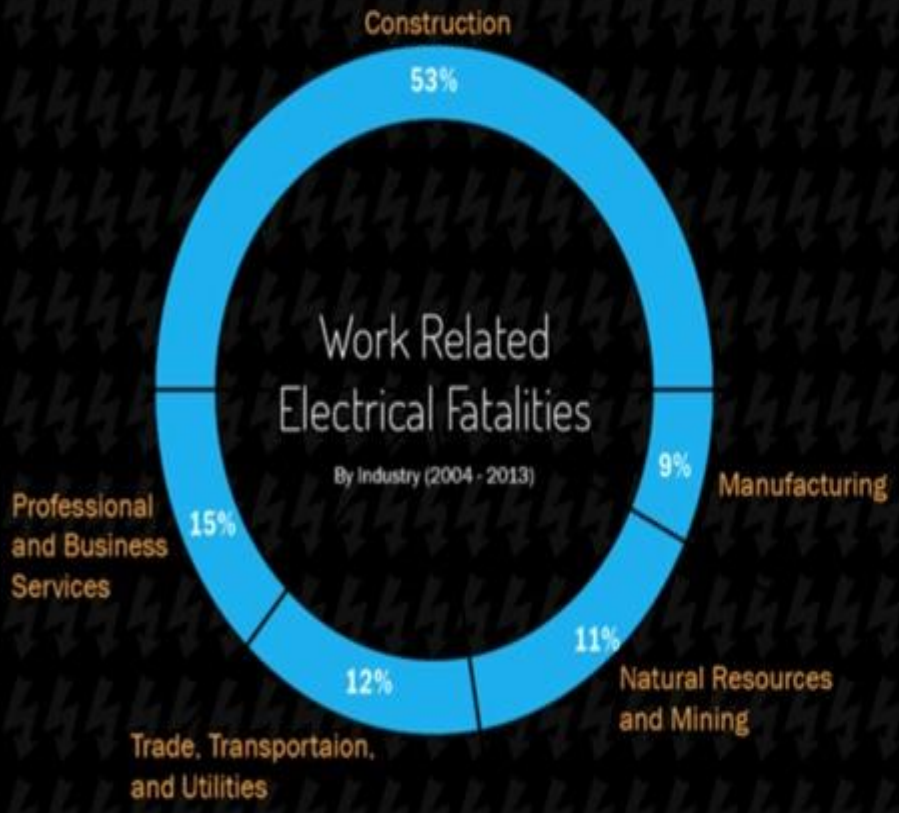
Statistics

Who's at risk and what's the culprit?



46%

According to the U.S. Bureau of Labor Statistics (BLS), there were a total of 1494 workplace fatalities resulting from contact with electrical current between 2004 and 2010. Almost half of these deaths (680, or 46%) involved contact with overhead power lines.

22%

It's not just high voltages, though. Fatal electrical accidents where the voltage was known, between 2011 and 2013, 22% of the fatalities involved systems of ordinary home or office power (220 volts or less).

Airswift's Electrical Safety Policy

Airswift will adhere to the policies set forth in the National Fire Protection Association (NFPA) 70E – Electrical Safety in the Workplace, including those pertaining to safe work practices for the following: Installation, operation and maintenance of electrical conductors, equipment, signaling and communication conductors as well as equipment and raceways.

