



1.0 Purpose

The purpose of this policy is to ensure that before any employee performs any servicing or maintenance on machinery, equipment or a system where the unexpected energizing, start up or release of any type of energy could occur and cause injury, the machinery, equipment or system will be rendered safe to work on by being locked and tagged out.

2.0 Scope

- 2.1 Effective hazardous energy control procedures will protect all workers potentially exposed to unexpected energizing or release of stored energy that could cause injury to employees during the servicing or maintenance of machines, equipment or systems, as well as while working on or near exposed de-energized electrical conductors and parts of electrical equipment.
- 2.2 This procedure meets the requirements specified by the Occupational Safety and Health Administration (OSHA) 29 CFR 1910.147, Control of Hazardous Energy (LOTO); 29 CFR 1910.333, Lockout/Tagout Electrical Safe Work Practices; and 1926.417, Lockout and Tagging of Circuits, as they relate to the control of hazardous energy sources.
- 2.3 This program does not apply to the work on cord and plug connected electrical 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 by the plug being under the exclusive control (within arm's reach and line of sight) of the employee performing the servicing or maintenance.
- 2.4 This procedure applies to all University of Pennsylvania employees.

3.0 REFERENCES

- 3.1 [29 CFR 1910.147, The Control of Hazardous Energy \(Lockout/Tagout\).](#)
- 3.2 [29 CFR 1910.333, Personal Protective Equipment.](#)
- 3.3 [29 CFR 1926.417, Lockout and Tagging Circuits.](#)

4.0 Definitions

- 4.1 **Affected Employee**- An employee whose job requires him/her to operate or use a machine, equipment or system on which servicing or maintenance is being performed under Lockout/Tagout (LOTO) or whose job requires him or her to work in an area in which such servicing or maintenance is being performed.

Authorized Employee- A person who either applies the locks and tags on machines, equipment and systems or works under the protection of Lockout/Tagout in order to perform servicing or maintenance on that machine or equipment. This person has completed the mandatory training to be qualified as an



Authorized Employee. Only an authorized employee installs and removes his or her own lock(s) and tag(s) as required by this program.

- 4.2 Authorized Locks and Tags** - These are locks and tags that are used to ensure the safety of the authorized employees performing servicing and maintenance of machines, equipment or systems. Servicing or maintenance may not begin until these devices are applied to the energy isolation device(s). These locks and tags shall not be used for any other purpose. The locks shall be singularly keyed and the authorized employees shall retain the keys to individual locks. The keyed lock will be red in color. The print and format of tags shall be standardized and will warn against hazardous conditions if the machine or equipment is energized. The tag shall read “Danger – Do Not Operate” and will have black lettering with a white background. The tag will have an unlocking strength of at least 50 pounds. Locks and tags will identify the authorized employee applying the devices. Only an authorized employee may perform service or maintenance work on the machine, equipment or system.
- 4.3 Energy Source** - Any source of hazardous energy or materials. Energy sources include, but are not limited to; electrical, mechanical, hydraulic, pneumatic, chemical, radiation, and thermal energies, as well as various forms of potential energy such as that stored in springs, compressed gases, or in suspended objects (gravitational).
- 4.4 Double Block and Bleed** - The closure of a line, duct, or pipe by closing and locking and tagging two in-line valves and by opening and locking/tagging a drain or vent in the line between the two closed valves.
- 4.5 Energy Isolation Device** - A device that prevents the transmission or release of hazardous energy or hazardous materials. Examples include, but are not limited to; restraint blocks, electrical circuit breakers, disconnect switches, slide gates, slip blinds, or line valves. For lockout/tagout purposes, isolating devices that provide visible indication of the device’s position are desirable.
- 4.6 Lockout Device** - A device that utilizes a positive means such as a lock, either keyed or combination type, to hold an energy-isolating device in a safe position to prevent the energizing of a machine, equipment or system. Other lockout devices include dead ends (blanks), bolted slip blinds, valve hand wheel covers, and chains/lock. All locks require a Danger Tag.
- 4.7 Lockout/Tagout (LOTO)** - Installation of lock(s) and tag(s) on the Energy Isolation Devices to ensure that work can be performed safely. The lock(s) and tag(s) ensure that the Energy Isolating Device(s) and the machine, equipment or system they isolate and/or control, cannot be operated until the lock(s) and tag(s) are removed.
- 4.8 Other Employees** - Employees whose work operations are or may be in an area where energy control procedures are utilized.
- 4.9 Safe Condition Check (Verification of De-energizing)** - The inspection or test of a machine, equipment or system performed by the Authorized Employee to ensure that the hazardous energy or materials are controlled to prevent injury or accident. **Note: This is an essential element of all energy control programs and procedures, which ensures the safety of all potentially exposed personnel.**



