



Lockout/Tagout Program STANDARD OPERATING PROCEDURE (SOP)

I. Purpose

The purpose of this program is to eliminate the injury or harm to employees in accordance with OSHA 29 CFR 1910.147 standards. The standard requires the employer to have an established plan along with procedures to effectively isolate all energy sources. Lockout/Tagout (LOTO) is used to isolate hazardous energy sources. These sources can be in the form of electrical, hydraulic, chemical, thermal, pneumatic, or other energy. Employees who work around these areas must be trained in LOTO procedures that enable employees to affectively shut down equipment, control all energy sources, and control the release of possible energy while work is being performed on the equipment. This program applies to the control of energy during installation of new equipment, servicing and /or maintenance of systems, machines, and equipment by all Tennessee Technological University (TTU) employees. All employees who will come in direct contact with energized equipment must be trained concerning potential hazards.

II. Responsibilities

A. Management Shall:

1. Provide necessary equipment and resources to implement a LOTO Program.
2. Ensure full compliance with the detailed responsibilities of employees set forth in the referenced procedures and standards applicable to their work areas.

B. Supervisors shall:

1. Identify and inventory equipment with hazardous energy sources.
2. Determine if removal of hazardous energy introduces additional hazards (i.e. critical equipment).
3. Develop specific LOTO procedures if applicable for machines and equipment.
4. Review LOTO procedures with employees in their respective work areas.
5. Ensure compliance with the LOTO Program requirements within their specific work areas.
6. Ensure LOTO training is conducted for all personnel affected by this program.
7. Ensure that a LOTO program review is performed at least annually.

8. Inform contractors that the workplace contains equipment with hazardous energy sources.

C. Employees shall:

1. Follow safe work practices and use the appropriate written LOTO procedure while performing work on equipment with hazardous energy sources.
2. Report to their supervisors any unsafe conditions concerning the control of hazardous energy sources.
3. Ask their supervisor for assistance or clarification of work procedures as necessary.
4. Attend annual LOTO training.

D. Environmental Health & Safety (EHS) shall:

1. Assist in determining workplace situations that require LOTO procedures.
2. Assist supervisors with the formulation of specific LOTO procedures.
3. Review procedures to ensure compliance.
4. Assist in auditing TTU's LOTO Program on an annual basis.
5. Develop and conduct training on the LOTO Program.

III. Scope

This program applies to the control of energy during installation of new equipment, servicing and/or maintenance of systems, machines, and equipment by all TTU employees and contractors working for TTU.

1. This applies to all of the TTU systems and equipment operated and maintained by TTU.
2. Describes guidelines for the performance of LOTO on all building systems and equipment.
3. LOTO procedures should be used in conjunction with [Job Hazard Analysis](#) (JHA).

IV. Definitions

- **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 person who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment. An affected employee becomes an authorized employee when that

employee's duties include performing servicing or maintenance covered under this section.

- **Capable of being locked out:** An energy isolating device is capable of being locked out if it has a hasp or other means of attachment to which, or through which, a lock can be affixed, or it has a locking mechanism built into it. Other energy isolating devices are capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy isolating device or permanently alter its energy control capability.
- **Energized:** Connected to an energy source or containing residual or stored energy.
- **Energy isolating device:** A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following: A manually operated electrical circuit breaker; a disconnect switch; a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors, and, in addition, no pole can be operated independently; a line valve; a block; and any similar device used to block or isolate energy. Push buttons, selector switches and other control circuit type devices are not energy isolating devices.
- **Energy source:** Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.
- **Hot tap:** A procedure used in the repair, maintenance and services activities which involves welding on a piece of equipment (pipelines, vessels or tanks) under pressure, in order to install connections or appurtenances. It is commonly used to replace or add sections of pipeline without the interruption of service for air, gas, water, steam, and petrochemical distribution systems.
- **Lockout:** The placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.
- **Lockout device:** A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy isolating device in the safe position and prevent the energizing of a machine or equipment. Included are blank flanges and bolted slip blinds.
- **Normal production operations:** The utilization of a machine or equipment to perform its intended production function.
- **Servicing and/or maintenance:** Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning or unjamming of machines or equipment and making adjustments or tool changes, where the employee may be exposed to the **unexpected** energization or startup of the equipment or release of hazardous energy.
- **Setting up:** Any work performed to prepare a machine or equipment to perform its normal production operation.
- **Tagout:** The placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating

device and the equipment being controlled may not be operated until the tagout device is removed.

