

UNIVERSITY OF TORONTO

General Procedure for Lockout

Purpose and Scope

The purpose of this **general** procedure is to establish **minimum requirements** for lockout to control potentially hazardous energy associated with machines or equipment in order to prevent injuries during maintenance or repair operations.

If machinery could inadvertently activate, or if the unexpected release of energy could cause injury, then the energy source(s) must be isolated and controlled by using this **general** lockout procedure.

This procedure applies to any situation at the University of Toronto which may expose a worker to such a hazard. Additional procedures may also need to be developed for some specific applications.

Applicable Legislation, Standards and Guidelines

- Occupational Health and Safety (OHS) Act of Ontario
- Ontario Regulation 851, Industrial Establishments
- Ontario Regulation 213/91, Construction Projects
- Ontario Regulation 632/05, Confined Spaces
- E&USA Rule Book, Electric Utility Safety Rules (2009)
- ANSI/ASSE Z244.1-2003 (R2008), Control of Hazardous Energy, Lockout and Alternative Methods
- CSA Standard, CSA Z460-05 (R2010), Control of Hazardous Energy – Lockout and Other Methods
- University of Toronto Lockout Standard (Rev. Feb 2012)
- University of Toronto Confined Spaces Program (Rev. May 2008)

Definitions

Authorized Employee

An employee who is qualified because of knowledge, training, and experience and has been assigned to perform lockout.

Control lock

A Control lock is used to replace a worker's personal lock if he/she must leave the site before the operation is released from lockout. The control lock is usually placed by the Trade or Utility supervisor and must be labelled with the Trade or Utility and the name and MIKE or telephone number of the person who applied it.

Energy isolating device

A mechanical device (a disconnect switch, line valve, block, blank off plate) that physically prevents the transmission or release of an energy source to machinery or equipment.

Energy source

Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, gravitational, stored or other energy.

Group Lockout Procedure

This is the procedure used where there are several workers involved and several sources of energy to be locked out. This is usually accomplished through the use of a lock box under the direction of a Superior Authorized Employee.

Individual Lockout procedure

This is the basic procedure that is used where there is only one worker who is required to lockout one source of energy.

Lock box

This is a secure box, usually attached to the machinery or equipment that contains locks, tags and keys for use in a group lockout situation. It is usually under the control of the Superior Trade or Utility.

Lock box locks

These are the locks which are supplied with the lock box and used in a group lockout situation.

Lockout

Lockout means to physically neutralize all energy sources in machinery or equipment, usually by applying locks, before beginning any maintenance or repair work. The primary purpose of lockout is to prevent all energy isolation devices (switch, circuit breaker or valve) from accidentally or inadvertently being operated while workers are working on equipment.

Lockout device

This is a device that uses a positive means (such as a lock) to hold an energy-isolation device in a safe position and prevent the energizing of a machine or a piece of equipment. Each lockout device must always be accompanied by a tagout device.

All Lockout devices, must

- be unique, distinctive, easily recognizable, and clearly visible
- be the only devices used for controlling potentially hazardous energy
- not be used for any other purpose
- be capable of withstanding the environment to which they are exposed
- be substantial enough to prevent operation of the energy isolating device without the use of excessive force

Locks, by themselves, do not de-energize equipment. They are attached only after the machinery has been isolated from its energy sources.

Multiple person lockout procedure

This procedure is used where several workers are involved, but there is a single lockout point. Generally, a multi-lock hasp is attached to the energy isolating device which allows as many personal locks as necessary to be attached.

Multi-lock hasp or scissor device

This is a special device which allows several personal locks to be attached to a single lockout point. It cannot be opened until all of the personal locks have been removed. If more than 6 locks are required for the lockout, then the last hole is left empty so that another multi-lock hasp can be added, thereby allowing more locks to be added.

Personal lock

A personal lock is one that is assigned to a particular worker involved in the operation. Each worker must apply and remove his/her own personal lock and carry his/her own key. Combination locks or locks with master or duplicate keys must not be used. Each personal lock shall be identified by an attached tag with the worker's name, Trade/Utility and MIKE number.

