



# Occupational Safety Program

## Lockout/Tagout Program Manual

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## **Purpose**

The purpose of the procedure is to establish requirements for the lockout and/or tagout of energy isolating devices. It should be used to ensure that the machine or piece of equipment is isolated from all potentially hazardous energy and locked out or tagged out before employees perform any servicing or maintenance activities where the unexpected energization, start-up or release of stored energy could cause injury.

## **Scope**

The procedures in this document may be used when there are limited numbers or types of machines or equipment, or there is a single power source.

The program covers authorized employees who may work on equipment, machinery, or a process such as Facilities Management personnel. The program also covers affected employees, which are those workers who may use or operate such equipment and processes that will be serviced, and those workers in the area where lockout/tagout is performed, who may otherwise be at risk of injury. The program also includes contractors, who may be authorized to do work relevant to this program or may be otherwise affected.

Servicing and/or maintenance which takes place during normal production operations is covered by this program if: 1) an employee is required to remove or bypass a guard or safety device; or 2) an employee is required to place any part of his or her body into an area of the machine or piece of equipment where work is actually performed upon the material being processed (point of operation) or where an associated danger exists during a machine cycle.

Minor tool changes and adjustments (e.g., clearing jammed paper from a copier, printer, or typewriter) and other minor servicing activities, which are routine, repetitive, and take place during normal production operations are not covered by this program. This type of maintenance must be completed using alternative safety measures (e.g., proper use of manufacturer-required and recommended machine guards).

The program does not apply to the following:

- Work where hazardous energy does not exist.
- Hot tap operations (e.g. pressure tapping, line tapping, pressure cutting, side cutting) where shutdown is not feasible. Hot tap operations generally include attaching branch connections to pipelines or cutting holes into said pipelines while a process is in operation, without interruption, with no loss or release/spill of product.
- Work on cord and plug connected electrical equipment for which exposure to the hazards of unexpected start-up is controlled by unplugging it from the energy source if the plug is under the exclusive control of the employee performing the service.
- Installations under the exclusive control of electric utilities or to exposure to electrical hazards from work on, near, or with conductors or equipment in electric-utilization installations, which is covered 29 CFR 1910 Subpart S.

## **Definitions**

**Affected employee:** An employee whose job requires him/her to operate or use a machine or equipment on which service or maintenance is being performed under lockout or 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 out 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 that employee's duties include performing servicing or maintenance covered under this section.

**Blank:** A disk inserted into the space between two pipe flanges to prevent the passage of liquid or gases through a pipe.

**Bleed:** The release of stored hydraulic, electrical, or pneumatic energy.

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

**Energized:** Connected to an energy source or containing 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, and, in addition, no pole can be operated independently; a line valve; a block; and any similar device used to block or isolate energy. 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.

**Hot tap:** A procedure used in the repair, maintenance and services activities which involves welding on a piece of equipment (pipelines, vessels, or tanks) under pressure, in order to install connections or appurtenances. It is commonly used to replace or add sections of pipeline without the interruption of service for air, gas, water, steam, and petrochemical distribution systems.

**Lock:** Keyed device used to secure equipment. Keys for the lock shall be kept by the person completing the service only. Locks issued for use with this plan shall not be used for other

purposes. Additionally, locks shall be able to withstand the environment in which they are being used.

**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. A system in which a lock, when properly attached to a power or energy source, prevents the unintentional activation of equipment. The lock physically hold the switch or handle in the "OFF" position until it is removed by the authorized personnel.

**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. Included are blank flanges and bolted slip blinds.

**Lockout/Tagout (LOTO):** A list of procedures, abbreviated as LOTO, designed and implemented to protect employees from an accidental discharge of energy. LOTO is used interchangeably with, "Control of Hazardous Energy".

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

**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 making adjustments or tool changes, where the employee may be exposed to the *unexpected* energization or startup 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.

