

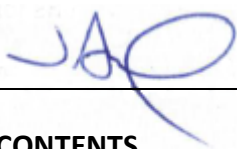
 DALHOUSIE UNIVERSITY <i>Inspiring Minds</i> Lockout-Tagout Energy Control Program	<i>Policy Sponsor:</i> Jerry Aguinaga, Executive Director EHS <i>Signature:</i> 	<i>Approval Date:</i> September 4, 2019
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PURPOSE

The purpose of this program is to establish and maintain a procedure-based lockout-tagout-tryout (LOTO) process to protect workers from unplanned release or transmission of energy from machines, equipment, or processes.

OBJECTIVES

The objectives are as follows:

- a) to recognize the need for energy isolation;
- b) to prevent accidental operation or energization of the machine, equipment, or process;
- c) to establish methods for achieving zero energy state; and
- d) to comply with applicable regulatory standards:
 - a. Nova Scotia Occupational Safety Regulations; Part 6-Lockout; Sections 51-54
 - b. Canadian Standards Association (CSA) standard Z460-13 (R2018), Control of Hazardous Energy-Lockout and Other Methods

SCOPE

A. Application

This program applies to:

- a) activities such as, but not limited to, installing, repairing, adjusting, inspecting, cleaning, operating, and maintaining machines, equipment (includes pipes for transporting a material, and hydraulic or pneumatic lines) and processes; and
- b) energy sources such as, but not limited to, electrical, mechanical, hydraulic, pneumatic, chemical, radiation, thermal, and compressed air energy sources, energy stored in springs, and potential energy from suspended parts (gravity);
- c) work carried out on Dalhousie University property or under the auspices of Dalhousie University.

This program does NOT apply to:

- a) Minor tool changes, adjustments, and other small service activities that take place during normal operations if they are routine, repetitive, and integral to the use of the equipment. (*Example: Changing a drill bit on a drill press.*) Provided that the work is performed using alternative measures which provide effective protection.
- b) Equipment that is isolated and made safe by simply unplugging an electrical cord, compressed air hose, removing a battery, or some other single-source energy supply when the person working on the equipment has exclusive control over the connection to the energy source.

B. Installation design requirement

Whenever replacement or major repair, renovation, or modification of a machine, a piece of equipment, or a process is performed, and whenever new machines, equipment, or processes are installed, energy-isolating devices (in addition to normal START and STOP control mechanisms) must be designed to accept a lockout device that will positively secure them in the isolated position. Energy-isolating devices are to be near the machine, equipment or process it is serving.

C. Responsibilities

The following responsibilities shall apply:

- a) All Employees are to be responsible for complying with the provisions of the University's Lockout Tagout Energy Control Program.
- b) Affected employees are to be aware of lockout procedures used to guard against unexpected start-ups.
- c) Only authorized employees are to operate energy isolating devices and place locks and tags on controls to prevent unexpected start-ups.

DEFINITIONS

Primary authorized employee: the lead authorized employee who oversees a group lockout.

Authorized Employee: an employee who is assigned to isolate hazardous energy sources and apply lockouts.

Affected Employee: a person whose job requires them to operate a machine or piece of equipment or work in an area where lockout is being performed.

Energy Sources: Any source of electrical, pneumatic, hydraulic, mechanical, thermal, chemical or other energy.

Energy-Isolating Device: a mechanical device that physically prevents the transmission or release of energy, including but not limited to the following:

- a) a manually operated electrical circuit breaker;
- b) a disconnect switch;
- c) a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors and no pole can be operated independently;
- d) a line valve;
- e) a block and
- f) other devices used to block or isolate energy. (Push button selector switches and other control type devices are not energy isolating devices.)

Lockout Device: a positive means (e.g. a lock) that secures an energy-isolating device in a position that prevents the inadvertent re-energizing of a machine, piece of equipment, or process.

Lockout: placement of a lockout device on an energy-isolating device in accordance with an established procedure to ensure that the equipment being controlled "locked out" cannot be operated until the lockout device is removed.

Tags (Tagout): the visual system used to communicate to affected employees, and any other potential users that energy source(s) is in a lockout condition.

Zero Energy State: a condition in which a machine, equipment, or process is rendered incapable of spontaneous or unexpected action or otherwise releasing kinetic or potential energy.

Machine Specific Energy Control Procedures: a procedure used by Authorized Employees to assist in ensuring that all energy sources have been properly locked out, and a zero energy state has been achieved.