Superior Authorized Employee (group lockout)

This is a person, usually **the supervisor of the Superior Trade or Utility**, who is qualified because of knowledge, training, and experience to coordinate the application and removal of the lockout procedure under the Group Lockout situation.

The Superior Trade or Utility

This is the group for which the first service order number was issued for a job. This group may subcontract parts of the job to other Trades or Utilities, but retains overall responsibility for the safe completion of the job. Where there is more than one superior number, a meeting will be held to determine which trade or utility will be the superior one for that particular job

Principal Authorized Employee (group lockout)

This person (usually a supervisor) has responsibility for a particular group of employees under the Group Lockout process and reports to Superior Authorized Employee in Group lockout situations.

Tagout device

This is a tag or sign, which must be attached to the lockout device, that is used to communicate vital information about the lockout, including the identity of the Authorized Employee who applied the device, the reason for locking out, and the date and time. It also warns workers not to operate that equipment.

The tag must be substantial enough to withstand the environment, be secured to prevent inadvertent or accidental removal, and it must remain legible for the duration of the job. It must be made of non-conducting material and be placed in a conspicuous location.

Tagout

Tagout means to attach tags or signs to the locks with written information about the nature of the lockout.

The General Lockout Procedure

(adapted from the CSA Standard Z460-05) – See Appendix 3 for a LOTO Flow Chart

Step 1. Preparation for Shutdown

The Supervisor or Authorized Employee shall:

- Identify the types and magnitude of energy to be controlled
- Identify all hazards (including stored energy)
- Identify the method or means of controlling the energy
- Identify the location of switches, energy sources, controls, interlocks or other such devices necessary to isolate the system.
- Assess the consequences of shutdown
- Notify all affected persons that the equipment will be shutdown and locked/tagged out
- Conduct a written job hazard analysis where necessary.

Step 2. Equipment Shutdown

- The equipment will be shutdown following established procedures.
- Ensure that all points of operation are considered, including remote control points.

Step 3. Equipment Isolation

- The equipment shall be isolated by following established isolation procedures which specify the use of disconnect switches, line valves, blocks, blanks, removal of spools, and capping of lines etc., as required.
- Computer shutdown alone does not constitute a proper isolation procedure.

Step 4. Application of Lockout Devices

- Locks shall be applied to each of the isolation devices. Each employee working on the equipment is responsible for attaching his/her personal lock and keeping the key, without exception.
- A multi-lock hasp or scissor device may be used to allow the application of more than one lock to a single energy isolating device.
- Tags must be attached to each lockout device whether it is a personal lock or a control lock. The tag should state the name, Trade or Division and MIKE or telephone number of the person who applied the device, the reason for locking out, the date and time.
- In the case of a group lockout, a designated Authorized Employee, usually the Principal Authorized Employee, will apply all control lockout devices.

Step 5. Release of Stored Energy (De-energization)

- Once all necessary Lockout devices have been applied, all potentially hazardous stored or residual energy must be relieved, blocked, bled, restrained, grounded or rendered safe by Authorized Employees. See below.
- Additional measures may be necessary to prevent the re-accumulation of energy.
- Each worker must ensure that this has been done.

