Environmental Health & Safety

Oklahoma State University

LOCKOUT / TAGOUT PROGRAM MANUAL

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Status

Contact(s)	Implementation Date	Comments
Kim Southworth, EHS	July 2015	Manual updated
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A: Introduction

Employees can be seriously or fatally injured if machinery they service or maintain unexpectedly energizes, starts up, or releases stored energy. OSHA's standard on the Control of Hazardous Energy (Lockout/Tagout), found in *Title 29 of the Code of Federal Regulations (CFR)* Part 1910.147, spells out the steps employers must take to prevent accidents associated with hazardous energy. The standard addresses practices and procedures necessary to disable machinery and prevent the release of potentially hazardous energy while maintenance or servicing activities are performed.

Lockout/ tagout equipment is used to prevent unexpected energization of machinery, and also helps to alert employees that maintenance activities are in progress. Equipment is considered "locked out" when potential energy is blocked and operation of machinery is prevented until the device is removed. When equipment is "tagged out", a warning tag will be used to signal that the equipment is not to be used or operated. These combined safety measures will be used to ensure maximum protection.

ADMINISTRATIVE RESPONSIBILITIES

ENVIRONMENTAL HEALTH AND SAFETY

The specific responsibility for developing and implementing Oklahoma State University (OSU) programs for health and safety resides with the Environmental Health and Safety (EHS) Department. In fulfillment of this responsibility, EHS has prepared the Oklahoma State University Lockout/Tagout Program and assists other departments in the development and implementation of lockout tagout procedures for their areas.

DEPARTMENTS

Each department is responsible for evaluating areas under its administrative control and determining whether there are processes or equipment that have the need for lockout/tagout procedures (LOTO). Departments who find the need for LOTO are responsible for the adoption and implementation of the contents of this Lockout/Tagout Manual and are also responsible for providing the necessary training, understanding and equipment to their employees. In addition, each department must develop and maintain current equipment-specific LOTO procedures applicable to their operations.

MANAGERS AND SUPERVISORS

Managers and supervisors play a key role in the implementation of the Lockout/Tagout Program. They are responsible for: determining situations that require the presence of LOTO devices and procedures; ensuring that all personnel are properly trained in LOTO procedures; identifying which personnel are required to participate in the LOTO program; ensuring proper LOTO devices are available to personnel; and ensuring that provisions of the program are followed.

PERSONNEL

Personnel are responsible for observing all practices and procedures contained in the Lockout/Tagout Program, understanding the proper procedures for energy control, other general safety practices, attending designated training sessions, and reporting hazardous or unsafe conditions to their supervisor, or EHS.

PROGRAM REVIEW

EHS will review the Lockout/Tagout Program annually. Recordkeeping from the previous year will be used to determine if revisions are needed. If revisions are needed, the changes shall be made and employees trained on the revisions.

STANDARD OPERATING PROCEDURES

Standard operating procedures (SOP) describe the method(s) that will be used to complete a task or operation. Departments with the need for LOTO procedures must develop SOPs and incorporate them into this manual to complete their Lockout/Tagout Program. Equipment-Specific Procedures must be developed by departments for the items outlined below to make the program specific to their areas.

- Training authorized and affected employees.
- Identify potentially hazardous energy associated with equipment, the energy source and the means of isolating that energy from equipment or machinery.
- Develop and review specific lockout/tagout procedures for all machinery and equipment that will require a specific lockout/tagout procedure.
- Utilizing the proper procedures for the restoration of equipment to power after service and maintenance has been performed.
- Establish steps indicating the safe removal and transfer of lockout/tagout devices and who will be responsible for these steps.
- Ensure all outside contractors comply with the lockout/tagout standard and provide specific lockout procedures to ensure an understanding of energy sources and energy isolating devices.
- Periodically review lockout/tagout program to ensure accuracy and compliance.

EXEMPTIONS

Work on cord and plug connected equipment for which exposure to the hazards of unexpected energizing or start-up of the equipment is controlled by the unplugging of the equipment from the energy source and the plug being under the exclusive control of the employee performing the servicing or maintenance will be excluded from this procedure.

