



University of Vermont  
Department of Physical Plant  
Burlington, Vermont

CONTROL OF HAZARDOUS ENERGY SOURCES AND  
ELECTRICAL HAZARDS LOCKOUT AND TAGOUT  
PROGRAM

in accordance with  
OSHA 29 CFR 1910.147

REVISED AND DISTRIBUTED BY:  
THE UNIVERSITY OF VERMONT  
DEPARTMENT OF PHYSICAL PLANT  
TRAINING AND COMPLIANCE OFFICE

REVIEWED BY:  
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**The University of Vermont**

**CONTROL OF HAZARDOUS ENERGY SOURCES AND ELECTRICAL HAZARDS  
LOCKOUT AND TAGOUT PROGRAM**

**1.0 PURPOSE**

The purpose of this program is to ensure that before an employee performs services or maintenance on machinery or equipment, where the unexpected energizing, startup or release of any type of energy could occur and cause injury, the machinery or equipment will be rendered safe to work on by being locked out/tagged out (LOTO). The program is designed to satisfy the Occupational Safety and Health Administration (OSHA) requirements outlined in 29 CFR 1910.147 "Control of Hazardous Energy Sources."

## **2.0 GENERAL INFORMATION**

All equipment and machinery shall be LOTO to protect against accidental or inadvertent operation during any servicing or maintenance activity. **Any unauthorized operation or attempt to operate any switch, valve, or other energy isolating device that is LOTO will be disciplined.**

An energy source is any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

Lockout means the placement of a lock on an energy-isolating device of a machine or on equipment in order to prevent the operation of the machine or equipment until the lock is removed. Energy isolating devices can include circuit breakers, switches, valves, and blocks.

Tagout means the placement of a tag which can be securely fastened to an energy-isolating device to indicate that the machinery or equipment may not be operated until the tagout device is removed.

Lockout is the preferred method of isolating machines or equipment from energy sources and shall be used whenever possible.

If only tags are used, additional steps shall be taken as they may be necessary to provide the equivalent safety available from the use of a lockout device.

At the point when any equipment is to be obtained or modified by the University, every effort shall be made to equip the unit with lockout capabilities.

### **3.0 LOCKOUT/TAGOUT PROGRAM**

This program establishes the minimum requirements for the LOTO of energy isolating devices. Specific procedures for control of hazardous energy sources must be developed for any equipment or machinery before any maintenance or servicing is performed on it. Equipment shall be evaluated, with specific LOTO procedures documented on the LOTO Procedure Sheets. (See Appendix 1)

Upon completion of the LOTO Procedure Sheets a copy shall be forwarded to the Physical Plant Training and Compliance Office, 284 East Avenue, Burlington, Vermont 05405. Procedure Sheets can also be faxed to 764-6620 or scanned and e-mailed to [TCO@uvm.edu](mailto:TCO@uvm.edu). LOTO Procedures will be recorded in a centralized electronic database.

### **3.1 RESPONSIBILITY**

Any employee who could be exposed to hazardous energy sources shall be instructed to the safety significance of the LOTO procedure. (See Section 7.0 Training) Such employees are classified as "Affected" employees. Employees authorized to perform LOTO shall receive training commensurate with their responsibilities. (See Section 7.0 Training) Such employees are classified as "Authorized" employees. The following job classifications have been authorized to perform LOTO procedures on University of Vermont (UVM) equipment that is covered under the OSHA standard.

- |  |                             |
|--|-----------------------------|
| 1. Assistant Director of PPD Maintenance | 7. Cage Operating Engineers |
| 2. Safety Programs Manager               | 8. Technician               |
| 3. Maintenance Manager                   | 9. Maintenance Mechanic     |
| 4. Supervisor/Sr. Mechanic               | 10.. Electrician            |
| 5. Safety Programs Coordinator           | 11. Plumber                 |
| 6. Supervisor                            |                             |

Each new and transferred "affected employee" and "other" employees whose work operations are or may be in the area shall be instructed in the purpose and use of the LOTO procedure. Prior to LOTO, the senior authorized individual shall brief all affected employees. In the event of tagout system only, the senior authorized individual will also brief all other personnel potentially exposed to the hazard. The procedures noted in the LOTO Procedure Sheets will be followed.