ENERGY FORM	ENERGY SOURCE	GENERAL LOCKOUT GUIDELINE
Electricity	<ul style="list-style-type: none"> • power transmission lines • machine power cords • motors • solenoids • capacitors (stored electrical energy) • generators • batteries • photovoltaic arrays 	<ul style="list-style-type: none"> • Turn off power at machine first (point of operation switch), and then at main disconnect switch for machine; lock and tag main disconnect switch (or remove fuses from box, and then lock and tag box). • Fully discharge all capacitive systems (e.g. cycle machine to drain power from capacitors) according to manufacturer's instructions. • Install grounds where necessary.
Fluid Pressure	<ul style="list-style-type: none"> • Hydraulic systems <ul style="list-style-type: none"> - hydraulic presses - rams - cylinders - hammers 	<ul style="list-style-type: none"> • Shut off, lock (with chains, built-in lockout devices, or lockout attachments) and tag valves; bleed off and blank lines as necessary. • Block any possible movement of machinery.
Air Pressure	<ul style="list-style-type: none"> • Pneumatic systems: <ul style="list-style-type: none"> - lines - pressure reservoirs - accumulators - air surge tanks - rams - cylinders 	<ul style="list-style-type: none"> • Shut off, lock (with chains, built-in lockout devices, or lockout attachments) and tag valves; bleed off excess air. If pressure cannot be relieved, block any possible movement of machinery.
Kinetic Energy (energy of a moving object or materials - moving object may be powered or coasting)	<ul style="list-style-type: none"> • blades • flywheels • materials in supply lines of bins or silos 	<ul style="list-style-type: none"> • Stop and block machine parts, and ensure that they do not recycle. Review entire cycle of mechanical motion; ensure that all motions are stopped. • Block material from moving into area of work and blank as required.
Potential Energy (energy stored in an object with the potential for release due to its position)	<ul style="list-style-type: none"> • springs • actuators • counterweights • raised loads • top or movable part of a press or lifting device 	<ul style="list-style-type: none"> • If possible, lower all suspended parts and loads to the lowest (rest) position, block parts that might move due to gravity; release or block stored spring energy.
Pressurized liquids and gases (including steam, chemicals)	<ul style="list-style-type: none"> • supply lines • storage tanks and vessels 	<ul style="list-style-type: none"> • Shut off, lock (with chains, built-in lockout devices, or lockout attachments) and tag valves; bleed off excess liquids or gases; blank lines as necessary.

Step 6. Verification of Isolation

- Prior to starting the work, and after isolation and de-energization, the Authorized Employee should perform a test of all start buttons and other activating controls on the equipment, check potential of the electrical supplies to ensure the equipment has been de-energized.
- Verify the test equipment before and after the test on a known source of energy
- Potential test indicators should not be used beyond the voltage limits for which they are rated.
- Return all of the controls to the off or neutral position after trying to start.
- For work involving several points of isolation, the Authorized Employee must keep record of the devices opened, locked off or otherwise rendered inoperable so that all of these devices can be reactivated once work is complete.
- Each person who has placed a personal lock on the equipment should be assured of his/her right to verify individually that the potentially hazardous energy has been isolated and/or de-energized before the repair or maintenance work begins.

PERFORM THE REPAIR OR MAINTENANCE WORK

- Do not do anything that could re-activate the equipment.
- Do not inadvertently bypass the lockout (e.g. when installing a new pipe or wiring.)

Step 7. Release from Lockout Control

Prior to restoring energy to the equipment, the Authorized Employee will perform an assessment of the work area to determine that:

- the machine or equipment is operationally intact
- all necessary guards have been re-installed
- all tools and materials used during the repair or maintenance activities have been removed
- all temporary de-energization measures and devices have been removed by those who placed them
- all other workers and affected individuals have been informed that the energy is about to be restored
- all other workers and affected individuals are clear of the equipment (perform a head count if necessary)

The last lock to be removed should be that of the person supervising the lockout. This responsibility should not be delegated to another person.

Follow the required steps to re-energize the system.

SPECIAL SITUATIONS

MULTIPLE PERSON LOCKOUTS

If more than one Authorized Employee works on the same equipment, each person must attach his/her lock to the multi-lock hasp on the energy-isolating device.

GROUP LOCKOUT (Lock box Procedures)

Where there are several lockout points to be secured and several Authorized Employees involved on the job, a group lockout procedure is followed.

- The Superior Trade or Utility obtains a lock box and secures it to the machine or equipment.
- Lock box locks from the lock box and tags are applied to all the lockout points by Authorized Employees from the Superior Trade or Utility.
- The keys are collected, verified and placed inside the lock box.
- The lock box is then closed and a multi-lock hasp is affixed to it. This will allow additional locks to be added.
- The last available hole should never be used for a lock, but should remain open to add another multiple lockout device if needed to create more spaces. In this way, as many locks as needed can be added to the equipment.
- Each worker on the job then applies his/her personal lock to the multi-lock hasp such that the box cannot be opened until each personal lock is removed. Each worker's personal lock remains in place as long as he/she is actively working on the locked out equipment.
- In all cases, the last lock to be removed should be that of the person supervising the lockout. This responsibility should not be delegated to another person.

