

Reed College Control of Hazardous Energy (Lockout/Tagout) Program

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1.0 Purpose and Scope

This program is designed to protect employees and contractors of Reed College when performing maintenance or servicing activities on campus and in the surrounding areas, from the unexpected start-up of equipment or the release of stored energy. It also is designed to protect Reed College employees and contractors from the unexpected start-up of equipment during tool changes and adjustments.

This program establishes the minimum requirements for the Lockout or Tagout (LOTO) of energy isolating devices to protect Reed College employees.

According to OSHA 1910.147(b), an Energy Isolating Device is defined as “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 underground supply conductors and, in addition, no pole can be operated independently, a side gate, a slip blind, a line valve, a block, and any similar device used to block or isolate energy. The term does not include a push button, selector switch, and other control type device.”

The types of energy sources being addressed in this program are electrical, pneumatic, hydraulic and mechanical.

Before a LOTO is considered, the type of energy, magnitude of the energy, and the potential hazards must be identified and addressed. These should be recorded on the device specific procedure (see Appendix 2).

2.0 Responsibilities of Positions

2.1 Environmental Health and Safety Department (EHS)

EHS is responsible for review and development on the LOTO program. Modifications may be made to address changes in regulations or to make improvements based on industry best practices or worker suggestions.

Training and associated documentation for supervisors, authorized employees, and affected employees is managed by EHS.

2.2 Supervisors

Supervisors are responsible for ensuring their employees are trained on specific LOTO procedures for systems and equipment serviced or maintained by their department. Supervisors



also must enforce the use of proper LOTO procedures, including for third parties under their direction.

Purchasing of necessary equipment to safely and effectively perform Lockout/Tagout is the duty of department supervisors. Supervisors should work with EHS to locate and identify systems and equipment that require LOTO for servicing and maintenance, and confirm that the appropriate LOTO devices are available. Program development, implementation, evaluation, and updating requires the involvement of Supervisors as well.

2.3 Authorized Employees

Authorized employees are those who are qualified to perform LOTO procedures in order to service or maintain systems or machines. Authorized employees must receive training on recognition, evaluation, and control of hazardous energy. Additionally, specific procedures must be followed when performing service or maintenance on a system or machine that requires LOTO. Employees must receive specific training for each system and/or device prior to working on that device. Work may not be performed until system specific training has been completed.

Authorized employees should work with their supervisors and EHS to locate, identify, and develop procedures for systems that require LOTO.

2.4 Affected Employees

Affected employees are those who work with or operate a system or machine which requires a LOTO procedure in order to perform service or maintenance. Affected employees should be trained to recognize hazardous energy and the purpose of LOTO, however they are not authorized to perform LOTO procedures or provide service/maintenance on systems or devices that require control of hazardous energy. Affected employees should notify their supervisor when maintenance is required and only allow authorized employees or properly vetted contractors to perform work requiring LOTO.

3.0 General Lockout/Tagout Procedure

Below follows general LOTO procedures. System/device specific procedures should be followed before performing service, however this general procedure may be helpful when developing new procedures or evaluating existing ones. A general procedure form can be found in Appendix 2.

3.1 Preparation for Lockout/Tagout

A survey of all equipment to locate and identify all isolating devices must be conducted by a qualified *Authorized Employee* to be certain which switch(es), valve(s), or other energy source may be involved.



Details concerning the type(s) and location(s) of energy isolating means for specific equipment can be found by reviewing that equipment's individual Lockout/Tagout Procedure.

3.2 Sequence of Lockout/Tagout Procedure

1. All *Affected Employees* are **notified** in advance that a Lockout or Tagout system is utilized and the reason it is necessary. The *Authorized Employee* will review the type and magnitude of the energy of the specific machine or equipment and will understand the **potential hazards** prior to initiating procedures.

Note: If at any point there is a question concerning the procedure, the Reed College Authorized Employee is to stop, secure the area, and immediately contact his/her immediate supervisor.

