



## Energy Control (Lockout/Tagout)



# Lockout - Tagout

Lockout/Tagout (LOTO) refers to the specific practices and procedures to protect workers from injury due to the unexpected energization or started up again prior to the completion of maintenance or servicing work of machinery and equipment, or the release of hazardous energy during operations, service, or maintenance activities. LOTO also includes applying a Warning Tag on the physical restraint device. This documents the Authorized LOTO personnel and the date. LOTO operations must be done on all equipment, machinery or system Shut Downs before Authorized Personnel can perform repairs or service.

Most equipment and machinery has an Energy Isolation Device. These devices are usually put into the off position to shut down the hazardous energy source. Physical restraints (Lock Out Devices) can be put onto the Energy Isolation Device and secured with padlocks. Examples of Lock Out Devices include: ball valve and gate valve lock outs, circuit breaker lockouts, plug and wall switch lock outs and pneumatic lock outs. The total shutdown and restraint of all hazardous energy sources including the safe release of stored hazardous energy (e.g. capacitors and pressure in a line) must be accounted for.

Basic LOTO is simply unplugging equipment with the plug being controlled by the person working on the equipment. More complex LOTO may involve fuses, breakers and alternate electricity sources also being disabled. This is called "de-energizing" and there are points on equipment where locks are installed to assure power cannot be accidentally restored. An "Accident Prevention Tag" is attached to the locked equipment to document the LOTO process ongoing at the equipment. Each lock and tag can only be removed by the person who put it there following a systematic safety review to ensure that it is safe to re-start the equipment. While the lock and tag are in place, no one is permitted to touch or try to activate the equipment. "Practicing LOTO is vital to prevent injury, and it's each worker's personal assurance that they'll maintain their health and safety on the job "Even a small departure from the LOTO procedure can result in disaster. People have been seriously injured and departments have suffered major disruptions and financial losses to their operations when 'short-cuts' around LOTO were taken. By practicing LOTO, equipment hazards are identified and controlled before personnel start working on the equipment, energy-isolation locations are locked and tagged, and safe work processes are documented, before the person sets out to work on the equipment. Job planning becomes easy and straight-forward as safe-work steps are clear and easy to follow, and all equipment energy-hazards are known and locked de-energized by all workers."

### Energy Isolation is the Key

Avoiding electrocution is only one of the ways that LOTO procedures protect people. Other forms of energy can be just as hazardous as electricity and must be isolated and controlled. Basic physics concepts come into play when any kind of potential energy is involved. For example, an experienced worker was injured while cleaning a large building ventilation fan. Even though the motor was turned off for cleaning, the fan did not stop. Differences in air temperature in the duct caused the blades to continue turning. The worker, who had used a makeshift method to stop the fan's rotation and then continued cleaning, was injured. This is an example of how a proper LOTO procedure is needed for all kinds of energy sources.

Equipment may be powered by or store hydraulic, mechanical, compressed air, pressurized water or other kinds of energy. An LOTO program identifies all energy-hazards on a piece of equipment, and outlines safe-work processes and tools to control the hazards while work is done on the equipment. To de-energize fluids or gasses under pressure, valves can be locked closed, bleed-valves opened or "blinds" installed to block pipes. To prevent movement, equipment can be "blocked" with devices that temporarily prevent suspended or rolling parts from moving. Even placing a wheel-chock on a parked vehicle, or buckling your seat-belt, is practicing LOTO!



## General LOTO Procedure



### LOTO Basics

All employees fit into one of the following LOTO roles:

- "Authorized employee"  
Services equipment & authorized to apply LOTO.
  - "Affected employee"  
Operates or uses equipment being serviced under LOTO.
  - "Other employee"  
Works in an area where LOTO being used.
- Preferred means of controlling hazardous energy at is LOCKOUT IN CONJUNCTION WITH TAGOUT.
  - Each isolation point must have both a lock and a tag attached to it.
  - Locks must be standardized & used only for LOTO.
  - Tags must indicate lock holder & date of application.

### Types of Hazardous Energy

- Electrical
- Pneumatic
- Hydraulic
- Mechanical
- Thermal
- Chemical
- Radiation
- Steam
- Spring-Driven
- Suspended Parts

#### How Injuries Occur During the Servicing of Equipment?

- 80% failed to turn off equipment
- 10% equipment activated by someone else
- 5% failed to control potential energy
- Most of remaining 5% disconnected power but failed to verify effectiveness

- Some energy sources can be turned on/off.
- Others can only be dissipated or controlled.

## When is LOTO applied?

- Adjusting
- Inspecting
- Modifying
- Replacing parts
- Tool changes
- Clearing jams
- Lubricating
- Cleaning

"...during the servicing of equipment". There are some situations where LOTO is not required...

## Exceptions to LOTO

- Cord & plug connected equipment
- Plug is only source of energy
- Plug is under continuous control of one person
- Minor tool changes and adjustments, and other minor servicing activities, which take place during normal production operations, if they are routine, repetitive and integral to the use of the equipment for production, provided that the work is performed without the removal or bypassing of machine guards.
- Alternative measures for protection are used.
- Body part not placed in the point of operation or other dangerous area during machine cycle.

## Lockout/ Tagout Devices

- **Durable** – Lockout and tagout devices must withstand the environment to which they are exposed for the maximum duration of the expected exposure. Tagout devices must be constructed and printed so that they do not deteriorate or become illegible, especially when used in corrosive or wet environments.
- **Standardized** – Both lockout and tagout devices must be standardized according to color, shape, or size. Tagout devices must also be standardized according to print and format.
- **Substantial** – Lockout and tagout devices must be substantial enough to minimize early or accidental removal. Tag means of attachment must be non-reusable, attachable by hand, self-locking and non-releasable, with a minimum unlocking strength of no less than 50 pounds (one-piece nylon cable tie).
- **Identifiable** – Locks and tags must clearly identify the employee who applies them. Tags must also warn against hazardous conditions if the machine or equipment is energized and must include a legend such as: DO NOT START. DO NOT OPEN. DO NOT CLOSE. DO NOT ENERGIZE. DO NOT

## Potential Energy vs. Kinetic Energy



Potential energy can be converted to kinetic! Goal of LOTO is to achieve "Zero Energy State"

## Special Situations

- Shift changes
- Oncoming employee attaches locks/tags prior to outgoing employee removing theirs.
- EHS must OK alternative procedures.
- Vehicle hazardous energy control
- Alternative vehicle control methods are permitted in circumstances where removal of the key fully ensures employee protection.
- The authorized employee performing the maintenance would need to retain sole control of the key.
- If removal of the key does not fully ensure employee protection additional measures are needed. (removal of battery cable, chock wheels, etc)
- Each employee applies own locks/tags to each isolation point.  
OR
- A designated person locks out each of the energy sources and puts the keys into a group lockbox. The authorized employees place their lock on the group lockbox before they begin work. After each worker finishes, the worker removes his lock from the box.
- EHS must OK alternative procedures.



## Group lockout

When two or more subcontractors are working on different parts of a larger overall system, the locked-out device is first secured with a folding scissors clamp that has many padlock holes capable of holding it closed. Each subcontractor applies their own padlock to the clamp. The locked-out device cannot be activated until all workers have signed off on their portion of the project and removed their padlock from the clamp.

A lock selected by color, shape or size (e.g. red padlock) is used to designate a standard safety device, locking and securing hazardous energy. No two keys or locks should ever be the same. A person's lock and tag must not be removed by anyone other than the individual who installed the lock and tag unless removal is accomplished under the direction of the employer. Employer procedures and training for such removal must have been developed, documented and incorporated into the employer's energy control program.

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