- Types of Electrical Hazards
- Training – Qualified/Unqualified Persons
- LOTO

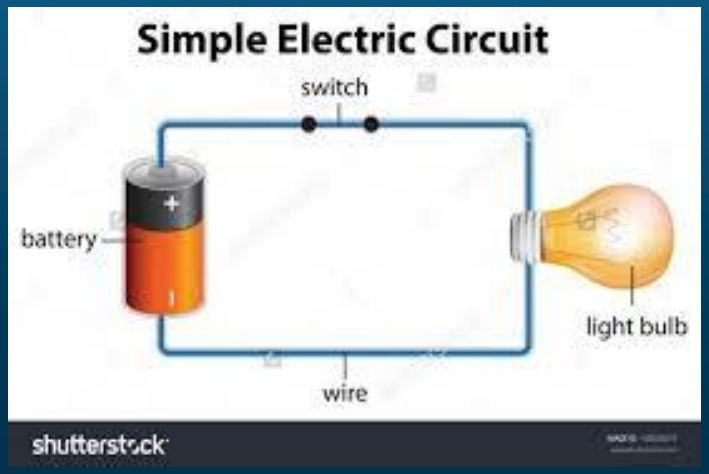
Fundamentals of Electricity

Electrical current is the flow of electrons through a conductor.

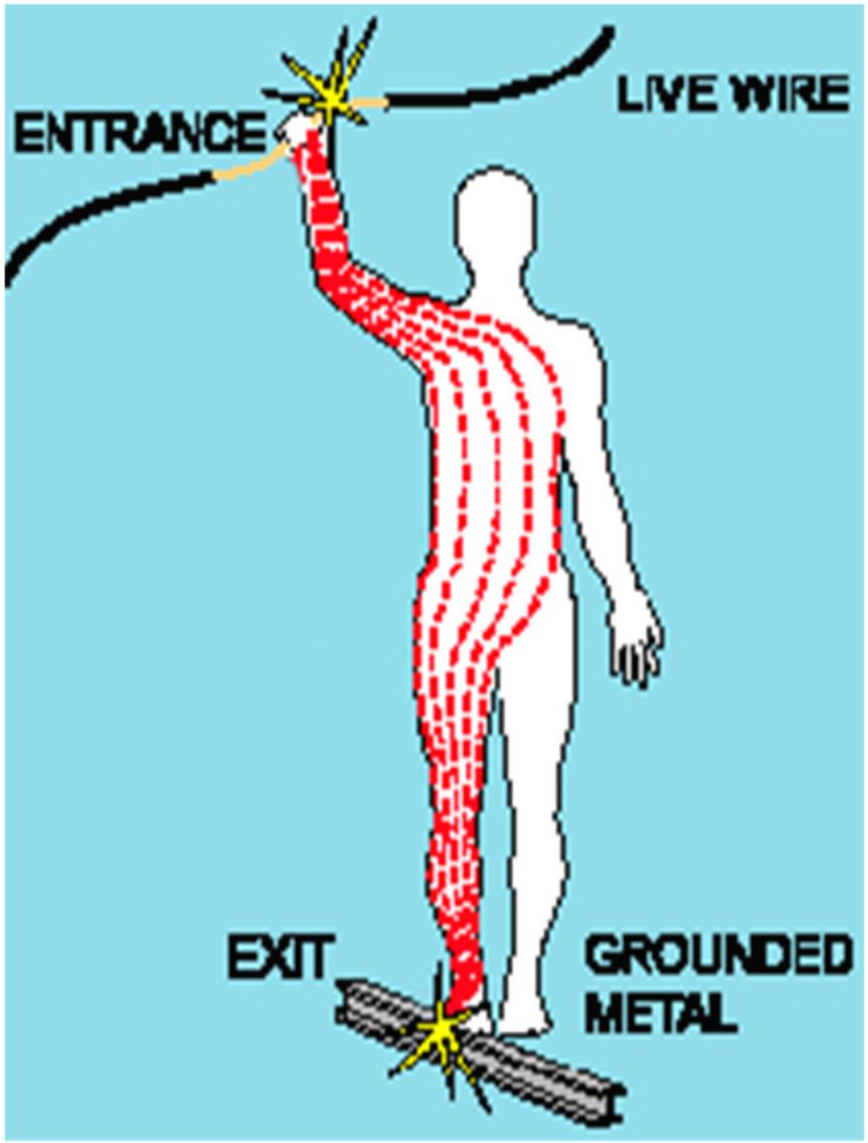
A conductor is a material that allows electrons to flow through it.

An insulator resists the flow of electrons.