2. If the machine or equipment is operating, the *Authorized Employee* will **shut it down** by the normal stopping procedure (depress stop button, open toggle switch, etc.).
3. In accordance with the specific machine(s) or equipment(s) Lockout/Tagout procedures, the *Authorized Employee* operates the switch, valve, or other energy isolating device(s) so that the **equipment is isolated** from its energy source(s). Stored energy (such as that in elevated machine members, hydraulic/pneumatic systems, steam, electrical capacitance) is dissipated or restrained by the following methods:

| Type of Stored Energy | Methods to Dissipate or Restrain |
|-----------------------|---|
| Electrical | Shut off main disconnect, Bleed Electrical Capacitance |
| Pneumatic | Close valve(s), Bleed Air Pressure, Lower Machine Members |
| Hydraulic | Close valve(s), Bleed Fluid/Pressure, Blocking, Lower Machine Members |
| Mechanical | Blocking, Lower Machine Members |

4. In accordance with the specific machine's or equipment's Lockout/Tagout procedure, the *Authorized Employee* will **lockout and/or tagout** the energy isolating devices with assigned individual lock(s) and tag(s). Additional safety measures may be required on specific equipment.
5. After ensuring that no Reed College employees are exposed, and conducting a **check** to ensure the disconnection of all designated energy sources, the *Authorized Employee* operates the push button or other normal operating controls to make certain the equipment will not operate.
6. The equipment is now safely Locked-out or Tagged-out.



3.3 Restoring Machines or Equipment to Normal Function and Operation

When the servicing or maintenance is completed and the machine or equipment is ready to return to normal operating condition, the *Authorized Employee* takes the following steps:

1. Check the machine or equipment and the immediate area around the machine or equipment to ensure that nonessential items have been removed and that the machine or equipment components are operationally intact.
2. Check the work area to ensure that all Reed College employees have been safely positioned or removed from the area.
3. Verify that controls are in neutral.
4. After all the above steps have been completed and the guards have been reinstalled, remove all Lockout and/or Tagout devices in accordance with specific procedures.
5. Notify *Affected Employees* that the servicing and/or maintenance is completed and the machine or equipment is ready for use.
6. Operate the energy isolating device(s) in accordance with normal start up procedure to restore energy to the machine(s) or equipment.

3.4 Multiple Persons Lockout

If more than one individual is required to lockout or tagout equipment, each places their own personal lockout device or tagout device on the energy isolating device(s). When an energy-isolating device cannot accept multiple locks or tags, a multiple lockout or tagout device (hasp) may be used.

If lockout is used, a single lock may be used to lockout the machine or equipment with the key being placed in a lockout box or cabinet which allows the use of multiple locks to secure it. Each employee will then use their own lock to secure the box or cabinet. As each person no longer needs to maintain their lockout protection, that person will remove their own lock from the box or cabinet.

Note: single-lock group lockout is prohibited in all industries; all locks must be unique for each qualified individual. See OR-OSHA Admin. Order 2-1990, f. 1/19/90, ef. 3/1/90 and OR-OSHA Admin. Order 12-2001, f. 10/26/01, ef. 10/26/01



4.0 Periodic Inspection

To evaluate the effectiveness of the program and the safety of employees, random periodic inspections should be conducted of LOTO procedures being utilized in the field. An authorized employee, other than the ones utilizing the LOTO being inspected, will evaluate the procedure and performance of the LOTO. Inspection forms are found in Appendix 3.

5.0 Long Duration Lockout/Tagout

For long duration LOTO (such as new construction, major repairs, etc.), locks may be applied by maintenance personnel, site engineers (if work is done by outside contractors), or senior maintenance managers. A tag with a short description of why the equipment is locked out and signed by the employee is attached to the lock.

Each employee must attach their own lock to the energy isolating device during each time they work on the machine or equipment, even though a "Long Duration" lock is attached.

6.0 Shift of Personnel Change

If work has begun and carries over to the next shift, the oncoming crew attaches its own locks and/or tags before the outgoing crew removes theirs.

7.0 Contractors

Prior to work being performed, an *Authorized Employee* and the contractor inform each other of their respective lockout/tagout policy/procedures. If the contractor's LOTO procedures are to be utilized, all *Affected Employees* are instructed on the restrictions and prohibitions of the contractor's procedures.

8.0 Training

Reed College certifies that employee training has been completed and kept up to date. Certification includes employee names and dates of completion.

8.1 Initial Training

8.1.1 Authorized Employees

Authorized employees will be trained on the following items prior to beginning any work on systems or devices that require control of hazardous energy:

1. Recognition of hazardous energy sources.
2. Types and magnitude of energy in the workplace.
3. Methods for energy isolation and control.