**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. A tagging procedure, intended to act only as a warning device, used to prevent the unintentional activation of equipment. The tag used at Towson University will contain the name and title of the authorized employee and read "DO NOT OPERATE". Tagout device attachment means shall be of a non-reusable type, attachable by hand, self-locking, and non-releasable with a minimum locking strength of no less than 50 pounds. All tags and attachment means shall also be made to withstand the environment in which they are being used.

**Tagout device:** A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to 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.

## **Responsibilities**

### **A. Environmental Health & Safety (EHS)**

1. EHS will provide consultation to assist in the identification of equipment where LOTO should be utilized.
2. EHS will prepare the LOTO Program with periodic review and revisions as needed;
3. EHS will distribute the LOTO program to each affected department for distribution to all individuals who are authorized by the department to perform maintenance on energized equipment;
4. EHS will approve locks to be used by individual departments;
5. EHS will investigate and document all reported accidents and/or near-miss accidents that are directly or indirectly related to the locking and tagging of equipment; and
6. EHS will provide training and retraining to all authorized employees.

### **B. Department Heads**

1. Department Heads will designate Supervisors to implement specific LOTO procedures.
2. Department Heads will select appropriate locking and tagging devices for their respective department.

### **C. Designated Supervisors**

1. Supervisors will implement all provisions of the LOTO for work areas under their control.
2. Supervisors will inventory and identify all potentially dangerous equipment capable of releasing hazardous energy during maintenance in work areas or facilities under their control.
3. Supervisors will prepare specific LOTO and emergency procedures for hazardous machinery.
4. Supervisors will identify persons authorized to implement LOTO procedures and assure that each person attends training provided by the Department of Environmental Health & Safety.
5. Supervisors will report all workplace injuries, unsafe conditions, and near-misses to EHS.
6. Supervisors will instruct authorized LOTO personnel regarding the applicability of this plan to their respective shop.
7. Supervisors will provide proper locking and tagging equipment including locks, tags, multiple lock holders, etc.
8. Supervisors will direct periodic safety audits of LOTO procedures to determine regulatory compliance, and to recommend action to correct conditions of non-compliance.
9. Supervisors will comply with necessary documentation requirements.

#### **D. Authorized Employees**

1. Employees who perform lockout or tagout procedures are required to learn and understand such procedures prior to performance. Only authorized employees may lockout or tagout machines or equipment.
2. Employees who perform lockout or tagout procedures are responsible to follow the appropriate procedures for the specific equipment they are locking or tagging out. They must adhere to the requirements of the Lockout Tagout Program.
3. Employees are required to be trained prior to performing any lockout/tagout procedures initially, and trained annually, and must comply with documentation requirements. New training may be required when new hazards exist or when a lack of proficiency is demonstrated by the employee.
4. Authorized employees will notify affected employees whenever a lockout or tagout will occur, as well as when the equipment is being placed back in service. They must follow guidelines referenced in this manual to protect themselves and others from the release of hazardous energy.
5. Employees ensure the security of their own locking devices.
6. Employees must report all workplace injuries, unsafe conditions, and near-misses to their Supervisors and EHS.

#### **E. Affected Employees**

1. Each new or transferred affected employee and any other employee whose work operations are or may be in the area will be instructed in the purpose and use of the lockout or tagout procedure.
2. Employees must notify the appropriate persons when equipment needs servicing.
3. Employees must follow LOTO instructions given by the authorized employees.
4. Employees in such work areas should be trained at least initially.

### **Introduction**

Lockout/Tagout is the preferred method of isolating machines or equipment from energy sources. Its procedures must be used for the maintenance and service of equipment/process where hazardous energy exists and unexpected startup could occur, where employees are required to remove or bypass a safety device, or where employees are required to place any part of their body in harm's way under these conditions. For this reason, the program may also be referred to as the Hazardous Energy Control Procedure (HECP). Lockout is a means to prevent the flow of energy from the energy source to equipment through use of a physical lock while tagout is a means of warning through a physical tag. The methods are useful in combination to prevent accidental use or access to equipment or a process that may cause employees harm or property damage.