- 4.10 Maintenance and/or Construction** - Workplace activities such as maintenance inspections, construction, installing, setting up, modifying, adjusting, and maintaining and or servicing machines, equipment or systems. These activities include lubrication, cleaning, or un-jamming of machines or equipment and making adjustments or tool changes, where the employee may be exposed to the unexpected energizing or start-up of the equipment or release of hazardous energy. This applies to all personnel regardless of job title; (i.e., operator, maintenance, electrician, etc.)
- 4.11 Tag** - A “Danger – Do Not Operate” Tag, which can be securely fastened to an energy isolating device with an unlocking strength of 50 pounds, to indicate that the energy isolating device and the machine, equipment or system being controlled cannot be operated until the tag is removed. Tags are essentially warning devices affixed to energy isolating devices and do not provide the physical restraint of a lock.
- 4.12 Supervisor** – One who has the responsibility of overseeing lockout/tagout activities.

5.0 Responsibilities

- 5.1 The Executive Director of Environmental Health and Radiation Safety or Designee** - is responsible for approving and ensuring compliance with this procedure.
- 5.2 Supervisors** - are responsible for initiating and controlling this procedure. Ensure that the proper procedures for isolating all energy sources have been implemented. Identify personnel required to complete Penn’s lockout/tagout training.
- 5.3 Authorized Employees** - are responsible for isolating all energy sources to a machine, equipment or system and ensuring a safe condition before work is performed. Inspects machine, equipment or system to ensure that all energy has been isolated, energy dissipated and installs authorized locks & tags.

6.0 LOCKOUT/TAGOUT (LOTO) PRINCIPLES

This procedure establishes the requirements for the lockout/tagout of energy isolating devices.

- 6.1** It is mandatory that all personnel comply with the restrictions and limitations of this lockout/tagout program and related procedures.
- 6.2** No individual shall attempt to start, energize, use or operate machinery, equipment or a system that has been locked and tagged out after the safe condition check has been completed.
- 6.3** No individual other than the authorized employee who installed the lockout device and tag shall attempt to remove them, except as noted in Section 8.
- 6.4** Lockout tagout equipment will be stored in the appropriate shops or local locations where it will be used with the exception of each authorized employee’s personal lock, which will be controlled by the individual.



- 6.5 The authorized employee “Danger- Do Not Operate” tag signifies that there is an authorized employee working on a machine, equipment or system and it was installed by that task’s authorized employee prior to starting work and will be removed by that authorized employee when his/her work is completed.
- 6.6 The authorized employee “Danger – Do Not Operate” tag is reserved for the exclusive use of the authorized employee identified on that tag. Tags must be legible and understandable by all authorized employees, affected employees, and all other employees whose work operations are or may be in the area in order to be effective. Tags and their means of attachment must be made of materials which will withstand the environmental conditions encountered in the workplace.
- 6.7 No one shall authorize another person to ignore or violate this program and its procedures.
- 6.8 No person shall remove a lockout device when an unsafe condition exists until they have corrected the condition or another person has installed a lockout device.
- 6.9 Affected employees shall be notified by the University of Pennsylvania (Penn) or the authorized employee of the application and removal of lockout devices or tagout devices. Notification shall be given before the controls are applied, and after they are removed from the machine, equipment or system.
- 6.10 A check valve cannot be used as an energy isolation device.
- 6.11 Whenever outside personnel (contractors, etc.) are to be engaged in activities covered by the scope and application of this program, Penn and the outside employer shall inform each other of their respective lockout or tagout procedures. Penn shall ensure that its employees understand and comply with the restrictions and prohibitions of the outside employer’s energy control program.
- 6.12 When electrical system grounds need to be applied they shall be the last devices applied and the first devices removed in application of lockout/tagout. Only qualified electrical personnel shall apply grounding devices.
- 6.13 All employees shall receive the appropriate level of training based upon their lockout/tagout duties (i.e., Authorized, Affected, or Other).
- 6.14 Any employee who observes any apparent violation of this program or related procedures shall immediately notify their supervisor.