4. System specific procedures they will utilize.

8.1.2 Affected Employees

Affected employees will be trained on the following items prior to working with systems or devices that require control of hazardous energy when being serviced or maintained:

1. The purpose and use of energy control procedures.
2. Procedures for the proper interrupting of a LOTO.
3. Prohibition on restarting machines or equipment while LOTO ongoing.

8.2 Retraining

Employees will retrain when one of the following occurs:

1. Job assignments change.
2. Machine, equipment, or processes present new hazards.
3. Energy control procedures change.
4. When disciplined for not following proper procedures.

9.0 Additional Information

- Removal of locks and tags once work is completed should be done as soon as safely feasible. Failure to do so can result in confusion and delay of work until the individual is found. Negligent employees may be issued a warning or be required to receive additional training.
- If an *Affected Employee* needs to operate a locked-out/tagged-out piece of equipment during normal working hours, they should call the phone number listed on the lock or tag. If unavailable, call Facilities Services at 503-777-7283 and provide the initials written on the lock or tag. Facilities staff will locate the individual and see if they can accommodate the request.
- If an *Affected Employee* needs to operate a locked-out/tagged-out piece of equipment outside of normal working hours, they should call Maintenance On-Call at 503-939-4446. The on-call staff must first get confirmation from both the individual who placed the lock and their supervisor before removing the control device.
- Except for after-hour removal by authorized on-call staff with proper confirmation, no one should remove a lock other than the individual who placed it or their supervisor. Unauthorized removal of locks puts individuals at risk and will result in disciplinary action.
- Contractors must use LOTO procedures when working on systems or devices which require control of hazardous energy. *Authorized Employees* or supervisors showing contractors the equipment must provide specific procedures and instructions. Contractors must follow the “one worker, one lock, one key” policy.
- Disciplinary measures may include verbal or written warnings, suspensions, or possibly termination of employment depending on the number and/or severity of violations.



Appendix 1: General List of Systems Requiring LOTO

EQUIPMENT REQUIRING LOCKOUT/TAGOUT PROCEDURES

a) Electrical:

- a) Power tools and devices have electrical disconnect switches because accidental energizing could cause electrical shock or injuries. Lock out equipment at the disconnect switch mounted on the machine or down the line. Locate electrical panels or sub-panels and lock out/tag off individual breakers. Lock/tag out the panel cover, as well. Check equipment for more than one energy source to lockout/tag-out. (Exception: Any work on cord and plug connected electric equipment that is controlled by the unplugging of the equipment from the energy source and the plug is under the exclusive control of the employee performing the servicing or maintenance.)
- b) Table saws, band saws, radial arm saws requiring service, which do not fall under the exception noted above, must use lockout/tag-out procedures.
- c) Fume hoods: Protect workers replacing belts and performing other service on fume hood motors, pulleys, fans, ducts, etc. Protect building occupants and users of the hoods. Inform the hood users in advance of the shutdown to guarantee they do not use hazardous materials in the affected hoods. Tag hoods with warning signage. Verify the effectiveness of service or corrective actions before releasing the hoods for use. Measure open sash face velocity with a velometer (available from EHS) and document airflow.
- d) HVAC units: Protect workers servicing motors, fans, pulleys, etc. from electrocution and/or the accidental activation of moving parts. Warn building occupants in advance of any shutdown that will affect indoor air quality.
- e) Circuit breakers to circuits: Lock out/tag-out equipment that is hard wired and cannot be unplugged. Lock out/tag out the individual circuit. In some cases, lock out/tag out the panel or sub-panel.
- f) For equipment that can be unplugged, a cover can be locked in place over the plug end, or secure a tag to the plugged end.

b) Compressed air:

- a) Compressed air lines may or may not have valves available in line to isolate the section of the compressed air line being serviced. However, always lock out/tag out a valve. Install a bleeder valve on the line being serviced to prevent buildup of pressure due to compressed air leaking by the shut off valve.
- b) Additional note: Use a compressed air line to supply air to a liquid system. Be aware of the possibility that when the unit is shut down, some of the liquid could be sucked into the compressed air line through the open valve. Check with the Stockroom Manager or departmental contact before beginning the work.
- c) Compressors: Disconnect and lockout/tag-out the electrical supply. Open valve to bleed compressed air built up in the system. Check all gauges and replace any defective



Total

gauges noted. Secure a valve cover lock over the valve or lock with a chain to lockout/tag-out the valve. Keep a bleeder valve open on the line being serviced or the unit itself.

