

**Control of
Hazardous Energy
LOCKOUT/TAGOUT
29 CFR 1910.147**

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I. Introduction

Many industrial accidents are caused by the uncontrolled release of hazardous energy. Many of these accidents can be prevented by practicing proper Lockout/tagout procedures. Before employees service or perform maintenance of any piece of equipment that is energized by electrical, pneumatic, hydraulic or other energy source, the equipment must be rendered inoperable. Lockout/tagout procedures must be applied to electrical and mechanical equipment, circuits, piping systems, high pressure systems, chillers, pumps, air handlers, disconnects, valves, circuit breakers, fans, and all other systems and processes involving hazardous energy sources.

II. Scope and Application

This program applies to the control of hazardous energy during servicing of machines and equipment where the unexpected energizing or start-up of the machine or equipment, or release of stored energy could cause injury to employees. Minor tool adjustments and changes or other minor servicing procedures do not fall under Lockout/Tagout requirements if the activities are routine, repetitive and integral to the production operation, provided there is alternative means of employee protection, such as machine guarding. Lockout/tagout procedures do not apply to cord and plug-connected equipment, if the equipment is unplugged and the employee has exclusive control of the plug.

The program does not apply to outside contractors hired by Tufts University. Contracts and service agreements should contain provisions that ensure compliance by the contractor.

III. Definitions

Affected employee

An employee whose job requires her/him to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout/tagout requirements, or whose job requires him/her to work in an area in which such servicing is being performed.

Authorized employee

An employee who locks 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 her/his duties include performing service or maintenance covered under this program.

Hazardous energy

Energy that is stored or produced by electrical, mechanical, chemical, thermal, hydraulic or pneumatic sources.

Other employee

An employee whose work operations are or may be in an area where lockout/tagout procedures may be utilized.

IV. Lockout/Tagout Manual

Each supervisor of authorized and/or affected employees is required to maintain a manual containing all of the information necessary to comply with the provisions of this program. The contents of this manual are as follows:

1. Tufts University lockout/tagout program.
2. Standard lockout procedures for all machines and equipment.
3. Training certification for all authorized and affected employees
4. Record of annual inspection performed on each machine or piece of equipment listed in section 2 above.

V. Energy Control Procedures

1. Applying Energy Control

Energy isolation and lockout/tagout are to be applied only by trained employees authorized to perform service or maintenance.

Before lockout/tagout is applied, all employees who work in the affected area must be notified.

The OSHA standard requires that control of hazardous energy be performed according to an 8-step procedure.

Step 1 Preparation for Shutdown

Before turning off any equipment to lockout/tagout, you must know:

- The types and amounts of energy that power it
- The hazards of that energy
- How that energy is controlled

Step 2 Equipment Shutdown

- Shut the system down by using its operating controls.
- Be sure to follow correct shutdown procedure for equipment, so that no one is endangered during shutdown.

Step 3 Equipment Isolation

- Operate all energy disconnects so that the equipment is isolated from its energy sources.
- Be sure to isolate all energy sources – secondary power supplies as well as main energy source.

- Never pull an electrical switch while under load.
- Never remove a fuse instead of disconnecting the power source.

Step 4 Applying Lockout/Tagout Devices

- All energy disconnects are to be locked and tagged according to Tufts' energy control program.
- Only standardized locks and tags are to be used for lockout/tagout, and they must not be used for anything else. Locks must be standardized as to color, shape, size, and type; capable of withstanding environmental conditions, and strong enough to prevent removal without the use of excessive force.
- Use a lockout device if lock cannot be placed directly on the energy control, or if more than one employee must lockout energy disconnect.
- When lockout is used, every member in the work crew must attach his personal lock.
- Tags must be attached to the energy disconnect to identify the employee that applied lockout and the date of lockout. Tags must warn against the hazards of operating the equipment and withstand a minimum pull of 50 pounds.

Step 5 Control of Stored Energy

The following steps may be necessary to guard against energy left in equipment after it has been isolated from energy sources.

- Inspect systems to insure all moving parts have stopped.
- Discharge capacitors and install ground wires.
- Relieve trapped pressure downstream.
- Release tension on springs, or block movement of spring driven parts.
- Block or brace parts that could fall because of gravity, or loss of hydraulic or pneumatic pressure.
- Drain process piping systems and close valves to prevent flow of hazardous materials.
- Use blank flange to block flow of hazardous materials if valve not available.

