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Applies to: all employees and students who are in control of hazardous energy.

## **INTRODUCTION**

The University of Wisconsin-Milwaukee (UWM) requires all employees and students, to comply with the requirements of Standard-Control of Hazardous Energy (OSHA: 29 CFR 1910.147 better known as Lockout/Tagout (LOTO) standards.

This program establishes the requirements for locking/tagging of energy-isolating devices and is tailored to encompass activities including but not limited to: repair, maintenance, servicing, cleaning, set-up, and adjustment.

Energy sources include, but not limited to: kinetic, potential, electrical, thermal, pneumatic, mechanical, and hydraulic.

Whenever there is a replacement, renovation, repair, or modification of a machine, or equipment, or when new machines, or equipment are installed, energy-isolating devices for such machines or equipment shall be installed.

## **SCOPE**

The intent of this program is to ensure that machine/equipment is de-energized and isolated from all potentially hazardous energy sources and locked/tagged out before employees perform service or maintenance tasks, where the unexpected energizing, start-up, or release of stored injury could cause injury.

## **PURPOSE**

This program is to provide definitive guidelines to protect all employees and other people during machine and equipment installation, servicing, maintenance, and removal machinery or equipment. This shall be accomplished by preventing unexpected release of energy that could cause injury.

## **DEFINITIONS**

**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/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/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.

**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 of dismantle, rebuild, or replace the energy isolating device or permanently alter its energy control capability.

**Energized:** Machines and equipment are energized when they are connected to an energy source, or they contain 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

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.

**Kinetic Energy:** The energy of motion; energy resulting from moving objects such as released loads and uncoiled springs. Wind energy is the kinetic energy of air in motion. Wind energy is often overlooked as an energy that must be locked out. Example: when changing a belt, any part that can be moved by the wind, must be locked out.

**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 a safe position and prevent the energizing of a machine or equipment.

**Normal Production Operations:** The utilization of a machine or equipment to perform its intended production function.

**Other Employees:** All employees who are or may be in an area where energy control procedures may be utilized. This may include contractors or other building occupants such as faculty and students.

**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 adjusting or tool changes, where the employee may be exposed to the unexpected energization or start-up 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.

**Residual Power:** Energy which is retained in a system, machine or unit when the supply line disconnect is placed on the OFF position. Power capacitors and electric or magnetic fields are examples that may have residual power if not properly dissipated.

**Residual Pressure:** The differential pressure remaining within a component after the pressure source is closed off.

**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:** Any prominent warning device, such as a tag and a means of attachment that can be securely fastened to an energy-isolating device to indicate that the machine or equipment to which it is attached may not be operated until the tagout device is removed.

## **RESPONSIBILITIES**

### **UWM Management**

- It is the responsibility of UWM to ensure that every department affected by lockout/tagout shall comply with all aspects of this program.

### **UWM Safety & Assurances**

- Develop, implement, and maintain UWM's Energy Control (Lockout/Tagout) Program.
- Assist departments in implementation of this program; including training materials and training.
- Provide consultation and assistance as requested.
- Evaluate each department's program on a periodic basis to ensure its effectiveness.

### **Supervisors**

- Identify all work area hazardous energy sources or equipment that requires lockout/tagout.
- Develop, implement, and enforce specific energy control procedures for each hazardous energy source.
- Provide resources, such as, tags, locks, and keys; maintain accurate inventory of all resources.
- Maintain a list of authorized persons, trained in lockout/tagout procedures perform lockout/tagout work.
- Review and assess all lockout/tagout procedures annually; ensure the overall efficiency of the program.
- Maintain and an accurate documentation of operating procedures for de-energizing machines and equipment.
- Contact University Safety & Assurances for assistance with any revisions.
- Maintain training and retraining documentation; enter in TMA.
- Ensure that an effective lockout/tagout program is in place and followed; this shall be done through documented observations of employees performing a lockout application.

#### **Authorized Employees**

- Participate in lockout/tagout training and ensure full compliance with UWM's lockout/tagout procedures.
- Follow instructions for de-energizing machinery and/or equipment before performing servicing or maintenance.
- Notify all affected personnel that lockout/tagout of equipment is required and the reason for locking the machinery or equipment.
- Report violations to their immediate supervisor.

#### **Affected Employees**

- Participate in lockout/tagout training and ensure full compliance with UWM's lockout/tagout procedures.
- Shall never remove and lockout/tagout device.
- Shall never attempt to energize or operate any piece of equipment being serviced or repaired that has a lock or tag on it.
- Report violations to their immediate supervisor.