### **3.2 PREPARATION FOR LOTO**

The authorized employee shall make a survey using the LOTO Procedure Sheet to locate and identify all isolating devices such as switch(es), valve(s) or other energy isolating devices which apply to the equipment to be LOTO. More than one hazardous energy source and/or means of disconnect (electrical, mechanical, pneumatic, or other) may be involved. If specific procedures have not been developed and documented, they shall be developed and documented before work is begun. No work can proceed until a Maintenance Manager or Supervisor verifies and approves the specific procedure written by an authorized employee (See Appendix I for LOTO Equipment Procedures Sheet.) Locks and tags are to be made available to each authorized employee, with the Maintenance Manager or Supervisor responsible for ensuring that this equipment is available and adequate for the hazards present in the facility.

### **3.3 GENERAL LOTO SYSTEM PROCEDURE**

1. Refer to written LOTO procedures specific to the equipment serviced or maintained.
2. Notify all affected employees that a LOTO system is going to be utilized and the reason for the LOTO.
3. Notify the Central Heat Plant (656-2649) of the LOTO by identifying machinery, purpose for shut down and estimated time of the shutdown. The authorized employee shall know the magnitude of energy that the machinery or equipment utilizes, shall understand its hazards and shall understand how the shutdown of this piece of equipment effects other associated equipment and other utilizing the space for work, research, etc.
4. If the machinery or equipment is operating, shut it down by the normal stopping procedure. This is usually done by depressing the stop button, opening the toggle switch, etc. In addition, ensure that all stored energy is *dissipated and/or* restrained.
5. Operate the switch, valve, or other energy isolating device(s) so that the *work is* isolated from its energy source(s).

Lockout/Tagout Device Application:

- A. Locks/tags shall be affixed/installed to each energy isolating device only by an "authorized employee".
- B. Locks shall be affixed in a manner that will hold the energy isolating devices in a **safe** or **off** position.
- C. Tags, when used, shall be affixed in a manner that will clearly indicate that the operation or movement of the energy isolating device from the **safe** or **off** position is prohibited.
- D. Tags that cannot be affixed directly to the energy isolating device shall be located as close as safely possible to the device and in a position that will be immediately obvious to anyone attempting to operate the device.
- E. All potentially hazardous stored or residual energy shall be relieved, disconnected, restrained, or otherwise rendered safe. (If there is a possibility of re-accumulation of stored energy to a hazardous level, verification of isolation shall continue until the possibility of accumulation no longer exists.)
- F. After ensuring that no personnel are exposed, as a check on having disconnected the energy sources, operate the push button or other normal operating controls to make certain the equipment **will not** operate.

**CAUTION - RETURN OPERATING CONTROL(S)**  
**TO NEUTRAL OR OFF POSITION AFTER THE TEST**

The equipment is now LOTO

### **3.4 TESTING OR POSITIONING OF MACHINES, EQUIPMENT, OR COMPONENTS**

1. Clear the machine or equipment of tools and materials.
2. Clear employees from the machine or equipment area.
3. Remove the LOTO devices.
4. Energize and proceed with testing or positioning.
5. De-energize all systems and re-apply energy control measures in accordance with the requirements set forth in this program.

### **3.5 PROCEDURE INVOLVING MORE THAN ONE PERSON**

1. In the preceding steps, if more than one individual is required to lockout/tagout equipment, each shall place his/her own assigned LOTO device on the assigned isolating device(s). If an energy isolating device cannot accept multiple locks a multiple LOTO 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 that allows the use of multiple locks to secure it. Each employee will have his/her own assigned lock to secure the box or cabinet. As each person no longer needs to maintain his/her lockout protection, that person will remove his/her lock from the box or cabinet.
2. Notify the Central Heat Plant (656-2649) of the multiple individuals who are required to lockout/tagout this piece of equipment.



### **3.6 REMOVAL OF LOCKOUT/TAGOUT DEVICES BY OTHER THAN THE AUTHORIZED EMPLOYEE**

Lockout/Tagout devices shall only be removed from each energy isolating device by the employee who applied it, except:

Lockout/Tagout devices maybe removed by the Maintenance Manager or Supervisor if the authorized employee who applied it is not available and:

- ✓ It is verified that the authorized employee who applied the device is not at the facility;
- ✓ All reasonable efforts were made to contact the authorized employee to inform him/her that his/her LOTO device has been removed, and;
- ✓ Authorized employee has this knowledge before he/she resumes work at the facility.