Hazards typically associated with devices requiring lockout/tagout include, but are not limited to the following: amputation; burns (chemical, electrical, thermal); electrocution; engulfment; entrapment/being caught; explosion; fire; release of corrosive, flammable, reactive, or toxic gases/substances. Machines, equipment, and processes (e.g. boilers, pipelines) may be simple

or complex, with various parts affected by batteries, electrical static, AC/DC power, high or low temperatures, hydraulic or pneumatic processes, pressurized gases or fluids, gravity, weights, springs, pistons, gears, or other moving/rotating parts. The magnitude of these hazards will vary based on the equipment and the state of said equipment/process. Control of the sources of hazardous energy involves stopping the equipment/process, isolation and neutralization or release of residual energy in its various forms, and restarting the equipment upon completion of work (see Appendix B for additional information on hazards and respective controls).

The “fatal five” main causes of lockout/tagout-related injuries stem from the following:

- Failure to stop equipment
- Failure to disconnect from power source
- Failure to dissipate (bleed, neutralize) residual energy
- Accidental restarting of equipment
- Failure to clear work areas before restarting

OSHA estimates that compliance with the lockout/tagout standard prevents an estimated 120 fatalities and 50,000 injuries each year. All new equipment or any equipment which has been modified, renovated, or major repair must be capable of being locked out. Controls shall be applied by use of procedures, in the correct sequence, with verification. This includes checking that all associated equipment is locked out and tagged out and that all affected employees are duly notified when such work is taking place and when it has been completed.

## **Applicable Regulations**

- 29 CFR 1910.147 – The Control of Hazardous Energy (Lockout/Tagout)

## **Procedure**

### **A. General Guidelines & Minimum Requirements for Lockout/Tagout Use**

#### **1. Awareness**

- a) The procedure is only used for the maintenance and service of equipment/process where hazardous energy exists and unexpected startup could occur, where employees are required to remove or bypass a safety device, or where employees are required to place any part of their body in harm’s way under these conditions.
- b) All equipment shall be locked out or tagged out to protect against accidental or inadvertent operation when such operation could cause injury to personnel.
- c) Always be sure all lockout/tagout devices are compatible with the environment in which they will be used (e.g. corrosive, humid, etc.)
- d) Do not attempt to operate any switch, valve, or other energy-isolating device where it is locked (or tagged) out.
- e) Do not attempt to remove another employee’s lock unless specific requirements are satisfied (see Step B4d).
- f) Never attempt lockout/tagout procedures unless you have been trained and certified by EHS.
- g) Never loan or share your lock, combination, or key with anybody else.



- h) Never attempt to undermine, bypass, or otherwise defeat the lockout/tagout procedure in use. Towson University's disciplinary procedures apply to any violation of the Lockout/Tagout Program.
2. Device Requirements and Types
- a) Devices used for Lockout/Tagout must be durable, standardized, substantial, and identifiable.
  - b) Types of lockout devices include locks (including padlocks), ball valve covers, circuit breaker lockouts, chains, cord/plug lockout, gate valve lockout, multi-lock hasps, other valve lockouts, wall switch lockouts, etc.
  - c) Tags applied shall read "Danger: Do Not Operate" or a similar message to this effect to warn employees of a locked out device/process.
3. Appropriate Use
- a) Use Location
    - i. *The lockout device (lock) may be placed on the circuit breaker, disconnect, switch, ball valve, or other area to isolate the energy.*
    - ii. *The tagout device (tag) may be placed at the same location as the lockout device or as close to the lockout device as possible. Generally, this will be where it is immediately obvious to any employee who may attempt to operate the equipment/process.*
  - b) The following are minimum requirements for the use of energy isolating devices whenever maintenance or servicing is done.
    - i. *Devices shall be used to ensure that the machine or equipment is stopped and isolated from all potentially hazardous energy. Additionally, they will serve as an outline to protect workers from the inadvertent release of hazardous energy.*
    - ii. *Locking devices and tags shall be used when employees are performing maintenance or service to any machine or system where unexpected or unintentional motion or release of energy could cause harm.*
    - iii. *Locking devices shall also be used when guards or other safety devices must be removed during service or when moving or energized parts put any part of the employee's body at risk of injury.*
    - iv. *Examples of conditions where locking and tagging must be used may include, but are not limited to:*
      - 1) *Clearing blocked or jammed mechanical equipment;*
      - 2) *Maintenance or repair work on equipment with moving parts;*
      - 3) *Confined Space Entry (see [Confined Space Entry Program](#)); and*
      - 4) *Repairs or installation of electrical equipment (see [Electrical Safety Program](#)).*