- **Tagout device:** A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

V. Tags

- A. Should be bright in color, durable to handle working conditions.
- B. Easily identified, marked appropriately.
- C. Must be signed by employee performing work along with date/time.

VI. Procedures for LOTO

A. The authorized employee will identify which sources of energy are present and must be controlled; and more importantly, identify what method of control will be used. This step involves completing sets of specific work instructions that outline what controls and practices are needed to lock and tag out a system before performing any activity.

1. Notify all affected employees.

B. The authorized employees will communicate the following information to notify affected persons:

1. What is going to be locked/tagged out?
2. Why it is going to be locked/tagged out.
3. For approximately how long will the system be unavailable?
4. Who is responsible for the lockout/tagout?
5. Who to contact for more information?
6. Equipment Shutdown.

C. Applying LOTO

1. If the equipment is operating it should be shut down in its normal manner. Use manufacturer instructions or in-house work instructions. Equipment shutdown involves ensuring controls are in the off position, and verifying that all moving parts such as flywheels, gears, and spindles have come to a complete stop.
2. Isolate the hazardous energy pertaining to the equipment.

D. The exact written instructions will be specific to that system in the workplace. In general, the following are used:

1. Electrical energy - Switch electrical disconnects to the off position. Visually verify that the breaker connections are in the off position. Lock disconnects into the off position.



Figure 1: Electrical lockout.

2. Hydraulic and pneumatic potential energy - Set the valves in the closed position and lock them into place. Bleed off the energy by opening the pressure relief valves, then closing the airlines.



Figure 2: Hydraulic and pneumatic lockout.

3. Mechanical potential energy - carefully release energy from springs that may still be compressed. If this is not feasible, block the parts that may move if there is a possibility that the spring can transfer energy to it.

4. Gravitational potential energy - Use a safety block or pin to prevent the part of the system that may fall or move.

5. Chemical energy - locate chemical supply lines to the system and close and lockout the valves. Where possible, bleed lines and/or cap ends to remove chemicals from the system.

E. Dissipation of residual or stored energy.

1. Electrical energy - To find a specific method to discharge a capacitor for the system in question, contact the manufacturer for guidance. Many systems with electrical components, motors, or switch gears contain capacitors. Capacitors

store electrical energy. In some cases, capacitors hold a charge in order to release energy very rapidly (e.g., similar to the flash of a camera). In other cases, capacitors are used to remove spikes and surges in order to protect other electrical components. Capacitors must be discharged in the lockout process in order to protect workers from electrical shock.

2. Hydraulic and pneumatic potential energy or setting - Set the valves in the closed position, and Locking them into place only isolates the lines from more energy entering the system. In most cases, there will still be residual energy left in the lines as pressurized fluid. This residual energy can be removed by bleeding the lines through pressure relief valves. Contact the manufacturer for more specific details, or if no pressure relief valves are available, what other methods are available.

3. Mechanical potential energy - Carefully release energy from springs that may still be compressed. If this is not possible, use blocks to hold the parts that may move if the energy is released.

4. Gravitational potential energy - If feasible, lower the part to a height where falling is impossible. If this is not possible, contact the manufacturer for guidance.

5. Chemical energy - If available, bleed lines and/or cap ends to remove chemicals from the system.

F. When the system's energy sources are locked out, there are specific guidelines that must be followed to ensure that the lock cannot be removed, and the system cannot be inadvertently operated. These guidelines include:

1. Each lock should only have one key (no master keys are allowed).

2. LOTO 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.

3. There should be as many locks on the system as there are people working on it. For example, if a maintenance job requires 3 workers, then 3 locks should be present - each of the individuals should place their OWN lock on the system. Locks can only be removed by those who installed them, and should only be removed using a specific process.



Figure 3: Example of multiple locks on a lockout tag.