SHIFT OR PERSONNEL CHANGES

If the work lasts longer than one shift, or when the Authorized Employee who applied the lock must leave the workplace, lockout protection must not be interrupted. There are at least two approaches to ensure continuity of lockout control.

- The replacement worker applies his/her lock before the departing worker removes his/hers. This also provides an opportunity for discussion regarding the status of the job.
- A control lock is applied by the supervisor, along with each personal lock. When an Authorized Employee has completed his/her shift but the work is not completed, he/she removes the personal lock, and communicates to the supervisor any outstanding work required.
- The control lock(s) must remain in place until the equipment is safe to return to service or has been rendered incapable of being returned to service, i.e. physically disconnected.

LOCK REMOVAL WHEN PERSON IS ABSENT

Personal locks

Workers should always apply and remove their own locks. However, in the rare event that the worker who applied a lock is unable to remove it (e.g. due to sudden illness or injury) the lock can be removed only under the direction and in the presence of the worker's supervisor who has assessed the situation and determined that it is safe to remove the lock. A lock removal form (Appendix 1) must be completed by the supervisor and kept on file. The person whose lock was removed must be notified verbally and in writing of the removal upon his/her return, and before resuming work (Appendix 2.) Anyone who removes someone else's lock without following this procedure will be subject to disciplinary action.

Control locks

As above, a control lock can only be removed by another supervisor in the same Trade or Utility after he/she has assessed the situation and determined that it is safe to remove the lock. The person who applied the control lock must be notified of the lock removal before he/she returns to work. A lock removal form must be completed and kept on file. Anyone who removes a control lock without following this procedure will be subject to disciplinary action.

CONTRACTORS

When Contractors or other outside workers are performing service or maintenance where it has been determined that lockout is required:

- The supervisor for that area shall ensure that the Contractor understands and abides by University of Toronto lockout procedures.
- Before locking out any equipment, the Contractor shall inform the supervisor of the need for lockout, the location and the expected duration of the lockout.

ENERGIZED TESTING

Where lockout devices must be **temporarily removed** for testing, trouble shooting, re-positioning of components etc:

- The state of the maintenance work must be assessed to ensure that testing can be done safely.
- All provisions of Step 7, **Release from Lockout Control**, must be followed.
- Energized testing is conducted.
- When energy is no longer needed, lockout is applied again, according to the procedures outlined in Steps 1 to 6.

CONFINED SPACES

- Refer to Ontario Regulation 632/05, Confined Spaces, under the OHS Act and the University of Toronto Confined Space Program, Rev. Dec. 2007.

HIGH VOLTAGE

- Refer to the EUSA Rule Book, Electric Utility Operations.

Appendix 1

LOCKOUT DEVICE AND INFORMATION TAG REMOVAL REPORT

Department: _____

Shift: _____

Authorized Employee's Name: _____

Machine, Equipment or Process: _____

Date and Time Lockout Device and Information Tag was discovered to be left on:

Reason(s) for Removal of Lock and Tag:

Confirmed that the Authorized Employee has left site or facility?

Supervisors Signature: _____ Time and Date: _____

Attempts made to contact the Authorized Employee?

Supervisors Signature: _____ Time and Date: _____

Authorized Employee has been contacted and is returning to workplace to remove the lockout device(s) and information tags. (Procedure ends, exit procedure, file form for future reference.)

Supervisors Signature: _____ Time and Date: _____

Authorized Employee cannot be contacted and or is unable to return to the Site to remove their lock or Information Tag.

Supervisors Signature: _____ Time and Date: _____

The status and condition of the machine or equipment is assessed and verified to be in a state that will allow for the safe removal of the Lockout device.

Supervisors Signature: _____ Time and Date: _____

Provisions have been made to prevent the Authorized Employee from resuming work at this facility without notification that their lock and tag have been removed.