"Hot Tap" operations involving transmission and distribution systems for substances such as gas, steam, water, or petroleum products when they are performed on pressurized pipelines will be excluded from the procedure provided that:

- Continuity of service is essential
- Shutdown of the system is impractical
- Documentation procedures are followed and special equipment is used which will provide proven protection for employees

Electronic testing, diagnostic testing, and adjustments that do not place an employee in a point of operation will be excluded from this procedure.

B: Training

All employees who are anticipated to be involved in working with energy systems are required to complete training on Lockout/Tagout procedures. EHS will provide training to ensure that the purpose and function of the energy control program is understood by employees and that the knowledge and skills required for the safe application, usage and removal of the energy controls are acquired by employees. This training will help employees to recognize applicable hazardous energy sources, the type and magnitude of the energy in the workplace, and the methods for energy isolation and control.

Additionally, retraining shall be provided for all employees whenever there is a change in job assignments, change in machines, when a new hazard is presented or when there is a change in energy control procedures. Retraining shall also be conducted when the employer has a reason to believe that there are deviations from or inadequacies in the employee's knowledge or use of the energy control procedures. Affected and Authorized employees are required to be trained on energy control procedures (Lockout/Tagout), Authorized employees are expected to have a thorough understanding of procedures involved with ensuring "Zero Energy State" which is a point at which the equipment has been safely isolated from any chances of reenegization or release of internal contained energy. An optional review form has been included to assist with reviewing employees who are to be Authorized employees. The review/audit form is located in Appendix E: of this manual.

C: Lockout/Tagout Procedures and Devices

Lockout/ Tagout procedures must be practiced any time there is the potential for unexpected energization or start-up of machinery or equipment, or the release of hazardous energy during service or maintenance activities. LOTO procedures are also required when work requires any faculty, staff or student to place any part of their body in a potential danger zone.

LOTO equipment consists of locks, chains, tags, hasps and other hardware used to prevent the operation of equipment which is being serviced or maintained. Lockout devices are to be used whenever possible to control potential energy by keeping equipment in an "off "position. Tags should be used in conjunction with lockout devices to warn against operation.

POTENTIAL ENERGY SOURCES

Sources can include:

- Electrical
- Pneumatic
- Hydraulic Pump and Line
- Water
- Gas
- Chemical or Coolant
- Steam
- Mechanical

Regardless of the energy source type or the LOTO device used, all LOTO devices must meet the following minimum criteria:

- Must be of durable construction and capable of withstanding the conditions in which they are placed.
- Must be identified as such and must only be used for the control of hazardous energy sources.
- Must identify the individual applying the device.
- Must not be bypassed, ignored or otherwise defeated
- Should be standardized by department, in color; size; shape and format.
- Should only be removed by the authorized employee originally attaching them. Removal by anyone else must be performed by the guidelines in section F: Removal of Lockout/Tagout Devices.

Use of Tags:

Tags may only be used, alone, when equipment cannot physically accept a lockout device. In these cases, all other procedures consistent with the Lockout/Tagout Program must be followed. The tags must be affixed as closely as possible to the isolation devices, immediately obvious to anyone attempting to restart the equipment. Additional control measures must be taken to reinforce the tagout device. Tags must be legible and understandable by all employees and must contain warnings against energizing the equipment, such as; DO NOT START, DO NOT OPEN, DO NOT CLOSE, DO NOT ENERGIZE, DO NOT OPERATE. Tags must be in plain view, at the same location as the energy isolation devices and must be securely attached to prevent accidental removal.

PREPARING EQUIPMENT FOR LOCKOUT/TAGOUT

Before service and/or maintenance activities begin, the following procedures **must** be implemented *in order*, when locking or tagging out equipment:

1. Prepare for shutdown;
    - Evaluate the equipment and identify all potential energy sources and the means for controlling them. Follow **Appendix C** for equipment-specific LOTO procedures.
    - Notify all affected employees in the work area when performing LOTO procedures.
2. Shut down the machine;
    - Equipment will be shut down using the normal shut-down procedures. When equipment is properly shut down, attach a “DANGER, DO NOT OPERATE” tag to the power switch.
3. Disconnect or isolate the machine from the energy source(s);
    - The equipment will then be de-energized and isolated from any hazardous energy sources.
4. Apply the lockout or tagout device(s) to the energy isolating device(s);
    - The *Authorized* employee will then affix the needed locks/tags to the appropriate energy isolating locations.
5. Release, restrain or otherwise render safe all potential hazardous stored or residual energy. If a possibility exists for re-accumulation of hazardous energy, regularly verify during the service and maintenance that such energy has not re-accumulated to hazardous levels; and
    - Release all pressure lines such as gas, air, steam, and hydraulic.