*If the equipment being serviced must be temporarily re-activated (for example, to test the equipment as part of the installation), all start-up and lockout procedures must be followed.*

- c) Specific Instructions for Hazardous Machinery/Process
  - i. *Specific instructions shall be developed for the locking and tagging of machinery, equipment, or process under the following conditions:*
    - 1) *When the machine/process being serviced has the potential for stored or residual energy, or the re-accumulation of stored energy after shutdown;*
    - 2) *When the machine has multiple energy sources;*
    - 3) *When the isolation and locking of the machine will not completely deactivate it;*
    - 4) *When the machine cannot be locked out;*
    - 5) *When a single lockout device will not achieve a lockout condition; or*
    - 6) *When the lockout device will not be under the exclusive control of the authorized employee performing the service.*
  - d) Working without a Lock
    - i. *If a lock cannot be applied to the equipment, and the supervisor can demonstrate that the tagging procedure will provide a level of safety equivalent to that obtained by the use of a lock, a tag may be used instead.*
    - ii. *Tag Limitation/Precautions*
      - 1) *Tags are warnings only (not as secure as a lock).*
      - 2) *Tags must NOT be bypassed or ignored.*
      - 3) *Tags must only be removed by the authorized employee.*
      - 4) *Tags must be legible and understandable.*
      - 5) *Tags may evoke a false sense of security.*
    - iii. *A tag used without a lock shall be supplemented by one additional safety measure that provides a level of safety equivalent to that obtained by the use of a lock:*
      - 1) *Additional safety methods may include the removal of an isolating circuit element, blocking of a control switch, opening of an extra disconnecting device or the removal of a valve handle to reduce the likelihood of inadvertent activation.*
      - 2) *The tagout device shall be attached to the same location that the lockout device would have been attached.*
    - iv. *Lockout/Tagout cannot extend beyond the work shift with tag only.*

## **B. Lockout/Tagout Implementation**

1. Employees shall implement an orderly shutdown of machinery to avoid any additional or increased hazards resulting from equipment stoppage. Individuals shall follow Steps B2-B5 as required. Steps B2-B4 assume that one person will be

performing the lockout/tagout procedure. If multiple persons will be performing said procedure, Step B5 is also relevant and must be followed.

## 2. Preparation for Shutdown

### a) Identification of the Energy Type or Source

- i. Determine where and how equipment is being energized.*
- ii. Since some equipment is powered by several sources (e.g., electrical, mechanical, pneumatic, chemical, thermal and hydraulic), all energizing sources shall be identified.*
- iii. For complex equipment, refer to the manufacturer's control diagram detailing the locations of all isolating points. These points may include breaker panels, switches, and valves.*
- iv. Possible residual energy and methods used to dissipate or restrain that energy shall be identified.*
- v. In addition to identifying energy sources, the employee must determine the magnitude of the energy, the hazards of the energy to be controlled and the methods or means to control the energy.*
- vi. If authorized employees are unable to determine each form of energy, they must consult their Supervisor(s) before work is started.*