Supervisors Signature: _____ Time and Date: _____

Witness: _____

Appendix 2

WARNING

Notice to Employee

Name: _____

Department:

The Lockout device and information tag that you applied to (machinery or equipment):

located in (room/building): _____

has been removed by (supervisor name and phone number): _____

The reason for the removal was: _____

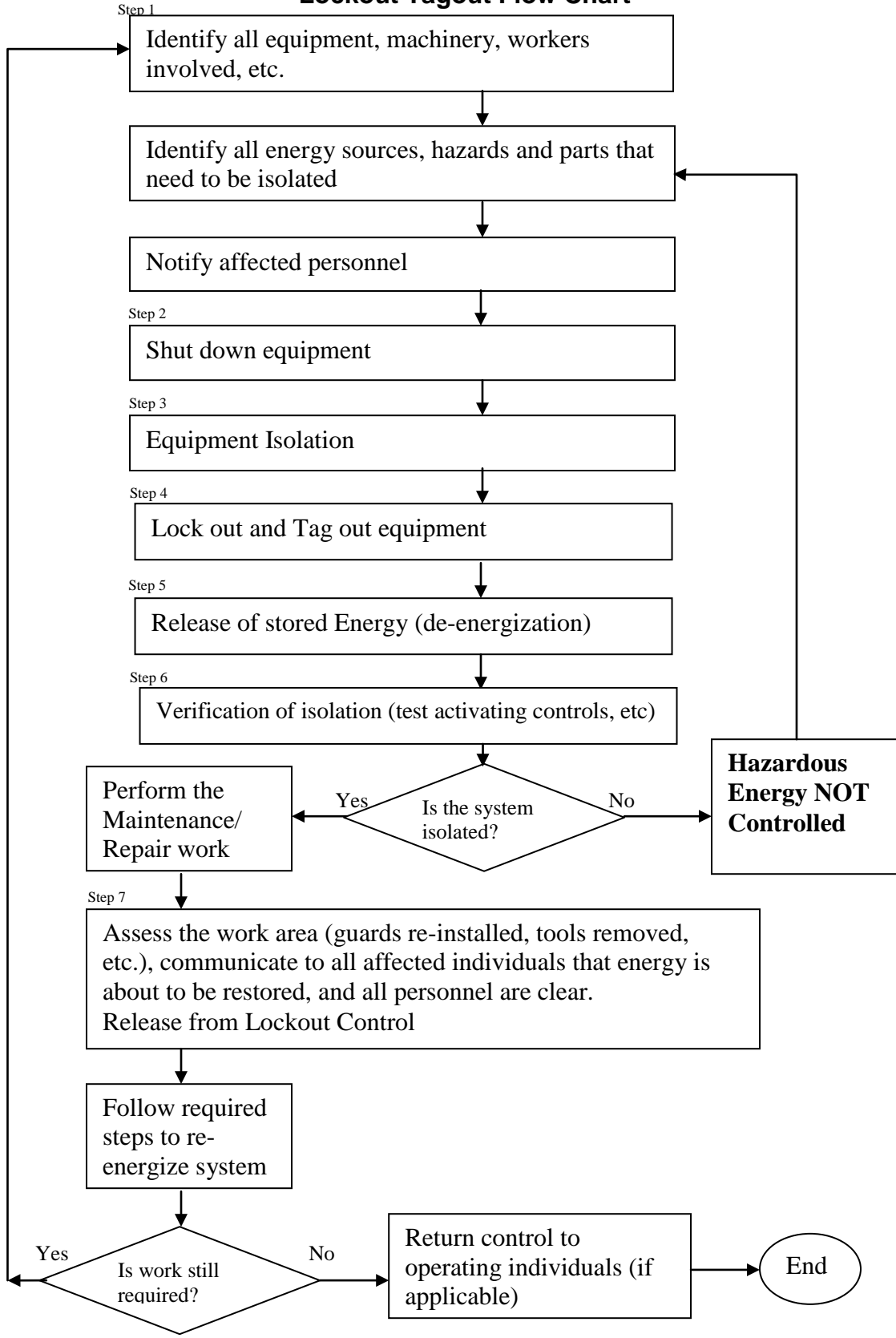
Please report to your immediate supervisor before starting work.

Date: _____

Supervisor: _____

Appendix 3

Lockout Tagout Flow Chart



Adapted from "Electrical Construction and Maintenance Worker's Safety Manual," Construction Safety Association of Ontario, 2008