- Blocking mechanical equipment with moving, rotating or elevated parts.
- Releasing spring loaded equipment.

6. Verify the isolation and de-energization of the machine.
    - Before maintenance, verify that the machine is de-energized by first establishing that no personnel are exposed and attempt to turn the machine on using normal operating controls.

GROUP LOCKOUT/TAGOUT

Group lockout should be performed when work is being done on equipment by more than one individual. Each department should develop a process for group LOTO procedures. This information should be outlined in Appendix C: Energy Control Procedure. Group LOTO can use a lockout device that accepts multiple locks, or a group box that stores all keys and is only opened by one competent individual. A group representative should be selected to supervise the LOTO procedure. He or she will be responsible for maintaining the group lockout box, or affixing the group lockout device. The representative will also oversee the entire LOTO operation and monitor the process to ensure it is performed in accordance with applicable regulatory requirements.

SHIFT CHANGES

At times, equipment maintenance will extend beyond one work shift, so a procedure must be in place to transfer control of LOTO procedures and equipment to the arriving shift. This is done by allowing the arriving employee to apply his/her LOTO devices prior to the outgoing employee removing their devices.

The responsibility for this occurring in a seamless fashion is held by all departing and arriving shift supervisors involved with the project. These supervisors will be required to oversee the transfer of LOTO devices and ensure that energy control is maintained throughout the transfer.

WORKING WITH CONTRACTORS

When outside servicing personnel are to be engaged in activities regarding lockout/tagout, please refer to OSU's Contractor Program Manual: http://ehs.okstate.edu/content/contractor

TESTING EQUIPMENT

If an employee must re-energize equipment during service/maintenance and it requires the temporary removal of the LOTO device(s), they must follow this sequence:

1. Clear all tools and materials from equipment/machinery;
2. Remove all employees from equipment area;
3. Remove LOTO devices;
4. Energize and proceed with service/maintenance;
5. De-energize and reapply LOTO devices.

D: Removal of Lockout/Tagout Devices

Each lockout/tagout device must be removed from each energy isolating device by the employee who applied it. Removal of the device will be accomplished by following the steps below:

1. Ensure that the equipment is operational and all tools are removed and safe guards are put back in place.
2. Ensure all employees are clear of the equipment.
3. Employee who placed the LOTO device will remove the LOTO device.
4. Re-energize equipment.
5. Notify surrounding employees that servicing/maintenance has been completed and machine is ready for use.

REMOVAL OF ANOTHER PERSON'S LOCK/DEVICE

When the authorized employee who applied the lockout/tagout device is not available to remove it, the device may be removed under the direction of the manager, provided they can demonstrate that the specific procedure of device removal provides the same degree of safety as removal by the authorized employee who applied it. This procedure must include the following elements:

1. Verify the authorized employee is not at the facility.
2. Notify the employee's supervisor of the situation.
3. Ensure that all efforts are made to inform the authorized employee that his/her lockout or tagout device must be removed.
4. If the authorized employee is unable to return to work, the department manager (or designee) may use bolt cutters to remove the lock.
5. Ensure the authorized employee has knowledge of the removal *before* they return to work at the facility.
6. All such actions must be recorded on Appendix C: Lockout/Tagout Removal Form.

E: Directory of Services

Environmental Health and Safety

University Health Services Suite 002 / (405) 744-7241

University Health Services

1202 West Farm Road / (405) 744-7665

Facilities Management

402 North Willis / (405) 744-7154

Stillwater, Oklahoma

Emergency - Ambulance, Fire, Police

(911)

Appendix A: Definitions

LIST OF TERMS

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 AND they have been trained to do so, safely.