- d) Quick disconnect line-supplied equipment: Disconnect the unit and tag the quick connect point to prevent accidental plugging in of the unit while being serviced.

c) Steam:

If boiler output lines require service, bleed steam out of any line being serviced.

Two methods are:

- a) Turn off two valves and open a bleeder valve between the two valves. Do this down line, from where work is being done, so no steam pressure will build up due to leakage around a closed valve. Lock out and tag out valves. Use a chain, lock, or lockable valve cover.
- b) Turn off the supply line valve, open the flange, and install a blank flange or plate to block any possible flow of steam. Tag the joint involved and lock out the closed valve.

d) Gas:

Tag and lock out gas valves. Shutting off gas valves requires the relighting of pilot lights in furnaces and other equipment. Bleed off residual line gas pressure outside and away from sources of ignition before beginning work.

e) Roll Up Doors and Other Fire Doors:

Roll up steel doors and drop-down steel doors are located in the following buildings on campus:

- a) Art building sculpture studio
- b) Commons servery
- c) ETC stairwells
- d) Eliot elevators (smoke screens)
- e) GCC Hallway near GCC 104
- f) Heating plant boiler room
- g) Kaul Auditorium coatroom
- h) Mailroom window
- i) Sport center cage
- j) Vollum College Center fire separation (horizontal) door
- k) Warehouse

Some of these doors are under spring tension, some are under heavy counterweights, and some are electrically driven. If work is underway, block open the doors to prevent the door from dropping down. Follow all manufacturer guidelines for working safely on this type of door.



f) Hydraulic:

- a) Hydraulic systems exist on personnel lifts, forklifts, tractors, and elevators. Whenever there is a planned release of hydraulic pressure in order to work on a piece of equipment, put the equipment in its lowest or fully released position before releasing the pressure.
- b) Apply the necessary stop pins and/or blocks to prevent sudden release of equipment when working on a hydraulically controlled piece of equipment in a partially or fully raised condition. Before using any blocking devices while working on equipment, make sure they are rated for the correct load weight and properly installed.
- c) If, as part of the repair, you need to replace a hydraulic line or fitting, bleed down the line to remove pressure and to prevent leakage of fluid. Lockout/tag-out the power supply as specified in the six-step procedure of the lockout/tag-out program.



Appendix 2: Generalized Lockout/Tagout Procedure Form

LOCKOUT/TAGOUT PROCEDURES FORM

| | | | | |
|---|--|---|---|-------------------------------|
| 1. Equipment: | | | | |
| 2. General | | | | |
| a. Energy Source(s) | b. Magnitude | c. Hazard(s) | d. Personal Protective Equipment | |
| | | | | |
| | | | | |
| 3. Caution!! | <i>Shut-down equipment by using normal stopping procedures prior to initiating lockout/tagout procedure.</i> | | | |
| 4. Energy Isolating Means | | | | |
| a. Energy Source(s) | b. Description of Equipment | c. Location | d. Lockout/Tagout | |
| | | | | |
| | | | | |
| | | | | |
| 5. Types of Stored Energy | | | | |
| a. Energy Source(s) with Residual Energy | b. Magnitude | c. Methods Used to Dissipate Residual Energy | | |
| | | | | |
| | | | | |
| | | | | |
| 6. Types of Equipment to Check to Ensure Disconnections | | | | |
| a. Description of Equipment* <i>*See Previous Page for List</i> | b. Authorized Employee | c. Location | d. Method | e. Process / Procedure |
| | | | | |
| | | | | |
| | | | | |
| <p>CAUTION: Return operating control(s) to “neutral” or “off” position after each test.</p> <p>At this point, the equipment is safely locked- and/or tagged-out.</p> <p>Start-up Procedures:</p> <ul style="list-style-type: none"> <input type="checkbox"/> After all tools have been removed from the machine(s) or equipment, guards have been reinstalled and Reed College employees are in the clear, remove all lockout and/or tagout devices in reverse order of installation. <input type="checkbox"/> Operate the energy isolating device(s) in accordance with normal start-up procedure to restore energy to the machine(s) or equipment. | | | | |

Appendix 2 Continues...