Resistance opposes electron flow.



4 Types of Electrical Injuries



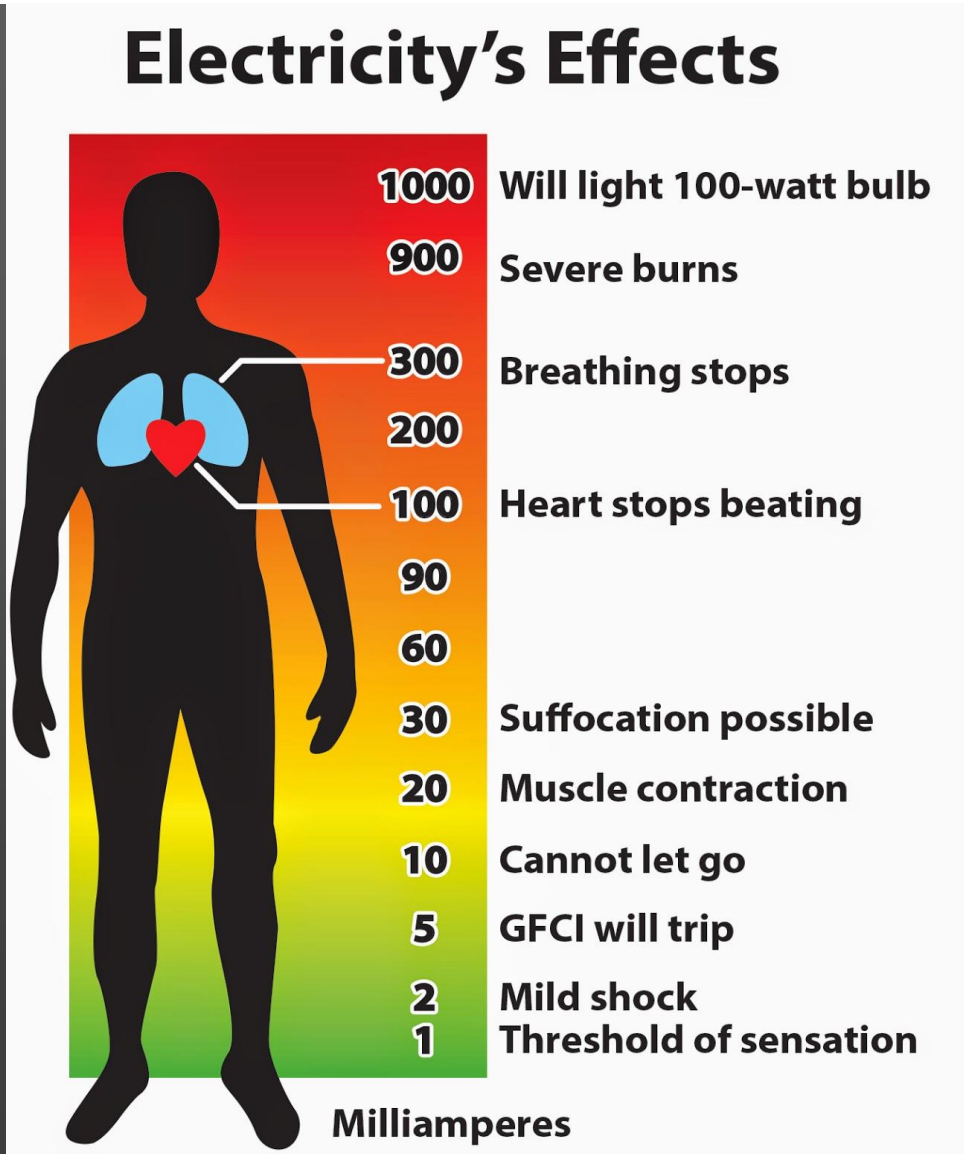
1) Electrocution (death due to electrical shock)
2) Electrical shock
3) Burns
4) Falls due to electric shock

How Electric Shocks Affects the Body

The Current travels in closed circuits through conductors (water, metal, the human body).