**Contractors should have their own LOTO program and should provide UWM a copy of it to show that they have a program.**

#### **PROGRAM DETAILS**

Employees or contractors who perform installation, servicing, and maintenance tasks on machinery or equipment shall comply with LOTO procedures when the following situations exist:

1. When the machine or piece of equipment has the potential for unexpected energizing or start-up and when the release of stored energy could cause injury.
2. When the employee is required to remove or bypass a guard or other safety device.
3. When an employee is required to place any part of their body into an area of a machine or piece of equipment where an associated danger zone exists during a machine operating cycle.
4. Renovation work that requires connection to energized equipment.
5. When new construction is connected to utility systems such as water, gas, steam, or electrical systems, and capable of containing hazardous energy.

## **LOCKOUT/TAGOUT PROCEDURE**

### **Preparation for Shutdown**

Before an authorized or affected employee turns off a machine or equipment, the authorized employee shall have sufficient training and knowledge on the type and magnitude of the energy, the hazards associated with the energy to be controlled, and how to control the hazardous energy.

### **Identification of All Energy Sources**

The location of all electrical, hydraulic, pneumatic, and other sources feeding the machine or equipment must be identified. Any questionable energy source(s) must be clarified by the supervisor, prior to work beginning. All sources must be locked/tagged out before any work can be performed.

### **Exceptions to the LOTO Procedure**

- Cord & Plug: LOTO procedures are not required in situations where the employee has complete control at all times of the cord and plug on electrical equipment and the accidental start-up or energizing is totally controlled by unplugging the equipment.
- Hot tapping: When a continuity of a vital service is essential, hot tap operations involving pressurized lines (steam, natural gas, etc.) may be completed without applying specific LOTO procedures.
  - This exception may only occur when shutdown is not feasible and engineering analysis of the hot tap procedure has been completed. Only qualified personnel, provided with adequate Personal Protective Equipment (PPE), training and equipment may perform hot tapping.
  - The Supervisor of the area must sign off, prior to starting hot tap work.

### **Locks and Tags**

- Lockout devices shall be uniquely identified in at least one of the following criteria: color, shape, size.
- Lockout devices shall be substantial enough to prevent removal without the use of excessive force or unusual techniques, such as with the use of bolt cutters.

- Lockout/tagout devices shall be affixed in a manner to hold the energy isolating devices in a “safe” or “off” position.
- Lockout/tagout devices shall be affixed to each energy isolating device by authorized employees only.
- Tagout devices shall be substantial enough to prevent inadvertent or accidental removal.
- Tagout devices shall be non-reusable, attached by hand, self-locking, and non-releasable, with a minimum strength of no less than 50 pounds.
- Tags must indicate the reason for lockout, the name of the employee working on the equipment, how that employee may be reached, and the date & time the tag was put in place.
- Where tags are used in conjunction with locks, the tag shall be fastened at the same point at which the lock is attached.
- If a tag cannot be affixed directly to the isolating device, the tag shall be located as close as safely possible to the device. This will be immediately obvious to anyone attempting to operate the device.

### Locks When Feasible

1. When an energy-isolating device (valve, breaker, switch, etc.) is capable of accepting a lock, a lockout shall be applied.
2. “Danger, Do Not Operate” tags shall only be used for applications and shall be installed at the lockout point. shall be used for no other application.



lockout  
The tags

### Electrical Lockout/Tagout

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

This program is designed for electrical work of 600 volts or less. The adoption of this program is not intended to be used for medium and high voltage work over 600 volts or exposure to overhead power lines.

Only qualified persons shall use test equipment, to test the circuit elements and electrical part of equipment to which employees will be exposed. The qualified person shall verify that the circuit elements and equipment parts are de-energized.

Only licensed, qualified electricians may work on energized circuits. Electricians shall be responsible for using appropriate PPE, to ensure compliance with 29 CFR 1910.335. Personal protective equipment for electrical hazards shall meet, be used, and maintained in accordance with ANSI J6 series. Electricians shall also be aware and follow the approach distances for alternating current.