7.0 Procedure

A specific written procedure for all machines, equipment or systems is developed and will be followed before beginning any servicing or maintenance work. The steps outlined in Section 7.1 will serve as a guide in accomplishing this requirement.

7.1 Detailed Lockout/Tagout Procedure

- 7.1.1 The authorized employee will determine all potential sources of hazardous energy. The authorized employee will develop a specific written procedure for isolating the machine



equipment or system if one does not already exist on the Equipment Energy Control Procedure form (Attachment C).

- 7.1.2 The authorized employee will obtain a lock box from the appropriate supervisor or storage location. Some lockout tasks may require the use of other lockout devices. Tags will have the name of the authorized employee and the date that the work is being performed.
- 7.1.3 The authorized employee will go to each energy isolation device in the proper order listed on the lockout/tagout procedure and de-energize that device using the locks from the lockbox. After removing each key from the lock, the authorized employee will keep the keys and place them into the lockbox that will prevent them from being misplaced. Keys to all locks will be kept inside the lockbox. The authorized employee will then place his/her lock and tag on the lockbox and lock it with his/her personal key. The authorized employee's personal key will be kept with him/her. In addition, a designated supervisor may put his/her lock on the lockbox. This would only be completed in order to secure the lockbox if an employee left the jobsite and another employee took control of the job. The new employee would then be required to put his/her lock on the lockbox and proceed to follow all of the required lockout/tagout procedures as stated in Section 7.1.
- 7.1.4 When all energy isolation devices have been properly de-energized and locked/tagged out, the authorized employee will perform the necessary safe condition check(s) to ensure that all energy has been dissipated and controlled (Example: pushing local start buttons, throwing switches, etc.). The work can now begin.
- 7.1.5 When all work is complete, the authorized employee will make sure that personnel are a safe distance from all machines, equipment or systems before energizing.
- 7.1.6 Lockout or tagout devices removal. The authorized employees will remove their personal locks from the lockbox and then remove all locks and tags from all energy isolation devices. Upon completion, the authorized employees' locks will be placed back into the lockbox. The machine, equipment or system will be energized in the proper order noted on the lockout/tagout procedure. The system will then be put back into service as required.

7.2 **Application of Control:**

The specific written procedure for all machines, equipment or system must include the following steps for proper control and isolation of energy:

- 7.2.1 **Notify Affected Employees** - Affected employees must be notified that work will be performed on the machine, equipment or system.
- 7.2.2 **Preparation for shutdown** - the authorized employees shall have knowledge of the type and magnitude of the energy, the hazards to be controlled and the method or means to control the energy.



- 7.2.3 Machine, equipment, or system shutdown** - the machine, equipment or system shall be turned off or shut down using normal procedures to avoid any increased risk to the employee(s).
- 7.2.4 Machine, equipment or system isolation** - all energy isolating devices that are needed to control the energy shall be physically located and operated in a manner to isolate the machine, equipment or system from the energy source.
- 7.2.5 Lock-out/tag-out application** - lock and tag must be applied to the energy-isolating device. **Each person** working on a machine, equipment or system must apply a lock and tag.
- 7.2.6 Verification of isolation** - prior to starting work on machines, equipment or systems that have been locked and tagged, the authorized employee(s) shall, if possible, verify that all energy sources have been isolated by attempting to operate the machine, equipment or system using local start buttons, switches, valves, etc. then returning them to the off position once the verification of isolation has been completed.
- 7.2.7 Removal of guards** - guards may not be removed if observers are too close to the “danger zone” or if the authorized employee(s) could be in any way exposed or potentially exposed to any danger.
- 7.2.8 Perform necessary servicing or maintenance then verify proper operation** - cycle machine or equipment to ensure it functions correctly. Follow specific procedures listed on the Equipment Energy Control Procedure form (Attachment C).
- 7.2.9 Notify Affected Employees** - notify affected employees that work is complete and the machine, equipment, or system is ready for operation.