OTHER HAZARDOUS ENERGY CONTROL METHODS

Traditional lockout to a full zero energy state may not be possible in all situations. In these situations other hazardous energy control methods are required. Always follow the Hierarchy of Implementation when selecting these control methods. This process shall be based on the following order of preference:

**Elimination → Engineered Safeguards → Warning and Alerting Techniques →
Administrative → Personal Protective Equipment**

In these situations a risk assessment is required to ensure that other hazardous energy control method(s) selected provide effective risk reduction for exposed individuals.

See [Appendix A](#) for more information on the Hierarchy of Implementation

LOTO ENERGY ISOLATING EQUIPMENT

Dalhousie uses various forms of energy isolating devices to physically prevent the transmission or release of energy. Energy isolating devices should never be tampered with or removed without authorization. Unit/Departments who perform lockout activities are expected to have a well maintained and equipped lockout station which provides access to process locks, general tags and checklist/audit cards readily available for use by authorized employees.

Locks are used with tags and are placed on energy isolation devices by the authorized employee working on the machine, equipment or process. The lock ensures other employees do not accidentally turn the equipment back on. Locks must be identifiable as LOTO locks and only be used for LOTO purposes.

Tags are used for warnings and do not provide any physical restraint from potential energy sources. Tags and their means of attachment must be made of materials, which will withstand the environmental conditions encountered in the workplace and do not readily conduct electricity. Tags are 3" x 5", and must state "DANGER, DO NOT OPERATE", or similar.

At Dalhousie University, the Following Two Types of Locks are Involved in Lockout:

A. Personal Lock

This lock is affixed to the main lockout point, and indicates that the authorized employee(s) are actively working on a machine or piece of equipment. Each authorized employee is issued ONE personal lock, which will be engraved with their name (*exceptions may apply to term employees, academic laboratories and workshops*). This lock must remain in the possession of the individual that the lock has been assigned. This type of lock is also RED in color, and is issued to authorized employees along with ONE unique key. These locks are issued by the EHS Office, upon request.

B. Process Locks

This type of lock is used for multiple lockout points, extended period lockouts (e.g., seasonal), or shift change. Process locks must always be applied to energy isolating devices, to ensure zero energy is maintained. These types of locks are BLACK in color, typically keyed alike and readily available for use by authorized employees. If already available in the workplace, different colors of process locks may be used. However, the expectation for all future purchase of process locks be BLACK in color.

At Dalhousie University, the Following Two Types of Tags are Involved in Lockout:

C. Personal Tag

A personal tag must always be used in conjunction with an authorized employee's personal lock. Each authorized employee is issued ONE personal tag, which has their photo and name on it. This type of tag indicates that authorized employee(s) are actively working on a machine or piece of equipment. This tag must remain in the possession of the individual that the tag has been assigned. These tags are produced by the EHS Office, upon request.

D. General Tags

A general LOTO tag(s) must always be used in conjunction with a process lock(s). When using general tags, authorized employees must ensure the tags are legible and state reason for the lockout (e.g. maintenance, cleaning, servicing, etc.), name of the employee working on machines, equipment, or process energy, employee contact information, date and time the tags was put in place.

See [Appendix B](#) for samples of Energy Isolating Equipment

E. Lockout-Tagout-Tryout - Checklist and Audit Card

This card is required to be completed by the authorized employee (primary authorized employee for group lockout) responsible for the lockout, and must be affixed to the main point of control along with personal lock(s) and tag(s). Completing this checklist section of the card verifies that the proper lockout-tagout-tryout steps have been performed and those participating in the lockout understand the details of the lockout event. Once the lockout is completed the Checklist/Audit Card is to be turned in to the responsible supervisor. The checklist will be kept on file (paper or electronic) for two years.

Using the audit section of the card, Managers, Supervisors, and Principal Investigators are responsible for ensuring that, at a minimum, annual audits on active lockout events are performed. The amount of lockout auditing should adequately represent the number of authorized employees in relation to their area of responsibility. Cards that undergo annual audits are required to be kept on file (paper or electronic) for a minimum of two years. Audit results are to be shared with the authorized employees involved with the lockout, as well as any corrective actions required.

See [Appendix C](#) for Lockout-Tagout-Tryout Checklist and Audit Card

Note: Academic laboratories and workshops, that are equipped with permanently mounted equipment for teaching or research purposes will, if applicable, have a lockout station that will provide access to locks, general tags and checklist/audit cards for faculty, staff and student use when performing a LOTO procedure.