Shock occurs when the body becomes a part of the circuit.

The Current enters at one point and exits at another i.e. entrance and exit wounds/burns.



First Aid

Always follow Site Emergency Procedures

Do not touch the victim

- Call Emergency Phone
- If it is safe to do so, disconnect the power source
- Use non-conductive object to push person away from the electrical source

Samples of Warning Signs

Voltage warning labels

Electrical voltage symbol

Danger of death from electricity warning

Switch off when not in use

Electric shock warning

High voltage warning

Overhead cables warning

Live wires warning

Buried cables warning

Mains voltage warning

Danger do not enter sign

Warning to isolate before removing cover

Samples of Warning Signs

Barricades shall be used in conjunction with safety signs where it is necessary to prevent or limit employee access to work areas exposing employees to uninsulated energized conductors or circuit parts.

Hazards of Electricity

Shock

- Most common and can cause electrocution or muscle contraction leading to secondary injury which includes falls

Fires

- Enough heat or sparks can ignite combustible materials

Explosions

- Electrical spark can ignite vapors in the air

Arc Flash

- Can cause burns ranging from 14,000 degrees f. to 35,000 degrees f.

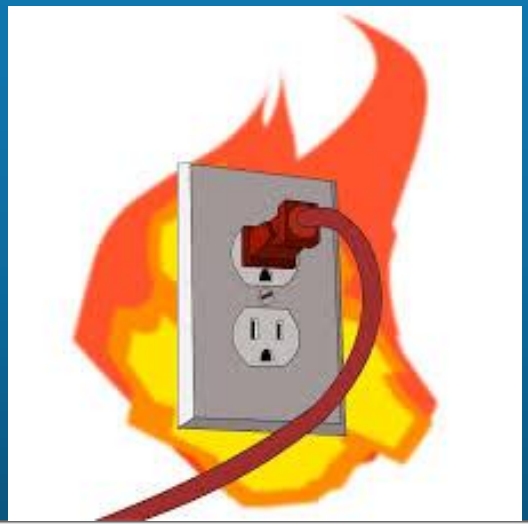
Arc Blast

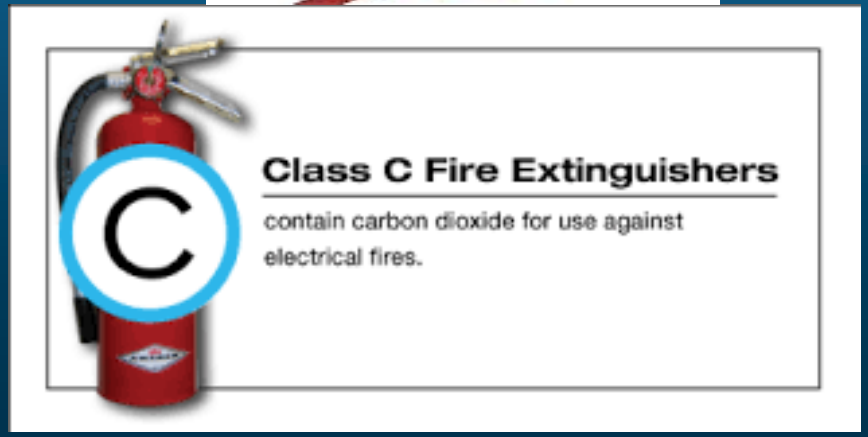
- In a short circuit event copper can expand 67,000 times. The expansion causes a pressure wave. Air also expands adding to the pressure wave

Fire Hazards

Always follow Site Emergency Procedures

- Call Emergency Phone
- If it is safe to do so, disconnect the power source
- Do not touch the burning object
- Do not use water on an electrical fire! Use a Category C fire extinguisher.
- Stay clear of the area and wait for the Emergency Services