7.3 Alternative Measures

Alternative measures have been developed to ensure effective protection during minor tool changes, adjustments, and other servicing activities, which take place during normal production operations, provided they are routine, repetitive and integral to the use of the equipment for production.

7.4 Removing Lock-Out/Tag-Out Devices:

Authorized employee(s) shall remove lock-out/tag-out devices in the following manner before energy is restored to the machine, equipment or system:

- 7.4.1** lock-out/tag-out devices will only be removed by the employee who applied them.
- 7.4.2** machine, equipment, or system shall be inspected to ensure all nonessential items have been removed and to ensure that the machine, equipment or system components are operationally intact. Ensure ALL guards are in place prior to operating.



- 7.4.3 ensure all machine, equipment or system settings are in the OFF position.
- 7.4.4 ensure all employees are a safe distance from the machine, equipment or system.
- 7.4.5 remove lock(s) and tag(s).
- 7.4.6 cycle machine or equipment to ensure it functions properly.

7.5 Lock-Out/Tag-Out Between Shifts:

Employees working on a machine, equipment or system must utilize their own lock that was provided and adhere to Penn's lockout/tagout program at all times, but if an employee's shift ends prior to completion of the work he/she must follow the procedure below:

- 7.5.1 The lock and tag of the employee that is leaving must remain on the equipment until the lock and tag of the incoming employee is placed on the energy-isolating device.

7.6 Exceptions to Written Lockout/Tagout Procedures

There are occasions where specific written lockout/tagout procedures are not required. They are not required when ALL of the following elements exist:

- 7.6.1 The machine, equipment or system has no potential for stored or residual energy or re-accumulation of stored energy after shut down which could endanger employees.
- 7.6.2 The machine, equipment or system has a single energy source that can be readily identified and isolated.
- 7.6.3 The isolation and locking out of that energy source will completely deenergize and deactivate the machine, equipment or system.
- 7.6.4 The machine, equipment or system is isolated from that energy source and locked out during servicing or maintenance.
- 7.6.5 A single lockout device will achieve a locked-out condition.
- 7.6.6 The lockout device is under the exclusive control of the authorized employee performing the servicing or maintenance.
- 7.6.7 The servicing or maintenance does not create hazards for other employees.
- 7.6.8 Penn, in utilizing this exception, has not experienced an incident or accident involving the unexpected activation or reenergizing of the machine, equipment or system during servicing or maintenance.

7.7 Outage Work

- 7.7.1** It may be necessary during large distribution outages to have several trades on one lockout/tagout permit. In this case, it is permissible to have a group lockout/tagout. The permit in Attachment A will be used.
- 7.7.2** An authorized employee will be chosen to install an authorized lock on all energy isolation devices on the permit. He/she will have all of the duties as stated in Section 7.1 and will have the responsibility as the supervisor to ensure continuity of protection for all authorized employees and to coordinate affected crafts. The supervisor will ensure all lock and tags are properly installed on the energy isolating devices by visually checking all energy isolation points.
- 7.7.3** The supervisor will list all of the other authorized employees on the permit with which he/she is working.
- 7.7.4** Each authorized employee will put his/her own lock on the lockbox before beginning work.
- 7.7.5** The supervisor cannot remove any locks or tags from the energy isolation devices unless all other authorized employees have first removed their locks and tags from the lockbox. If there is a need to remove a lock and tag from the lockbox because an authorized employee is not on site, then the procedures listed in Section 8.0 of this program must be followed.

7.8 Energy Isolation Devices Not Capable of Accepting a Lock

- 7.8.1** If an energy isolation device is physically incapable of accepting a lock, a tagout system shall be used, which will offer full employee protection similar to that of a lockout system.
- 7.8.2** The tagout system includes all of the steps of this lockout program except the actual use of a lockout device on that particular energy isolation device. Additional means to be considered as a part of the demonstration of full employee protection shall include the implementation of additional safety measures such as the removal of an isolating circuit element, blocking of a controlling switch, opening of an extra disconnecting device, or the removal of a valve handle to reduce the likelihood of inadvertent energizing.

