Hazardous Energy Control (Lockout-Tagout)

The purpose of this program is to prevent inadvertent operation or energization of machines, equipment, or processes in order to protect employees and establish methods for achieving zero energy state. This program applies to activities such as: erecting, installing, constructing, repairing, adjusting, inspecting, cleaning, operating, or maintaining the equipment and processes. This program applies to energy sources such as: electrical, mechanical, hydraulic, pneumatic, chemical, radiation, thermal, compressed air, energy stored in springs, and potential energy from suspended parts (gravity).

This standard does not apply to hot tap operations involving transmission and distribution systems for substances such as gas, steam, water, or petroleum products when such operations are performed on pressurized pipelines, provided the user demonstrates that (1) continuity of service is essential, (2) shutdown of the system is impractical, and (3) documented procedures are followed and special equipment is used which will provide proven effective protection for employees.

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: An employee 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 by this program.

Primary authorized employee: An authorized employee who has been assigned the responsibility of coordinating the overall lockout/tagout control when more than one department or other group is involved; coordinates the affected work forces and ensures the continuity of protection.

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.

Electrical Safe Work Condition: A state in which the conductor or circuit part to be worked on or near has been disconnected from energized parts, locked/tagged in accordance with the lockout/tagout policy, tested to ensure the absence of voltage, and grounded if determined necessary.

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.

Energized: Connected to an energy source or containing residual or stored energy.

Interlock: A device or system whereby the status of one control or mechanism allows or prevents the operation of another.

Other employee: An employee whose job requires him/her to work in an area in which machine/equipment servicing or maintaining is being performed.

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, to hold an energy isolating device in a safe position and prevent the energizing of a machine or equipment.

Normal production operations: The utilization of a machine or equipment to perform its intended production function.

Qualified Person: One who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training to recognize and avoid the hazards involved. A Qualified Person is a person who has been trained to avoid electrical hazards when working on or near exposed energized parts operating at 50 volts or more.

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 un-jamming of machines and 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 return a machine or equipment to a state of readiness 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.

Unqualified Person: A person who has little or no training regarding electrical hazards. Even though Unqualified Workers may not be exposed to energized parts, training still must be provided. At a minimum, the unqualified person must be familiar with any electrical-related safety practice that is necessary for their safety. This could be as simple as telling an unqualified person to shut off a machine if there's a problem and contacting a supervisor for assistance.

Responsibilities

Departments

Designate a principal authorized employee to oversee the department's lockout/tagout procedures (Lockout/Tagout Supervisor).

Develop and maintain safe shut down procedures on each piece of equipment or machine that the department's employees are expected to service or maintain. The Lockout Control Procedure Template form may be used in developing the procedures.

Maintain a list of authorized employees.

Ensure that all employees follow the requirements of each procedure.

Maintain a lockout/tagout station.

Ensure that employees attend training.

Conduct annual reviews of the department's compliance with this policy.

Employees

Conduct lockout/tagout operations in accordance with established procedures.

Attend training on safe lockout/tagout procedures.

Notify their supervisor when they have any questions about isolating energy sources safely or have observed non-compliance activities or when problems are identified with equipment or lockout devices.

Environmental Health & Safety

Develop the University's lockout/tagout program.

Assist with development of specific lockout/tagout procedures.

Coordinate lockout/tagout training.

Perform periodic audits of the program.

Training

Lockout/tagout training is required before employees are allowed to be involved in the servicing and maintenance of machines or equipment.

All authorized employees must be trained to recognize applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means (procedures) necessary to isolate and control hazardous energy.

All affected employees must be trained to understand the purpose and function of lockout/tagout procedures and the prohibition of trying to restart machines or equipment that are locked or tagged out.

Other employees who work in the area where lockout/tagout procedures are used shall be instructed about their purpose and prohibited from attempting to restart machines or equipment that are locked or tagged out.

General Lockout-Tagout Procedure

This procedure must be followed in sequence by authorized employees to render a piece of equipment safe for personal contact.

Prepare

1. Let all affected employees know you will be locking and/or tagging out the machine or equipment and why.
2. Identify potentially hazardous energies associated with the machine or equipment.
3. Locate the switches, valves, circuit breakers or other main disconnect energy isolating devices for each potentially hazardous energy source.
4. Shut down the machine or equipment by normal procedures.
5. Deactivate (turn off) all switches, valves, circuit breakers or other energy isolating devices. Be sure the machine or equipment is isolated from all potentially hazardous energies.

6. Dissipate or restrain any stored energy that may cause unexpected movement in equipment components. Energy may be stored in springs, elevated machine parts, rotating flywheels, hydraulic systems, and air, gas, steam or water pressure. Use methods such as repositioning, blocking movement or bleeding pressure.