Electrical Hazards and Protection

Hazards

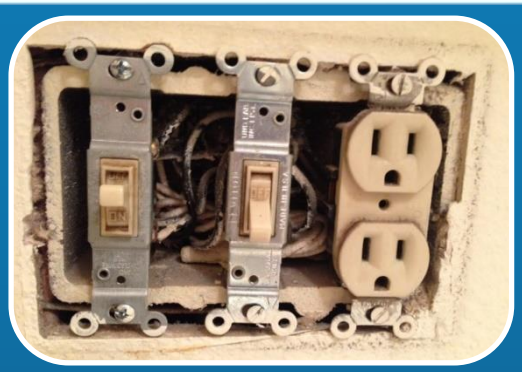
Inadequate wiring
Exposed electrical parts
Wires with bad insulation
Ungrounded electrical systems and tools
Overloaded circuits
Damaged power tools and equipment
Using the wrong PPE and tools
Overhead power lines
Damaged extension cords
Unqualified workers doing electrical work
All hazards are made worse in wet conditions

Protective Measures

Proper grounding
Use GFCI's
Use fuses and circuit breakers
Proper use of flexible cords
Guard live parts
Lockout/Tagout
Ensure Competent Person on site
Use proper approved electrical equipment
Qualified person install electrical devices
Employee training

Examples of Electrical Hazards

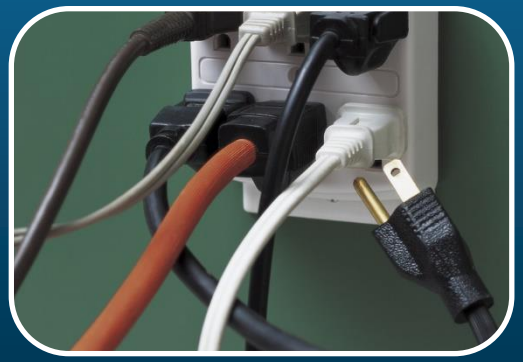
Overhead Power Lines



Damaged Receptacles

Exposed Conductors

Improper Grounding



Overloaded Circuits

Avoiding Electrical Hazards

Always ensure lines are deenergized before working on or close to power lines. Always use non conductive equipment i.e wood or fiberglass ladders

Do not use equipment with damaged receptacles or exposed conductors. They may contain a loose wire and cause a spark or electric shock.

Do not use equipment with damaged or removed grounding connectors. Grounding provides a low resistance path to ground to protect against electrical faults.

Do not overload circuits, this may cause the fuse to blow, causing sparks and electric shock. Equipment is more likely to overheat and be a fire hazard

Power Line Awareness

- Always ground any equipment such as cranes that can become energized
- Guarding or insulating the lines help prevent accidental contact
- Lines must be de-energized and grounded by the owner or operator of the lines
- Always maintain a safe distance when working near power lines

Visual Check Before Powering On

Before you turn it on <u>always</u> say **NO** to the following:

Are outlets, motors or circuits overloaded?

Are cords running near heat or water sources?

Are any of the receptacles or cord jackets damaged?

Do I see sparks or smoke?

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Types of Energy

Electrical

Mechanical

Hydraulic

Pneumatic

Chemical

Thermal

Gravity

Who is a “Qualified” person

A "qualified" person is permitted to work on or near exposed energized parts. This person has been trained in and familiar with the safety-related work practices that pertain to their respective job assignments and as a minimum, is trained and familiar with the following:

- The skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment.
- The skills and techniques necessary to determine the nominal voltage of exposed live parts, and
- The clearance distances specified in 29 CFR 1910.333(c) and the corresponding voltages to which the qualified person will be exposed.

Who is an “unqualified” person

A person classified as "unqualified" (i.e., not permitted to work on or near exposed energized parts) shall be trained in and familiar with any electrically related safety practices inherent to their jobs which are necessary for their safety.

All employees shall be trained in safety related work practices and clearance distances that pertain to their respective job assignments.