### b) Notification of Affected Employees

- i. Affected employees must be notified by authorized personnel of the intent to service equipment.*
- ii. Notification shall be given before LOTO controls are applied and should contain the name and job titles of authorized employees, location of equipment being serviced, and duration/date of service.*

## 3. Shutting Down Equipment/Process

### a) Shut Off Equipment/Process

- i. If the machine or equipment is operating, employees shall shut it down by the normal stopping procedures (depress the stop button, open the switch, close valve, etc.).*

### b) Isolate Equipment (Deactivate the Energy)

- i. Disconnect the device from all energy sources and release all residual energies that may present a hazard. Inspect the equipment to ensure all energy sources are disconnected.*

### c) Release of Stored or Residual Energy

- i. Release stored or residual energy, such as that in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, and pressurized systems (air, gas, steam, or water).*
  - 1) Depending on the energy type, this may be done by allowing system to cool, allowing weights to fall, draining fluids, electrical discharge,*

*blocking/chocking, mechanical release, stopping rotation, venting gases/relieving system pressure, or other practical means to neutralize or release energy.*

- ii. If energy is incapable of being released, the employee shall reposition, block, or utilize some other protective measure to prevent the release of residual energy while service is in progress.*

d) Apply LOTO Devices (Attach a Lock and Tag)

- i. Attach a lock and tag, of designated color, type, and descriptive warning, on each disconnecting means used to de-energize circuits and equipment on which work is to be performed.*
- ii. The lock shall be attached to prevent persons from operating the equipment.*
- iii. Tags must be securely attached to energy isolating devices so that they cannot be inadvertently or accidentally detached during use.*
- iv. Additionally, tags shall be attached to all points where equipment or circuits can be energized.*
- v. If multiple employees are servicing the same equipment, each shall attach their own lock to a multiple lock plate.*

e) Verify that Equipment is Secure and Deactivated

- i. Test the deactivation of the equipment to ensure that equipment cannot be energized and potential energy sources secured. This should be done by:
  - 1) Checking that no personnel are exposed;*
  - 2) Verifying the isolation of equipment by operating the push button or other normal operating controls. Secure all switches to prevent movement to the "ON" or "START" position;*
  - 3) Checking pressure gauges to ensure de-pressurization of lines; and*
  - 4) Inspecting electrical circuits to confirm zero voltage.**
- ii. All employees should consider equipment to be operable at all times, except when they have personally locked it out.*

4. Returning Equipment/Process to Service

- a) After service to the equipment/process has been completed and the equipment/process is ready to be tested or returned to service, the following steps must be followed.
- b) Inspect the Equipment/Process and Work Area
  - i. Inspect the equipment/process to ensure that non-essential materials have been removed and the equipment/process is in operating order. Visual inspections shall be conducted to ensure:
    - 1) Tools and equipment are removed and secured safeguards are in place; and*
    - 2) Blocks, pins, and chain (used during the lockout) are removed.**

- ii. *Additionally, employees shall verify all equipment components are fully assembled and operational.*
    - iii. *Finally, employees shall inspect the work area to ensure that all employees have been safely positioned or removed from the area.*
  - c) Inspect the Controls
    - i. *Verify the controls are in neutral or the "OFF" position.*
  - d) Remove the Lock Devices
    - i. *Each lock shall be removed by the authorized employee that applied it or under his/her direct supervision.*
    - ii. *If the authorized employee is absent from the workplace, then the lock or tag can be removed by a qualified person designated to perform this task provided that the immediate Supervisor:*
      - 1) *Verifies that the employee is not present and therefore unable to remove the lock;*
      - 2) *Makes all reasonable efforts to inform the authorized employee that the lockout/tagout device has been removed;*
      - 3) *Ensures proper procedures are followed when the lock is removed; and*
      - 4) *Ensures that the authorized employee knows the lockout/tagout device has been removed before work resumes.*
  - e) Re-energize the Machine
    - i. *After completing the above steps, restore the energy to the machine.*
  - f) Notify Affected Employees
    - i. *Notify affected employees that the servicing or maintenance is completed, and the machine or equipment is ready for use.*
- 5. Lockout/Tagout Procedure Involving More Than One Person
  - a) In the preceding steps, if more than one individual is required to lockout and/or tagout equipment, each shall place his/her own personal lockout (or tagout) device on the energy isolating device(s).
  - b) When an energy-isolating device cannot accept multiple locks or tags, a multiple lockout or tagout device (hasp) may be used.
  - c) 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 then use his/her own lock to secure the box or cabinet. As each person no longer needs to maintain his or her lockout protection, that person will remove his/her lock from the box or cabinet.