### **3.7 RESTORING MACHINES OR EQUIPMENT TO NORMAL OPERATIONS**

1. After the servicing and/or maintenance activities are complete and equipment is ready for normal operations, check the area around the machine or equipment to ensure that no one is exposed.
2. Notify the Central Heat Plant (656-2649) of restoration of equipment to normal operations.
3. After all tools have been removed from the machine or equipment, guards have been reinstalled, and employees are in the clear, remove all LOTO devices and notify the “affected” employees of their removal. Operate the energy isolating devices to restore energy to the machine or equipment.

#### **4.0 INFORMING OUTSIDE CONTRACTORS**

The Maintenance Manager, Supervisor or Department who hires outside contractors will inform them of the elements of this program and obtain the contractor's LOTO programs. The contractor's program shall be conveyed to our employees in an understandable manner. The work efforts covered by the procedure shall be fully coordinated and complied with. The University strongly requires contractors to **meet or exceed** our LOTO program and procedures for the safety of themselves and the campus community. Any inconsistencies in LOTO procedures on University equipment will need to be coordinated and approved by Sr. Mechanic, Supervisors, Maintenance Mechanics, and the contractor on site.

#### **5.0 SHIFT OR PERSONNEL CHANGES**

In the case of shift or personnel changes, a changeover period will be established so that the authorized employees may exchange their assigned locks/tags. Authorized personnel assuming control of lockout of equipment shall be fully briefed in the scope and strategy of the work by those who are being relieved.

#### **6.0 PERIODIC INSPECTIONS**

Periodically (at least annually) the effectiveness of the entire program will be evaluated by the Risk Management Safety Programs Specialist and/or Physical Plant Safety Programs Manager. Any deviations or inadequacies shall be documented and corrected. The inspection will be documented and records kept on file at the Physical Plant, Training and Compliance Office.

#### **7.0 TRAINING**

Training shall be given to all authorized, affected, and other personnel. In addition a copy of the illustrated overview of the OSHA Lockout/Tagout Standard 29 CFR 1910.147 is located at [http://www.uvm.edu/~uvmppd/TCO/?Page=lockout\\_tagout/loto.html&SM=tcosubmenu.html](http://www.uvm.edu/~uvmppd/TCO/?Page=lockout_tagout/loto.html&SM=tcosubmenu.html).

UVM will conduct training sessions as outlined in OSHA Lockout/Tagout Standard 29 CFR 1910.147 (c)(7), and prepare a record to certify that the employee training has been accomplished using the attached LOTO Training Sign-in Sheet (Appendix 2). The Maintenance Manager or Supervisor will conduct

retraining whenever there is a change in the job assignments, a change machines, equipment, or processes present a new hazard.

Additional retraining shall also be conducted whenever the periodic inspection indicates or whenever there is reason to believe, that there are deviations from or inadequate employee's knowledge or use of the energy control procedures. All training shall be documented on the LOTO Training Sign-in Sheet, (See Appendix 2).

## **8.0 ELECTRICAL LOTO**

Electrical work requires that a lock and a tag be used together. However, a tag can be used by itself only if the electrical disconnecting source does not have lockout capabilities.

Tags can be placed without a lock only under the following conditions:

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

## **8.1 ELECTRICAL TEST VERIFICATION OF DE-ENERGIZED CIRCUITS**

The Maintenance Mechanic or other authorized personnel shall use test equipment to test circuit elements and electrical parts of equipment to which employees will be exposed to and shall verify that the circuit elements and equipment parts are de-energized. The test shall also determine if any energized condition exists as a result of inadvertently induced voltage or unrelated voltage backfeed, even though specific parts of the circuit have been de-energized and presumed to be safe. If the circuit to be tested is over 600 volts, nominal, the test equipment shall be checked for proper operation immediately before and immediately after this test.

## **8.2 WORK ON ENERGIZED CIRCUITS**

Approval must be obtained from the Maintenance Manager or Supervisor prior to any work on energized circuits. The Maintenance Mechanic or other authorized employee will verify that by de-energizing circuits it will create additional or increased hazards or it is not feasible due to equipment design or operational limitations.