Appendix 2 (continued)

Instructions for Completing the Lockout/Tagout Procedures Form

1. Identify the **specific** equipment to be locked- and/or tagged-out.
2. General.
 - a. Identify and list all energy sources.
 - b. List magnitude for each energy source.
 - c. List associated physical/health hazards relative to each energy source. Examples include electrical shock and compressed gas/fluid.
 - d. For each energy source, identify personal protective equipment (PPE), if applicable, necessary to ensure employee safety while performing the procedure.

3. **Caution!!**

These sections are awareness sections, reminding the *Authorized Employee(s)* performing the lockout/tagout of what procedures need to be performed **prior** to initializing a safe shut-down.

4. Energy Isolating Means.
 - a. Assign order of importance to energy sources to ensure optimum employee safety.
 - b. Describe the equipment which qualifies as an energy isolating device and its associated label.
 - c. Describe the specific location of the energy isolating device.
 - d. Determine whether a lockout or tagout is appropriate.
5. Types of Stored Energy.
 - a. Is residual energy present? Assign order of importance to those energy sources which retain “residual energy”.
 - b. After the lockout/tagout sequence has been performed in the energy isolating means section, identify the residual energy magnitude. NOTE: This may be in the form of electrical capacitance, line pressure (pneumatic, hydraulic, steam, chemical), or mechanical, etc.
 - c. Specifically identify the method used to safely dissipate the residual energy for the energy source.
6. Types of Equipment to Check to Ensure Disconnection.
 - a. Describe the equipment pertaining to the energy source. Examples include: control panel, operator controls, and pneumatic gauge.
 - b. List the *Authorized Employee(s)* who would be viewing and/or manipulating equipment to ensure disconnection.
 - c. Identify the specific location of the energy source.
 - d. List the methods or equipment used to ensure the disconnection.
 - e. Describe the process or procedure the *Authorized Employee* would utilize. Examples include: activate toggle switch, no movement should occur, or pneumatic gauge should read 0 psi.



Appendix 3: Inspection Form for Lockout/Tagout Procedures

1. What machine is the crew working on?

| |
|--|
| |
|--|

2. Is the specific machine or equipment Lockout/Tagout Procedures form present in the immediate work area?

| | | | | | |
|-----|--|----|--|------------------|--|
| Yes | | No | | If not, explain: | |
|-----|--|----|--|------------------|--|

3. Has the main power source(s) been identified?

| | | | | | |
|-----|--|----|--|------------------|--|
| Yes | | No | | If not, explain: | |
|-----|--|----|--|------------------|--|

4. Other energy sources identified? Describe.

| |
|--|
| |
|--|

5. Has the machine and/or equipment been tested for inadvertent start-up prior to work being performed?

| | | | | | |
|-----|--|----|--|------------------|--|
| Yes | | No | | If not, explain: | |
|-----|--|----|--|------------------|--|

6. Number and names of the Reed College employees working on machine?

| Employee Name | Lock/Tag Attached? | | | | Key On Person? | | | |
|---------------|--------------------|--|----|--|----------------|--|----|--|
| | Yes | | No | | Yes | | No | |
| | Yes | | No | | Yes | | No | |

7. Were the locks and tags properly identified?

| | | | | | |
|-----|--|----|--|-------------------------|--|
| Yes | | No | | If not, whose were not: | |
|-----|--|----|--|-------------------------|--|

8. Will the work be completed this shift?

| | | | | |
|-----|--|----|--|--|
| Yes | | No | | |
|-----|--|----|--|--|

If no, have arrangements been made to inform the next crew?

| | | | | |
|-----|--|----|--|--|
| Yes | | No | | |
|-----|--|----|--|--|

9. Have the extra keys been identified and locked up in the maintenance office?

| | | | | |
|-----|--|----|--|--|
| Yes | | No | | |
|-----|--|----|--|--|

If no, have arrangements been made to inform the next crew?

| | | | | |
|-----|--|----|--|--|
| Yes | | No | | |
|-----|--|----|--|--|

10. Who made the inspection?

| Signature of Maintenance Foreman | Date | Time | |
|----------------------------------|------|------|-------|
| | | | am/pm |