Lockout/Tagout
LOTO

The OSHA standard for The Control of Hazardous Energy (Lockout/Tagout), Title 29 Code of Federal Regulations (CFR) Part 1910.147, addresses the practices and procedures necessary to disable machinery or equipment, thereby preventing the release of hazardous energy while employees perform servicing and maintenance activities. The standard outlines measures for controlling hazardous energies—electrical, mechanical, hydraulic, pneumatic, chemical, thermal, and other energy sources.

What is Lockout/Tagout (LOTO)?

While any employee is exposed to contact with parts of fixed electric equipment or circuits which have been deenergized, the circuits energizing the parts shall be locked out or tagged or both in accordance with the requirements of lock-out/tag-out procedures.

Lockout/Tagout is more than just putting a lock on the main electrical disconnect to a machine or part of a machine

Follow client specific Lockout/Tagout procedures
Only an Authorized Employee can perform Lockout/Tagout

Lockout/Tagout
LOTO Applies When:

- Employees are performing servicing and maintenance, and there is a potential for injury from unexpected start-up or release of stored energy

- Service and maintenance that takes place during normal production, if employee:
  - Must remove or bypass a guard or safety device; or
  - Must place any part of their body into the danger zone

Lockout/Tagout Personnel

Affected Employee: An **employee** whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout or tagout, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed.

Authorized Employee: A trained person who locks out or tags out a machine or equipment to perform servicing or maintenance on that machine or equipment.

Types of LOTO Devices

Lockout devices and tagout devices shall be singularly identified; shall be the only devices(s) used for controlling energy; shall not be used for other purposes; and shall meet the following requirements:

- Durable. Lockout and tagout devices shall be capable of withstanding the environment to which they are exposed for the maximum period of time that exposure is expected.
  - Tagout devices shall be constructed and printed so that exposure to weather conditions or wet and damp locations will not cause the tag to deteriorate or the message on the tag to become illegible.
  - Tags shall not deteriorate when used in corrosive environments such as areas where acid and alkali chemicals are handled and stored.

- Standardized. Lockout and tagout devices shall be standardized within the facility in at least one of the following criteria:
  - Color; shape; or size; and additionally, in the case of tagout devices, print and format shall be standardized.

Continued…

Types of LOTO Devices

- Substantial: Lockout devices. Lockout devices shall be substantial enough to prevent removal without the use of excessive force or unusual techniques, such as with the use of bolt cutters or other metal cutting tools.
  - Tagout devices. Tagout devices, including their means of attachment, shall be substantial enough to prevent inadvertent or accidental removal. Tagout device attachment means shall be of a non-reusable type, attachable by hand, self-locking, and non-releasable with a minimum unlocking strength of no less than 50 pounds and having the general design and basic characteristics of being at least equivalent to a one-piece, all environment-tolerant nylon cable tie.

- Identifiable. Lockout devices and tagout devices shall indicate the identity of the employee applying the device(s).
  - Tagout devices shall warn against hazardous conditions if the machine or equipment is energized and shall include a legend such as the following: Do Not Start. Do Not Open. Do Not Close. Do Not Energize. Do Not Operate.

Continued…

Types of LOTO Devices

Lockout/Tagout Steps

1. PLAN: Follow detailed procedures for equipment
2. NOTIFY affected employees
3. SHUTDOWN all energy sources
4. ISOLATE all secondary energy sources, such as heat, fumes etc.
5. LOCKOUT and TAGOUT equipment
6. RELEASE stored energy
7. VERIFY by trying the on/off switch to ensure the machine wont start
8. PERFORM the task for example, maintenance, installation etc.
9. REMOVE LOTO

Bring equipment back on line correctly – only the person applying the LOTO can remove it.

Key Points

Always obey warning signs and follow site safe procedures

Do not repair electrical components of your machine unless you are qualified to do so and followed LOTO procedures

Never tamper with electrical interlocks. LOTO

Always perform a visual inspection before using electrical equipment

Electricity will try to reach ground even if it means going through a person

Even the “small” voltage from your home can cause serious injury

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