## Machine or equipment shutdown

1. The machine or equipment shall be turned off or shut down using Machine-Specific Lockout/Tagout Procedures. The Machine-Specific Lockout/Tagout Procedure will identify the machine, location, sources of hazardous energy (electrical, hydraulic, pneumatic, etc.), number of locks/tags required for de-energization, and location of the isolation points.
  - a. Energy Control Procedures should be located with piece of equipment
2. If no machine-specific procedure exists, complete a lockout work plan for the equipment to be locked out. Please see US&A for assistance.
3. The authorized employee completing lockout/tagout must verbally notify all affected employees that maintenance/servicing will occur and that the machine will be locked/tagged out.
4. Shut down the equipment. After the equipment has been shut down, all energy isolation devices must be operated to ensure that the machine/equipment has been successfully disabled from its' energy source(s).
5. The equipment shall be de-energized so that the machine or equipment is isolated from the energy source(s). This is accomplished by operating the appropriate switch, breaker, valve, or other device.
6. Apply the LOTO device. All energy-isolating devices (valves, breakers, switches, etc.) shall be locked out and tagged. A "Danger, Do Not Operate" tag shall be securely attached with the lock and shall possess the name of the person that applied the lockout and the date that it was applied.
7. Following isolation and lockout, and before any work begins, all stored and residual energy (such as that stored in capacitors, spring elevated machine members, rotating flywheels, hydraulic systems, air, gas, steam, water pressure, thermal energies, etc.) shall be dissipated and the equipment shall be reduced to a zero-energy state. This may involve but is not limited to:
  - Discharging capacitors on electrical equipment.
  - Venting and drawing pressurized fluids and gases.
  - Cooling off hot equipment.
  - Blocking of all machinery components, which could move, rotate, or fall.
  - Attaching electrical grounding devices.
  - Deactivation of toggle switches and/or push buttons.

If a possibility of re-accumulation of stored energy exists, verification of isolation shall be continued until the servicing or maintenance is completed, or until the possibility that the re-accumulation of energy no longer exists.

8. Prior to starting work on machines or equipment that have been locked or tagged out; the authorized employee shall verify that isolation and de-energization of the machine or equipment have been completed. (This can be completed by visual inspection of vents and drains, electrical testing equipment, or by attempting to operate the system or equipment from the normal control station.)
9. Perform the repair or servicing task.
10. When servicing and maintenance have been completed and the machine or equipment is ready to return to normal operating condition, the following steps shall be taken:
  - Inspect the work area to be sure the equipment is fully assembled and operational.
  - Check to ensure that all remote controls are in the “off” or “neutral” position.
  - All devices positioned to dissipate stored energy are re-positioned as necessary for normal start-up.
  - Each lockout/tagout device shall be removed by the employee who applied the device.
  - Ensure the job site is secure and equipment is ready to be energized.
  - Ensure that all affected personnel, including the Building Chair, are informed that the equipment is to be re-energized and are stationed at a safe location.

### **Shift or Personnel Changes**

Whenever an individual LOTO procedure is extended beyond one work shift, the individual LOTO procedure shall be switched over to a group LOTO procedure.

### **Group LOTO Procedures**

Group LOTO is used whenever multiple repair workers and/or work shifts are involved.

When maintenance work is performed by contractors or by work groups different than the group that operates the equipment, information exchange must occur to ensure that all parties are aware of the LOTO status of machines/equipment.

Group LOTO follows all the requirements of the individual LOTO procedures listed above, but add the following requirements:

1. A primary owner/operator will be designated and must be an authorized employee. This employee will exercise primary responsibility for implementation of LOTO procedures for the equipment and machinery to be serviced. The primary owner/operator will coordinate operations with equipment operators before and after LOTO.

2. A verification system must be implemented to ensure continued isolation and de-energizing of hazardous energy sources during maintenance and service operations. (Typically, this will be a lock box to store keys to locks on all energy-isolating devices). All keys will be placed in the lock box and the primary owner/operator will place a lock on the lock box containing the LOTO keys.
3. Each authorized employee working on the equipment shall individually verify that hazardous energy has been isolated and de-energized and place an individual lock on the lock box.
4. When more than one crew or trades craft is involved, a principal authorized employee who is responsible for the service repair group is designated. The service group supervisor will place a service supervisor lock on the group lock box and store the key in a mutually agreeable location.
5. When servicing work is complete, all workers will remove their individual locks and tags. The servicing supervisor will inspect the work site and equipment and then remove their lock from the lock box.
6. Specific written procedures must be developed and implemented for complex isolation systems or repair operation involving many workers over more than one work shift. Contact US&A for help with this.

### **Group Tagout Procedures**

Design characteristics of certain equipment prohibit the use of a lockout device. A tagout shall only be used when the design of equipment or machinery makes it unfeasible to use a lockout device.