G. Verify Isolation

Verify that the system is properly locked out before beginning any work. Verification can take place in several ways:

1. The machine, equipment, or process controls (push buttons, switches, etc.) are engaged or activated and the result is observed. No result means isolation is verified. Return controls to safe position (off).
2. Visual inspection of:
 - a. Electrical connections to ensure they are open.
 - b. Suspended parts are lowered to a resting position or blocked to prevent movement.
 - c. Other devices that restrain machine or process movement.
 - d. Valve positioning for double block and bleed (for pipes or ducts) - closing two valves of a section of a line, and then bleeding (or venting) the section of the line between the two closed valves.
 - e. Presence of solid plate used to absolutely close a line - called line blanking (for pipes or ducts).
 - f. Any other acceptable method of energy isolation.
3. Testing of the equipment:
 - a. Test circuitry (should be done by a certified electrician) - however, equipment with capacitors needs to be cycled until all energy is drained.
 - b. Check pressure gauges to ensure hydraulic and pneumatic potential energy has been removed.
 - c. Check temperature gauges to ensure thermal energy has been discharged.
4. Choose the method that will best ensure that the energy to the system has been isolated without creating other hazards during the verification.

5. Complete the activity that required the lockout process to be started.

VII. Removing Lockout/Tagout

A. Clean area of waste, tools, and used parts.

B. Notify all affected employees that were notified before work performed and share update on machine/equipment.

C. Remove LOTO device on energy sources.

D. If an employee has left work site and he/she has a lock on machine/equipment then he/she will need to return back to the work site to remove his/her lock before energizing can take place or the following must take place:

1. Check to make sure that employee is off site.
2. All reasonable efforts shall be made to contact the employee that his/her lock LOTO device will be removed.
3. Group must determine if removal of LOTO is safe.
4. Remove LOTO lock or tag.
5. Document removal of LOTO.
6. Notify employee of removal upon his/her return.

E. The Supervisor will inform all employees that performed work on the machine/equipment will be started once: section VII Removing Lockout/Tagout(D)(1-6) has been completed, all employees have been notified and are at a safe distance away from machine/equipment.

F. All employees must move back to a safe distance before energizing the machine/equipment.

G. Test machine/equipment by energizing.

VIII. Group LOTO

A. If more than one individual is required to LOTO equipment, each shall place his/her own LOTO device on the energy isolating device/devices.

B. When an energy isolating device cannot accept multiple locks or tags, a multiple LOTO device (hasp) may be used.

C. If lockout is used, a single lock may be used to lockout the machine or equipment with the key being place in a lockout box or cabinet that allows the use of multiple locks to secure it.

D. Each employee will then use his/her own lock to secure the box or cabinet.

E. As each person, no longer needs to maintain his or her lockout protection, that person will remove his/her lock from the box or cabinet.

IX. Record Keeping

A. EHS shall ensure that records are kept in reference to OSHA 29 CFR 1910.147.

B. EHS will keep Training records.

C. Injuries shall be reported to the manager or supervisor that is on shift.

D. Recordable injuries will be recorded on the OSHA log by [Human Resources](#).

E. Un-recordable injuries will be assessed and medically treated.

F. Training record will include:

1. Employee's name.
2. Date of training.

X. Training

A. Training will be designed by EHS and shall be given annually.

B. All new employees will be trained before any work on equipment is performed or serviced, but within the first week of employment.

C. Supervisors as well as all management performing work around or working nearby will received training.

D. Training will include:

1. Recognition of hazardous energy sources.
2. Type and magnitude of the hazardous energies.
3. Procedures for energy-control and the tools and methods needed to isolate.
4. Know when energy-control methods are in place.
5. Know why these control methods are in place and the danger of hazardous energies.

E. Re-Training

1. Change in job duties.
2. Change in machine/equipment.
3. Inspections show improper methods being used by employees.
4. Inspections show all steps of LOTO not being fully utilized by employees.

XI. Inspections

- A. EHS shall perform inspections. Supervisors and managers may assist with inspections.
- B. Employees will be trained in duties and responsibilities of LOTO.
- C. Inspections will be documented by EHS.
 - 1. Date of inspection.
 - 2. Type of machine/equipment
 - 3. Employees involved in inspection.

XII. Disciplinary Actions

If an employee is found to have violated any of the items listed. Then [Procedures for Disciplinary Action \(HR-38\)](#) may be used.

- A. Unauthorized removal of LOTO devices.
- B. Disabling LOTO devices.
- C. Not heeding the LOTO warnings.
- D. Tampering with LOTO devices

XIII. References

- A. [Occupational Safety & Health Administration 29 Code Federal Regulations 1910.147](#),
- B. [Georgia Institute of Technology](#).