Lock

1. Apply appropriate lock or lockout devices to all energy isolating devices.
2. This ensures they are held in a “safe” or “off” position and that no person or unforeseen action can start or activate the machine or release potentially hazardous energy from the equipment. Lockout devices and locks may be omitted, but only if the energy isolating device is not capable of being locked-out. If a tag alone is used, additional safety measures that can provide the same level of safety as a lock must be employed. This might include removing and isolating a circuit element, blocking access to a controlling switch or removing a valve handle to reduce the potential for any inadvertent activation.

Tag

1. Alert everyone that the machine or equipment is not in service by attaching a proper tag to all locks or energy isolating devices (in the case where locks cannot be used).
2. Write your name, the date and the purpose for the lockout/tagout on the tag.

Clear

1. Clear the area around the equipment of personnel, tools and other nonessential items.
2. Ensure that all guards are in place.

Try

1. Try or test the operating controls to make sure that the machine or equipment will not operate or release other potentially hazardous energies.
    a. If the machine or equipment uses electricity, a qualified person (i.e., one who is knowledgeable in electrical hazards and safety measures) must verify the absence of voltage. If the circuit to be tested is over 600 volts (nominal), the test equipment must be checked for proper operation immediately before and after this test.
    b. Interlocked equipment must be checked carefully to make sure that the equipment is locked-out properly and not temporarily inoperative because of an interlock.
    c. Check the equipment or process by use of test instruments and/or visual inspection to verify that energy isolation has been accomplished.
    d. The equipment/process shall be examined to detect any residual energy. If detected, action must be taken to relieve or restrain the stored energy.
2. Return the energy isolating device(s) to their “off” or “safe” position. The equipment has now been locked and/or tagged out by the owner (i.e., the principle authorized employee). Any other authorized employees wishing to work on this machine or equipment must apply their own locks and/or tags and, after all personnel are clear of the equipment, must try the effectiveness of the lockout/tagout before commencing work. This means, if there are 10 people working on the machine at any one time, there will be 10 locks and/or tags on the energy isolating devices (for example by using multi-lock hasps), unless the owner uses a group lock out system, such as a lock box, where he/she performs lockout/tagout on the machine and places his/her keys in a

lock box and other authorized employees verify lockout/tagout of the machine and place their locks and tags in the lock box.

General Lockout-Tagout Removal Procedure

The removal procedure must be followed in sequence by authorized employees to remove locks and tags and restore energy to the machine or equipment.

1. Clear the equipment and the area around the equipment of personnel, tools or other nonessential items.
2. Ensure that all guards are in place.
3. Remove locks, lockout devices and/or tags. Only the same authorized employee who installed the lock(s) and/or tag(s) may remove them (there are limited exceptions which are described under, “Removal of Locks by Others”).

Electrical Lockout-Tagout (see also Electrical Safety)

Exposed electrical conductors or circuit parts, shall be de-energized before performing work, unless it can be shown that de-energizing creates additional hazards, or is not feasible due to design or operational limitations. Live parts are to be de-energized in accordance with this Lockout/Tagout program. If live parts are not placed in an Electrically Safe Work Condition, the work practices described in the Electrical Safety Program must be used to protect employees.

Special written procedures shall be developed by the department to describe the lockout/tagout measures necessary when employees are required to work on high voltage circuits or equipment (above 600 volts).

The lockout/tagout of electrical energy sources shall occur at the circuit disconnect switch. Any situations identified where the circuit cannot be positively interrupted must have procedures developed providing equivalent protection.

When a person needs to request an electrical disconnect of a machine or equipment, the person(s) performing the work on the machine or equipment must go with the person making the disconnect and attach his lockout/tagout device to the control device.

Electrical work requires a lock and a tag to be used together. However, a tag can be used by itself only if the electrical disconnecting source does not have lockout capabilities and if the following conditions are met:

1. Only one circuit or piece of equipment is de-energized.
2. The lockout period does not extend beyond the work shift.
3. Employees exposed to the hazards associated with re-energizing the circuit or equipment are familiar with this procedure.

Electrical Test Verification of De-energized Circuits

Unqualified Employees are prohibited from working on or near exposed energized circuits. Employees shall not use insulated live-line tools, test instruments (including voltage testing) or equipment on exposed energized parts unless they have been trained or instructed in their proper use. Only a Qualified Persons, trained in the proper use of voltage detector, can verify the absence of voltage.

Work on Energized Circuits

Energized electrical work shall be performed only under an approved and written Energized Electrical Work Permit found in the Electrical Safety Program.

Only Qualified Persons with appropriate personal and other protective equipment for shock and arc hazards shall work on energized circuits.