Whenever tagout is independently used for the control of hazardous energy, the following steps shall be taken:

1. The tagout must be accomplished by a completed LOTO procedure work plan that states a tagout shall be used.
2. Tagout must comply with basic LOTO procedures.
3. Tags shall be affixed at the same location that a lock would have been attached.
4. Affected employees will be trained and made aware of the use of tags.
5. It must be emphasized that tags are only warning devices.
6. Acceptable methods of isolating equipment being tagged out include:
  - Removal of an isolating circuit breaker
  - Blocking of a control switch
  - Opening a second disconnecting device
  - Removal of a valve handle
7. Additional safety precautions should be taken to isolate equipment and to prevent energizing the equipment.

### **Removal of a Lockout Device (in an employee absence)**

Before any lockout is removed the employer must:

- Verify the employee is not on the premises.
- Attempt to contact the employee to verify job/equipment status.
- The Supervisor must sign off, before the removal of any lock. Authorization shall be part of the TMA work history.
- US&A must be notified prior to removal of any lock.
- Verify that the equipment can be safely energized.
- Inform the employee upon return that their lockout device was removed.
- Contact US&A for help with developing and implementing specific procedures for special situations.

## **TRAINING**

Training on the purpose, content, and function of the LOTO program is required for all employees who participate in or are affected by the LOTO of equipment.

Training can be obtained through Safety & Assurances and/or through department-specific training. Records must be kept showing training dates, attendance, items covered, and name of the presenter. Training must be documented in TMA; however, if you do not use TMA, all safety records must be sent to US&A.

Authorized employees shall receive training on:

- 1) the recognition and identification of potential hazardous and stored energy,
- 2) explanation and proper use of LOTO procedures,
- 3) proper use, application and removal of LOTO devices and systems,
- 4) specific area equipment LOTO procedures, and
- 5) how to deal with special conditions.

\*Authorized employees shall receive annual training.

Affected employees require him/her to operate or use a machine or piece of equipment on which servicing/maintenance are being performed and under lockout/tagout. An affected employee may be a UWM employee, staff, or student. It could also be a contractor, sub-contractor, or visitor. If there are any questions as to who an affected person could be, please contact US&A for further clarification.

Affected employees shall receive training on:

- 1) Purpose and use of LOTO procedures,
- 2) How to recognize LOTO equipment, and
- 3) Prohibition on tampering with LOTO equipment.

Retraining is required when:

- 1) There is a new or revised energy control procedure,
- 2) An authorized employee's job duties change regarding LOTO,
- 3) The LOTO program changes,

- 4) Additional unique LOTO hazards arise (such as new equipment, modified processes, or the use of different LOTO devices), and,
- 5) Periodic inspections or program evaluation show employee deficiencies in LOTO procedure.

### **RECORDKEEPING**

All records applicable to the Hazardous Energy Control Program shall be maintained in the TMA database. Data entered into TMA is kept forever.

### **INSPECTIONS**

- University Safety & Assurances (US&A) shall conduct periodic inspection of the energy control procedure, at least annually, to ensure that the procedure and the requirements of this standard are being followed.
- The periodic inspection shall be performed by an authorized employee, other than the one(s) using the energy control procedure being inspected.
- Where lockout is used for energy control, the periodic inspection shall include a review, between the inspector and each authorized employee.
- Where tagout is used for energy control, the periodic inspection shall include a review, between the inspector and each authorized and affected employee.
- US&A shall certify that the periodic inspections have been performed. The certification shall include:
  - 1) Identification of machine/equipment on which energy control procedure was utilized,
  - 2) date of inspection,
  - 3) Employees included in inspection, and
  - 4) The person performing the inspection.

### **ENFORCEMENT**

- No employee shall install, service, remove, or perform electrical or mechanical maintenance on any electrical equipment or machinery unless he/she is trained, and “Authorized” for the specific tasks to be performed, which shall include the specific lockout procedures necessary for that task.
- Supervisors of Authorized Lockout/Tagout Employees shall periodically audit their employees on the job to ensure compliance with lockout procedures.
- Employees who fail to adhere to lockout and tagout procedures are subject to disciplinary action; up to and including termination of employment.

## Appendix A

### Electric Power Generation, Transmission, and Distribution CFR 1910.269

This appendix covers the operation and maintenance of electric power generation, control, transformation, transmission, and distribution lines and equipment.

While a third party maintains all power lines, the University of Milwaukee maintains power generation and transmission into the buildings. Employees working on voltages higher than 600 volts shall comply with this standard. Employees will need specialized training and hazard assessments will need to be conducted by Safety and Assurances and Electrical Professionals.