### **C. Group Lockout/Tagout Procedure**

1. This section of the Hazardous Energy Control Procedure (HECP) will be reviewed with all personnel affected or authorized by the group lockout/tagout before implementation of the job.
  - a) One authorized employee will be designated as responsible for the lockout/tagout.
  - b) The HECP will be reviewed with each group member.
  - c) If more than one crew, craft, department, etc. is involved, one authorized employee will coordinate the lockout/tagout to ensure that all control measures are applied and that there is continuity of protection for the group.
  - d) Each authorized employee will affix the lockout or tagout device to the group lockout. Each lock must have that person's name affixed to it. Each authorized employee will remove their lockout or tagout device when they stop working on the equipment or machine being serviced.
  
2. Supervisors must coordinate multi-shift repairs.

### **D. Shift Changes**

1. The authorized employee in charge of the group or individual lockout/tagout will coordinate shift changes. This will include:
  - a) Changing locks or tags.
  - b) Retesting to ensure de-energized state of equipment or machinery being serviced.
  - c) Notification of start-up and testing to be performed.
  - d) Changes in the job that effect the lockout or tagout procedures (HECP).

### **E. Contractors**

1. Contractors or outside personnel involved in operations relating to equipment or machinery lockout that affects Towson University employees, must submit their hazardous energy control (lockout/tagout) procedures to EHS prior to performing such work.
2. Affected employees must be trained and notified as outlined in this written program.
3. The contractor and TU (e.g. Facilities Management) must inform one another of respective lockout or tagout procedures. The responsible manager or Supervisor for the affected area will ensure that contractors/outside personnel and affected employees are informed of the proper procedure.
4. TU must ensure its employees comply with the restrictions and prohibitions of the contractor's hazardous energy control procedures.

### **F. Training**

Employees who are required will be trained in lockout/tagout through EHS. The training requirements apply to employees who perform lockout/tagout.

Training will be assigned virtually through Vector Solutions SafeColleges found at the following URL: <https://towsonehs-md.safecolleges.com/training/home>. Employees shall request training by emailing [safety@towson.edu](mailto:safety@towson.edu) or by calling the Environmental Health & Safety (EHS) office at 410-704-2949.

#### **G. Annual Inspection**

Each year an authorized employee (EHS), who is not involved in the HECP being inspected, will conduct an inspection of the Hazardous Energy Control Procedure (HECP). This will be accomplished by reviewing the HECP Form with authorized employees. In addition, the authorized employee conducting the inspection will observe the actual implementation of the HECP. When lockout is used, the HECP will be reviewed with each authorized employee. Where tagout is used, HECP will be reviewed with both affected and authorized employees. The designated inspector will document this annual inspection. The documentation will include the employee's name, date of the inspection, and the equipment being locked or tagged out.

#### **Resources**

To request documents, reviews for procedures, processes, or equipment, or general inquiries, contact EHS by emailing [safety@towson.edu](mailto:safety@towson.edu) or by calling the Environmental Health & Safety (EHS) office at 410-704-2949.

## Appendix A: Lockout/Tagout Standard

**29 CFR 1910.147: The Control of Hazardous Energy (Lockout/Tagout)**

<https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.147>



## Appendix B: Hazardous Energy Checklist

**Table 1. Hazardous Energy Checklist.** The table features energy types which may derive from various sources, their associated hazards, the relative magnitude or degree to which the hazard may exist, and the control methods or devices that may be used to lockout and/or tagout the process or energy source.