Group Lockout-Tagout

For major process or equipment overhaul, rebuilds, etc., which require group lockout/tagout, a system is required that affords employees a level of protection equivalent to that provided by personal lockout/tagout. Overall responsibility is vested in a *Primary Authorized Employee* for a set number of employees working under the protection of a group lockout or tagout device. There shall be provisions for the *Primary Authorized Employee* to ascertain the exposure status of individual group members with regard to the lockout or tagout of the machine or equipment. Each authorized employee shall affix their personal lockout or tagout device to the group lockout device, group lockbox, or comparable mechanism when he or she begins work, and shall remove those devices when he or she stops working on the machine or equipment being serviced or maintained.

Shift or Personnel Changes

Specific procedures shall be utilized during shift or personnel changes to ensure the continuity of lockout or tagout protection, including provision for the orderly transfer of lockout or tagout device protection between off-going and oncoming employees, to minimize exposure to hazards from the unexpected energization or start-up of the machine or equipment, or the release of stored energy. Facilities shall develop specific written procedures to accommodate those situations where it is necessary to continue the current lockout/tagout of the equipment/process into subsequent shifts.

Removal of Locks or Tags by Others

If the authorized employee is still on site, or not known to have left the site, that employee's locks and/or tags must not be removed by any other person. During an emergency while the authorized employee is off site, the authorized employee's immediate supervisor or other management personnel above them can remove their lock and/or tag after a complete check of the equipment to determine that no hazard can result from the lock and/or tag removal. The authorized employee must be informed that their lock and/or tag were removed before their return to work.

Special Lockout-Tagout Situations

Lockout-Tagout Interruption (energized testing)

In situations where the energy isolating device(s) is locked/tagged and there is a need for testing or positioning of the equipment/process, the following sequence shall apply:

1. Clear equipment/process of tools and materials.
2. Clear personnel.
3. Clear the energy isolating device(s) of locks/tags according to established procedure.
4. Proceed with test/positioning.
5. De-energize and relock/tag energy isolating device(s) to continue the work.
6. Operate controls or use test instruments to verify energy isolation.
7. Return controls to "off" or "neutral" position, if applicable.

Contractors and Non-University Personnel

Project Managers or administrators who hire or oversee contracted projects shall communicate this program and specific procedures to contractors whose work necessitates performing lockout/tagout procedures.

Contractors and their subcontractors shall comply with all provisions of the University's Lockout/Tagout program and ensure that their employees are appropriately trained and authorized.

Contractors and their subcontractors shall comply with any shut down procedures that have been developed by the University for each machine or piece of equipment that the contractor must service or maintain or other such project where energy sources are present.

When shut down procedures are not available from the University, the contractor shall develop and provide the University with their own shut down procedures for that machine or piece of equipment or project. Prior to start of work, the shutdown procedures shall be submitted for approval to the project manager responsible for the project.

Accidents

If the accident involved the control of hazardous energy with a single lockout source, a specific procedure will be written before work is continued.

If the accident involved a specific procedure for a piece of equipment, the lockout/tagout specific procedure will be evaluated and modified (if necessary) prior to authorizing work to continue.

Locks, Keys, and Tags

Locks and employee tags shall not be used for any purpose other than personal protection. Locks shall be standardized and used only for lockout applications. There shall be no master key which can be used to open anyone's lock. Likewise, there shall not be more than one accessible key for each individual's lock. When locks are used in the lockout/tagout application, they shall always be accompanied by tags. Tags are only warning devices and do not provide the physical restraint offered by locks. Employee tags shall be used only for personnel protection. They shall include a legend such as "DO NOT START; DO NOT OPERATE" or a similar directive that informs employees working in the area not to start up the equipment.

Periodic Review

Each Department shall develop and document a formal audit of their lockout/tagout energy control procedures annually to ensure that employees are knowledgeable and utilize the designated procedures. The documentation shall identify the machine or equipment on which the energy control procedure was being utilized, the date of the inspection, the employees included in the inspection and the person performing the inspection.

An authorized supervisor or management employee shall perform the audits. The audit shall include a review between the inspector and each authorized employee of their responsibilities under the energy control procedure being audited. Deviations or inadequacies observed during the audits shall be corrected.

Installation Design Requirement

After January 1, 1990 OSHA requires that, whenever replacement or major repair, renovation or modification of a machine or equipment is performed, and whenever new machines or equipment are installed, energy isolating devices shall be designed to accept a lockout device.

Governing Regulations and Entities

- Occupational Safety and Health Administration (OSHA) 29 CFR 1910.147, The control of hazardous energy (lockout/tagout)
- Lockout/Tagout and Alternative Methods, ANSI/ASSE Z244.1-2003

Forms

Lockout Control Procedure Template