- Purge reactor tanks and process lines.
- Dissipate extreme cold and heat, or wear protective clothing.

Step 6 Verifying Isolation of Equipment

The following steps will insure the isolation of all energy sources to equipment.

- Make sure that all danger areas are clear of personnel.
- Verify that all energy disconnects cannot be moved to the on position.
- Use a voltmeter or equipment to check electric circuits.
- Press all start buttons and controls to verify that equipment is safe.
- Remember to return all controls to “off” or safe positions when finished testing.

Step 7 Perform Work

Begin maintenance or service, being sure not to bypass or deactivate lockout devices.

Step 8 Removing Lockout/Tagout – Restoring Equipment to Service

- Make sure the equipment is safe to operate by removing all tools from work area and insuring that system is fully assembled.
- Conduct a head count to make sure everyone is clear of equipment.
- Verify that the controls are in neutral or off.
- Notify everyone in the area that lockout/tagout is being removed.
- Remove lockout/tagout devices. Each device must be removed by the person who puts it on.
- Follow a checklist of required steps to reenergize the system.
- Notify the affected employees that the servicing or maintenance is completed and the machine or equipment is ready for use.

2. Compliance

All employees are required to comply with the restrictions and limitations imposed upon them during the use of lockout procedures. Only authorized employees are permitted, and required, to perform the lockout in accordance with this procedure. All employees, upon observing a machine or piece of equipment which is locked out to perform servicing or maintenance, shall not attempt to start, energize or use that machine or piece of equipment. Failure to comply with this procedure will result in appropriate disciplinary measures.

3. Alternative Release from Lockout/Tagout

If the authorized employee who applied the lockout or tagout device is not available to remove it, that device may be removed under the direction of a supervisor, provided that:

- a. Verification by the supervisor that the authorized employee who applied the device is not at the facility;
- b. All reasonable efforts are made to contact the authorized employee to inform her/him that her/his lockout or tagout device has been removed;
- c. The authorized employee is notified of the above before she/he resumes work at the facility.

VI. Protective Materials and Hardware

1. Lockout devices shall be the only devices used for controlling energy, shall not be used for other purposes, and are standardized within the Physical Plant Department.
2. Tagout devices are also standardized within the Physical Plant Department.

VII. Periodic Inspection

At least annually, an inspection of each energy control procedure will be performed by an authorized employee other than those utilizing the procedure being inspected in order to correct any deviation or inadequacies identified. Certification of these inspections will identify the machine or piece of equipment, the date of inspection, the names of employees included in the inspection, and the person performing the inspection.

VIII. Training

Environmental Health & Safety will conduct the required general training sessions for authorized, affected and other employees. Supervisors will conduct the training on specific energy control procedures for specific machines

and pieces of equipment. Supervisors will maintain records to certify that employee training has been accomplished and is being kept up-to-date.

Retraining is required whenever there is a change in job assignments, a change in machines, equipment or processes that present new hazard, or when there is a change in the energy control procedures. Additional training is also required whenever a periodic inspection reveals, or whenever there is a reason to believe, that there are deviations from, or inadequacies in, the energy control procedures. The purpose of retraining is to reestablish employee proficiency and introduce new or revised control methods and procedures as necessary.

IX. Outside Personnel

Whenever non-Tufts or “outside” personnel will be involved in activities covered by the scope and application of this standard, Tufts University and the contractor shall inform each other of their respective lockout/tagout procedures. Tufts University shall ensure that our employees understand and comply with the restrictions and prohibitions of the contractor’s energy control program.

X. Group Lockout/Tagout

When a group lockout/tagout is necessary, one authorized employee is given the primary responsibility for the employees working under the protection of a group lockout/tagout device. That employee must ascertain the exposure status of individual group members. When more than one group is involved, assignment of the overall job associated lockout/tagout control responsibility must be given by management to an authorized employee designated to coordinate affected work forces and ensure continuity of protection. Each authorized employee shall affix a personal lockout/tagout device to the group lockout/tagout device at the beginning of work, and shall remove the device when she/he stops working on the machine or piece of equipment being serviced.

XI. Shift or Personnel Change

Specific procedures shall be developed for shift or personnel changes to ensure the continuity of lockout/tagout protection, including provisions for the orderly transfer of lockout/tagout device protection between employees.