*NOTE: Working on energized parts requires the wearing of appropriate personal protective equipment. The Maintenance Manager or Supervisor will be responsible for specifying the appropriate personal protective equipment to be used.*

## **9.0 ACCIDENTS CONCERNING LOTO**

The Physical Plant Safety Programs Manager will be responsible for fully investigating the LOTO accidents and reporting the cause of such accident to the Risk Management Safety Programs Specialist. If the accident involved the control of hazardous energy of a single lockout source, a specific procedure will be written and included before work is continued. If the accident involved a specific procedure for a piece of equipment the LOTO specific procedure will be evaluated and modified (if necessary) prior to authorizing work to continue.

APPENDIX 1

**LOCKOUT/TAGOUT PROCEDURE SHEET**

Equipment Name: \_\_\_\_\_ FAMIS Equip No. \_\_\_\_\_

Description: \_\_\_\_\_

Location (provide as much detail as possible): Building Name \_\_\_\_\_

Room Number \_\_\_\_\_ Room Name and other details \_\_\_\_\_

Associated equipment that will be affected: \_\_\_\_\_

***Type of Energy Source and Description:***

Check all that apply:

\_\_\_\_ 1. Electrical: (please circle) 120v 208v 240v 480v

\_\_\_\_ 2. Hydraulic (please circle) Main Source Secondary Source Supply Return

\_\_\_\_ 3. Pneumatic (please circle) Main Source Secondary Source Supply Return

\_\_\_\_ 4. Gas (please circle) Main Source Secondary Source Supply Return

\_\_\_\_ 5. Water (please circle) Main Source Secondary Source Supply Return

\_\_\_\_ 6. Other: (please specify in detail) \_\_\_\_\_

Device used on #: (A) Disconnect (B) Breaker (C) Plug (D) Valve

1. \_\_\_\_\_ 2. \_\_\_\_\_ 3. \_\_\_\_\_ 4. \_\_\_\_\_ 5. \_\_\_\_\_ 6. \_\_\_\_\_

Location of LOTO on Equipment (please circle): Front Side Back Side Top Side Bottom Side

Left Side Right Side North Side South Side East Side West Side

Hazardous Stored Energy Condition to Avoid (explain): \_\_\_\_\_

Power Down Time: No Yes: length of time \_\_\_\_\_ Power Up Time: No Yes: length of time \_\_\_\_\_

Affected Employees/Department: \_\_\_\_\_

Authorized Employee Writing Procedure \_\_\_\_\_ Date: \_\_\_\_\_

Authorized Employee Verifying Procedure \_\_\_\_\_ Date: \_\_\_\_\_

**\*\*Please send a copy to the Neil Jackson, Training & Compliance Office, 284 East Avenue, Burlington\*\***

**APPENDIX 2**

**TRAINED EMPLOYEES SIGN-IN SHEET**

Date of Training \_\_\_\_\_

Equipment Name: \_\_\_\_\_ FAMIS Equip No.: \_\_\_\_\_

Method of Lockout: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Trained Employees:**

**Name & Signature:**

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

**Trainers' Name & Signature** \_\_\_\_\_

**\*\*Please send a copy to the Neil Jackson, Training & Compliance Office, 284 East Avenue, Burlington\*\***

**APPENDIX 3**

**OSHA LOTO STANDARD (29 CFR 1910.147)**

<http://esf.uvm.edu/riskmang/lotoprogram.html>

**Control of Hazardous Energy – Lockout/Tagout OSHA publications 3120**

<http://www.osha.gov/Publications/osha3120.pdf>

NIOSH Criteria Documents - Guidelines for Controlling Hazardous Energy During Maintenance and Servicing [Lockout/Tagout], September 1983

<http://www.cdc.gov/niosh/83-125.html>

Preventing Worker Deaths from Uncontrolled Release of Electrical, Mechanical, and Other Types of Hazardous Energy, **August 1999**, DHHS (NIOSH) Publication No. 99-110

<http://www.cdc.gov/niosh/99-110.html>

OSHA Fact Sheet (2002), 212 KB PDF, 2 pages.

[Control of Hazardous Energy Sources \(Lockout/Tagout\).](#)

National Institute for Environmental Health and Safety (1998, January 6), 6 pages.

<http://www.niehs.nih.gov/odhsb/manual/man11h.htm>