7.9 Adding Energy Isolation Devices

Energy isolation devices may be added to an existing lockout/tagout permit operation. The authorized employee responsible for the lockout/tagout operation will review the scope of the additional task and determine if it can be completed safely under the existing lockout/tagout permit. If the work can be completed safely under the existing permit, the authorized employee responsible for the lockout/tagout operation will perform the steps per Section 7.1 of this procedure. If the task cannot be completed safely under the existing lockout/tagout permit, a new permit for the task shall be developed and implemented.



8.0 Removal of Authorized Employee Locks and Tags When Off-site

There may be times when the lockout/tagout task needs to be closed out to place a machine, equipment or system back into service when an authorized employee still on the lockout/tagout task is off-site and cannot be located. Removal of an authorized employee lock and tag without the authorized employee's signature will require a review by the authorized employee's direct supervisor.

- 8.1** The authorized employee's supervisor will attempt to reach the authorized employee to determine if the lockout/tagout task may be closed. If the authorized employee indicates that the lockout/tagout task may be closed, the authorized employee must return to the site to follow the normal lockout/tagout energy isolation device removal procedure.
- 8.2** If the authorized employee cannot be contacted or cannot return to the facility, the authorized employee's supervisor may authorize removal of the authorized employee from the lockout/tagout task.
- 8.3** If the supervisor authorizes the removal of the authorized employee's lock(s) and tag(s) all potentially affected employees shall be notified.
- 8.4** The authorized employee will be contacted by his/her supervisor immediately upon their return to work, to notify them that they have been removed from the lockout/tagout task.

9.0 Contractors

Penn and the outside contractor must inform each other of their respective lockout/tagout procedures. The responsibility for training outside contractor employees lies with their employer. Penn shall ensure that its employees understand and comply with the restrictions and prohibitions of the outside employer's energy control program. Prior to the contractor performing work, a designated point of contact will be made within the contractor's organization for the purpose of interfacing and coordinating the lockout/tagout procedures.

10.0 Lockout/Tagout Periodic Inspections

Annually, Penn shall perform a review of its energy control program and procedures for ensuring that the lockout/tagout procedures and requirements of 29 CFR 1910.147 are being met. A written report shall be made documenting inspection findings, results, and as appropriate any corrective actions taken for lockout/tagout program deficiencies.

- 10.1** Periodic inspections of Penn's Lockout/Tagout Program and procedures shall be conducted at least annually.
- 10.2** Periodic inspections shall be scheduled and documented in writing (See Attachment D).
- 10.3** A person trained as an authorized employee must perform the periodic inspection. The representative may not review any lockout/tagout task that they currently have responsibility for. The representative must review the procedures being implemented by and under the control of other authorized employees. The inspection shall include a review of each authorized employee's responsibilities under the program



and related procedures. Written documentation of findings shall be produced and completed documents will be retained by FRES, EHRS or the School/Center, per Section 12.

- 10.4** An inspection of various lockout/tagout tasks that have been closed out will be inspected to verify that they have been properly completed and closed out. Written documentation of findings shall be produced and completed documents will be retained by FRES, EHRS or the School/Center, per Section 12.
- 10.5** Active lockout/tagout tasks will be visually verified that all locks and tags are in place. The required lockout/tagout documents will be verified to have been prepared in accordance with Penn's Lockout/Tagout Program. Written documentation of findings shall be produced and completed documents will be retained by FRES, EHRS or the School/Center, per Section 12.
- 10.6** If during the inspection a discrepancy or procedural inadequacy is found, steps shall be taken immediately to determine the reason for, and the corrective action necessary to remedy the discrepancy. Written documentation of findings shall be produced and completed documents will be retained by FRES, EHRS or the School/Center, per Section 12.
- 10.7** Discrepancies or noncompliance with Penn's Lockout/Tagout Program and procedures will be corrected as soon as possible but no later than 60 days from the date of identification. The appropriate individuals shall be retrained if a discrepancy or inadequacy is identified.

11.0 Personnel LOTO Training

Employees shall be trained so that they understand the purpose and function of the lockout/tagout program and procedures. Employees shall also be trained so that they understand the purpose, contents and requirements of 29 CFR 1910.147, The Control of Hazardous Energy (Lockout/Tagout).