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.

Appendix B: Energy Control Procedures

OSU ENERGY CONTROL PROCEDURE

Equipment ID:	Mfg.:		Model No:		ID No:	
Equipment Location(s):			Date Performed:			
Task(s) to be Performed:						
Name of Person Performing Assessment:						

A. ENERGY FORM(S): (Check all that apply)

☐ 1. Electrical
- ☐ a. Low Voltage (50-600V)
- ☐ b. High Voltage (>600V)

☐ 2. Chemical/Explosion, pressure, extreme heat, fire, corrosive, reactive, oxidizer, toxic

☐ 3. Pressure
- ☐ Pneumatic
- ☐ Hydraulic

☐ 4. Vacuum

☐ 5. Mechanical – capable of crushing, pinching, cutting, snagging, striking.

☐ 6. Thermal – High Temperature, Surface temperature, Hot Liquids, steam

☐ 7. Thermal – Cryogenic – contact with super cold surface or with cryogenic liquid.

☐ 8. Ionizing Radiation

☐ 9. Non-Ionizing Radiation
- ☐ a. Ultraviolet
- ☐ b. Infrared
- ☐ c. Rf/Microwave
- ☐ d. Laser
- ☐ e. Magnetic Fields

☐ 10. Stored – Flywheels, springs, differences in elevation, elevated parts that could drop, capacitors, batteries.

B. BASIC PROCEDURES

Lockout Procedure:

- ☐ 1. Notify all affected personnel of LOTO.
- ☐ 2. Turn off power at disconnect points listed in Column C.1.
- ☐ 3. LOTO each energy control point listed in Column C.1.
- ☐ 4. Dissipate/disconnect any stored energy. See Column C.2. {☐ N/A}
- ☐ 5. Block any mechanical parts, remove any mechanical links. Lock blocking in place. {☐N/A} (NOTE: Two physical blocks required to secure any gas/liquid line)
- ☐ 6. Verify personnel are clear of hazards.
- ☐ 7. Verify no hazardous energy remains. Use circuit tester/meter if electrical energy is involved. See Column C.4.
- ☐ 8. Attempt to re-start machinery or re- energize equipment through normal means. **NOTE:** Return switch back to **OFF** position.
- ☐ 9. Perform required work.

Procedure to Device to Operation:

- ☐ 10. Verify Danger Zone is clear of equipment, workers, tools, and test equipment.
- ☐ 11. Unlock and remove any blocking devices; remove linkages.
- ☐ 12. Reposition any safety devices.
- ☐ 13. Warn workers to stay clear of area.
- ☐ 14. Remove all locks and tags from energy control points.
- ☐ 15. Verify area is clear of personnel.
- ☐ 16. Re-start/re-energize the equipment.
- ☐ 17. Notify all affected personnel and other persons that the lockout has been cleared.

C. SPECIFIC PROCEDURES

Hazardous Energy (Specify form & Values including names of chemicals)	C.1 **Specific Lockout Locations**	C.2 **Dissipate Stored Energy At These Points**	C.3 **Block These Parts/Remove Linkages**	C.4 **Verify Residual Energy By These Methods**

SHIFT CHANGES: If this procedure lasts beyond one work shift, the relief crew will apply their locks and tags before the departing shift removes their locks and tags. **If this does not happen, the new crew must start with a new ECP.**

Appendix C: Removal of Another Person's Device

The following steps will be followed when removal of another person's lock and/or tag is necessary. This is to be completed by the Manager that authorizes removal of the lock and/or tag and witnessed by another supervisor/manager.

1: Attempt to contact the person to have him/her remove his/her lock(s) and/or tag(s).

Employee's Name: _____ Facility/Dept.: _____

What attempt was made? (Phone, etc.): _____

Result of contact? _____

Date: _____ Time_____

2: Notify the affected people.

Check the area to ensure it is clear and safe before removing the lockout/tagout device(s).

Lock ID Number(s) that was destroyed (cut off)? _____

Person(s) involved in checking the area and removing the lockout/tagout device(s) were:

_____

_____

3: The individual's supervisor will discuss this serious matter with the employee before returning to work the following shift.