Energy Type	Hazard	Magnitude	Control Method
Chemical (Gas)	Asphyxiant, Corrosive, Flammable, Reactive, Toxic	Slight, Moderate, High	Cylinder Valve, Gas Line Valve
Chemical (Liquid)	Corrosive, Flammable, Reactive, Toxic	Slight, Moderate, High	Flange Plate, Valve
Electrical	Burn, Fire, Shock, _____	110 VAC, 208 VAC, 220 VAC, _____V ____A	Fuse Blocks, Main Electrical Switch, Plug Control, Shielding
Electromagnet/ Strong Magnet	Strong Magnetic Field	Slight, Moderate, High, _____ Gauss	Circuit Breaker, Main Electrical Switch, Plug Control
Hydraulic	Abrasion, Burn, Crush, Flammable, Injection/Impalement, Laceration, Moving Parts, Pinch, Projectile, Toxic	Slight, Moderate, High	Anti-Motion Device/Lock, Valve
Mechanical	Abrasion, Crush, Flammable, Injection/Impalement, Laceration, Moving Parts, Pinch, Projectile, Rotation	Slight, Moderate, High, _____ ft-lb, _____ hp	Anti-Motion Pin, Blocking, Fuse Blocks, Main Electrical Switch, Plug Control, Shielding
Pneumatic/ Vacuum	Abrasion, Asphyxiant, Crush, Injection/Impalement, Laceration, Moving Parts, Pinch, Projectile	Slight, Moderate, High, _____ lb Force	Air Line Valve, Gas Cylinder Valve, Gas Line Valve, _____
Radiation, Ionizing (UV, X-Ray)	Burns (Eye, Skin, Other Tissue), Cancer, Reproductive Health	Slight, Moderate, High	Interlock, Main Electrical Switch, Plug Control, Shielding
Radiation, Nonionizing (RF, Microwave, Laser, IR, etc.)	Burns (Eye, Skin, Other Tissue), Reproductive Health	Slight, Moderate, High	Interlock, Main Electrical Switch, Plug Control, Shielding
Thermal	Burns, Frostbite	Cryogenic, Moderate Temp., High Temp.	Fluid Line Valve, Main Electrical Switch, Plug Control, Steam Valve

## Appendix C: General Guidelines for Performing Lockout/Tagout

The following guidelines in Steps A-C assume that one person will be performing the lockout/tagout procedure. If multiple persons will be performing said procedure, Step D is also relevant and must be followed.

### **A. PREPARING FOR SHUTDOWN**

1. Identify the types of energy and sources.
2. Notify affected employees of intent to service equipment.

### **B. SHUTTING DOWN THE EQUIPMENT**

1. Turn off equipment.
2. Deactivate energy.
3. Release all stored or residual energy.
4. Attach locking and tagging devices.
5. Verify that equipment is secure and deactivated.

### **C. PREPARING TO RETURN EQUIPMENT TO SERVICE**

1. Remove all tools from the equipment.
2. Inspect the controls to verify they are in the "OFF" position.
3. Remove all locking and tagging devices.
4. Re-energize the equipment.
5. Notify affected employees when machine is back in service.

### **D. LOCKOUT/TAGOUT PROCEDURE INVOLVING MORE THAN ONE PERSON**

1. In the preceding steps, if more than one individual is required to lockout and/or tagout equipment, each shall place his/her own personal lockout (or tagout) device on the energy isolating device(s).
2. When an energy-isolating device cannot accept multiple locks or tags, a multiple lockout or tagout device (hasp) may be used.
3. 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 then use his/her own lock to secure the box or cabinet. As each person no longer needs to maintain his or her lockout protection, that person will remove his/her lock from the box or cabinet.