- 11.1** Authorized Employees shall receive training in the recognition of sources of hazardous energy, the types and magnitude of hazardous energy and the means and methods of isolation and control.
- 11.2** Affected Employees shall be instructed in the purpose and use of the Penn's Lockout/Tagout Program.
- 11.3** Other Employees shall be instructed about Penn's Lockout/Tagout Program and about the prohibition against attempting to restart equipment, machines or systems that have been locked and tagged out of service.
- 11.4** Employee retraining will be conducted when there are changes in job assignment; machines, equipment or processes; or in Penn's Lockout/Tagout Program and procedures. Retraining will also be conducted when a periodic inspection of the effectiveness of this procedure reveals inadequacies in employee knowledge or performance.
- 11.5** A record of all training and retraining shall be maintained. The training record shall include the name of the employee, level of training, name of the instructor and the date of the training. (See Attachment B: Training Attendance Roster)

12.0 RECORDKEEPING

- 12.1** EHRS will maintain Lockout/Tagout Program training records on file.
- 12.2** FRES-related periodic inspections shall be maintained by the FRES Director of Safety.
- 12.3** School or Center-related periodic inspections shall be maintained by the School or Center and EHRS.

Approved By:

Matthew D. Finucane

Executive Director of Environmental Health & Radiation Safety

October 10, 2011

Effective Date

ATTACHMENT A

PERMIT NUMBER	COMPONENT DESCRIPTION

COMMENTS

REFERENCES

AUTHORIZATION

Supervisor

Date

NUMBER	ENERGY ISOLATION POINT	DESCRIPTION	POSITION	DATE & INITIAL	
				APPLIED	REMOVED
1					
2					
3					
4					
5					
6					
7					

JOB COMPLETED

Authorized Employee

Date

PERMIT CLOSED

Supervisor

Date



ATTACHMENT B

University of Pennsylvania

ATTENDANCE ROSTER

Program Title: LOCKOUT/TAGOUT TRAINING (1910.147) Instructor(s) _____

Date From _____ To _____

Training Location: _____

	NAME	Penn-ID NUMBER	DEPARTMENT	TOTAL COURSE/ WORKSHOP HOURS	Type of Training Authorized Employee Affected Employee Other Employee
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					

ATTACHMENT C

Equipment Energy Control Procedure				
Lockout/Tagout Program				
Equipment:			Serial #:	
Manufacturer:			Location:	
Model:		Asset #:		
Energy		Location	Magnitude	Control Method
Electrical:				
Pneumatic:				
Hydraulic:				
Gravity:				
Mechanical:				
Thermal:				
Chemical:				
Other:				
Potential Hazards:				
Remember to Release all Stored Energy				
Shutdown Procedure:			Startup Procedure:	



ATTACHMENT D

Periodic Review Form - Hazardous Energy Control (LOTO)

Required Frequency: Annually

To meet OSHA requirements at least one person who performs the Hazardous Energy Control Hazardous Energy Control Assessment must be on the location's list of Authorized employees.

LOCK-OUT/TAG-OUT PERIODIC REVIEW FORM

This form shall be used to verify that a lock-out/tag-out procedure is correct and current. The review shall certify that the procedure is utilized properly and shall be performed at least annually.

Employee Name: _____ Date: _____

Trade/Shop _____

Equipment: _____ Location: _____

Check all energy sources that were locked and tagged out:

- 1. Electrical _____
- 2. Pneumatic _____
- 3. Hydraulic _____
- 4. Thermal _____
- 5. Mechanical _____
- 6. Chemical _____
- 7. Other _____

Were all energy sources de-energized according to the machine specific procedure?

_____ Yes _____ No

Are the written procedures adequate in controlling all energy sources?

_____ Yes _____ No

Were the results of this review covered with the employee(s)?

_____ Yes _____ No

List steps taken to correct deviations or deficiencies with this procedure:

Reviewing Employee: _____

FRES employees shall return completed forms to the **FRES Director of Safety for review**.
All other employees shall return completed forms to **EHRS**.

FRES/EHRS will retain this form on file for one (1) year.