Who held the discussion with the employee? _____

Provide details and/or your comments: _____

_____

_____

Employee's Signature: _____ Date: _____

Witnessing Supervisor: _____ Date: _____

Authorizing Manager's Signature: _____ Date: _____

4: Retain this document for departmental safety records.

Appendix D: Periodic Inspection

This form is used to audit energy control procedures for the following equipment/machine(s):

_____

_____

Basic Information: Complete/Compare with Existing Energy Control Procedure

Department: _____ Building: _____ Date: _____

Location/Area: _____

Inspector: _____

Authorized Employee(s) Involved: _____

_____

Other Employee(s) Affected: _____

_____

Service/Maintenance Activities Requiring Lockout/Tagout: _____

_____

_____

_____

Review the current lockout/tagout procedures and indicate whether they are satisfactory. Any procedures marked "No" must have a detailed explanation under Comments/Deficiencies, below.

A. Control Methods:	Satisfactory?	☐ Yes ☐ No
B. General Review of Responsibilities and Procedures:	Satisfactory?	☐ Yes ☐ No
C. Energy Identification:	Satisfactory?	☐ Yes ☐ No
D. Lockout Device:	Satisfactory?	☐ Yes ☐ No
E. Energy Release Methods:	Satisfactory?	☐ Yes ☐ No
F. Lockout Steps:	Satisfactory?	☐ Yes ☐ No

G. Comments/Deficiencies:

_____

_____

_____

_____

Certification:

This energy control procedure is adequate (or modified as noted above). The inspector has reviewed appropriate responsibilities with the Authorized Employee(s). Tag limitations were inspected and appropriate affected employees included in this review where tagout devices are used.

Inspector's Signature: _____ Date: _____

Authorized Employee's Signature: _____ Date: _____

Authorized Employee's Signature: _____ Date: _____

Authorized Employee's Signature: _____ Date: _____

Appendix E: Authorized Employee Review/Audit

Employee Name: _____ Employee CWID #: _____

Department: _____ Supervisor: _____

Date of Most Recent Lockout/Tagout Training: _____

When conducting the annual review with the authorized employee, you must ask the employee to answer the questions listed below. If the employee can fully answer the question, check the "Yes" box. If the employee cannot fully answer the question, check the "No" box and conduct additional training to ensure that the employee understands.

1. When must the Lockout/Tagout Procedure be utilized?
   - ☐ Yes. Fully understands
   - ☐ No. Does not fully understand

2. What should be done if you must leave your lock in place after the end of your shift?
   - ☐ Yes. Fully understands
   - ☐ No. Does not fully understand

3. What should be done if more than one person is working with/or on a piece of equipment which must be locked out?
   - ☐ Yes. Fully understands
   - ☐ No. Does not fully understand

4. How many keys are allowed for each lock?
   - ☐ Yes. Fully understands
   - ☐ No. Does not fully understand

5. Who is allowed to remove a lock?
   - ☐ Yes. Fully understands
   - ☐ No. Does not fully understand

6. What does the phrase, "one lock, one key, one person" mean?
   - ☐ Yes. Fully understands
   - ☐ No. Does not fully understand

Select a piece of equipment with multiple power sources. Have the employee lockout the equipment utilizing the approved energy control procedure. If the employee is unable to successfully achieve a zero energy state, conduct additional training to ensure that the employee fully understands the procedures.

Equipment Selected: _____ Power Source: _____

Did the employee notify affected personnel & others as required? ☐ Yes ☐ No

Did the employee successfully identify all sources of energy and their magnitude? ☐ Yes ☐ No

Did the employee successfully relieve, block, or isolate all sources of stored energy? ☐ Yes ☐ No

Did the employee apply lockout devices to the energy isolating devices properly? ☐ Yes ☐ No

Did the employee test lockout and return controls to "neutral" or "off" position? ☐ Yes ☐ No

Did the employee successfully achieve a "zero energy" state? ☐ Yes ☐ No

Did the employee notify affected personnel prior to returning equipment to service? ☐ Yes ☐ No

Did the employee ensure the equipment was prepared to be returned to service? ☐ Yes ☐ No

_____ _____

Supervisor's Name Supervisor's Signature