LOCKOUT-TAGOUT-TRYOUT GENERAL PROCEDURE

Though machines, equipment and processes will vary greatly in how they are successfully locked out, the following general steps **MUST** be taken each time a lockout is performed:

1. **Notify the Affected Employees:** Notify the affected employees that servicing or maintenance is required on a machine, equipment, or process and that the selected unit will be shut down and locked out.
2. **Machine, equipment, or process shutdown:** If the machine or equipment is operating, shut it down by the normal stopping procedure (e.g., press the “off” button, push the lever up, close the valve, or building automation system, etc.).
3. **Machine, equipment, or process isolation:** The machine, equipment, or process must be isolated by following established shutdown procedures, that specify the use of disconnect switches, line valves, blocks, blanks, removal of spools, capping of lines, etc, as required. Refer to the Machine Specific Energy Control Procedure (MSECP), if available.
4. **Application of lockout devices:** Affix the appropriate energy isolating device(s), lock(s), tag(s), and completed checklist.
 - a. If there are multiple lockout points, the personal lock, tag and checklist are to be placed on the main point of control. General tags/process locks are used at all other points of lockout.
5. **Release Stored Energy:** Once the necessary lockout devices have been applied, all the potential hazardous stored or residual energy must be relieved, blocked, bleed, restrained or rendered safe. Each worker involved must check that this has been done.
6. **Verification of Isolation (tryout):** Ensure that the machine, equipment, or process is disconnected from its energy source(s) by first checking that no personnel are exposed, then verify the isolation of the lockout by operating the controls. For example, **verification can be accomplished by:**
 - a. testing circuitry;
 - b. attempting system cycling;
 - c. visually inspecting the position;
 - d. manually trying the machinery controls, actuating devices, or locked-out mechanisms;
 - e. monitoring movement or discharge; or
 - f. observing bleeds, gauges, indicators, etc.
7. **Begin work:** Once the Operating Control(s) are in neutral or “off” position, begin work.

TESTING AND ADJUSTING EQUIPMENT DURING A LOCKOUT

1. Check the machine or piece of equipment and the immediate area to ensure that non-essential items have been removed and that components are operationally intact.
2. Check the work area to ensure that all employees have been safely positioned or removed from the area.
3. Verify that the controls are in neutral or in the “off” position.
4. Remove the lockout device(s) and re-energize the machine or piece of equipment for testing or positioning.
5. When testing or positioning is complete, de-energize the machine or piece of equipment and re-apply control measures.

RESTORING EQUIPMENT TO SERVICE

1. Check the machine or piece of equipment and the immediate area to ensure that non-essential items have been removed and that components are operationally intact.
2. Check the work area to ensure that all employees have been safely positioned or removed from the area.
3. Verify that the controls are in neutral or in the “off” position.
4. Remove the lockout device(s) and re-energize the machine or piece of equipment.
5. Notify all affected employees and others that the work has been completed and that the equipment is ready to be returned to use.

PROCEDURE FOR GROUP LOCKOUT

When more than one authorized employee is involved in a lockout, a system equivalent to that provided by personal lockout must be in place. In such cases, an authorized employee is selected to act as the Primary Authorized Employee and has responsibility to apply and coordinate removal of the lockout of a machine, piece of equipment, or process on which work will be performed.

Basic Steps for a Group Lockout:

1. The Primary Authorized Employee applies a lock and tag to each energy-isolating device. Refer to the Machine Specific Equipment Control Procedure, if available.
2. The key(s) to the locks applied to each energy-isolating device are placed in lockbox, or in the case of a single point lockout on a hasp.
3. The lockbox or hasp is locked by the Primary Authorized Employee with their personal lock, tag and a completed checklist.
4. Authorized employees then apply their personal lock and tag to the lockbox or hasp, which verifies that all hazardous energy is isolated and locked out.
5. Once all of the work is completed and verified by the Authorized Primary Employee, the isolation can be removed, as long as all of the personal locks have been removed from the lockbox or hasp.
6. If the Authorized Primary Employee in charge is satisfied that it is safe to do so, they shall remove their locks and tags from all energy isolating devices.
7. Once the lockout devices have been removed from all energy isolating devices the equipment can be re-energized as required.

PROCEDURE FOR SHIFT CHANGES AND EXTENDED PERIOD LOCKOUTS

If there are multiple lockout points, the personal lock, tag and checklist are to be placed on the main point of control. General tags/process locks are used at all other points of lockout. A Lockout must never be interrupted during a change of shift or during an extended period.

A. Direct Change of Shift

Incoming authorized and outgoing authorized employees are in contact with each other and simply exchange information, incoming installs their personal lock(s) and outgoing removes their lock(s) on the energy isolating device(s). Re-testing must always be done to ensure the de-energization.

B. Indirect Change of Shift or Lockout during an Extended Period

When incoming and outgoing authorized employees are not in contact, or an extended period lockout occurs (i.e. unavailable parts/manpower or seasonal):

1. Outgoing authorized employee installs a process lock(s) onto energy isolating device(s).
2. Outgoing authorized employee removes their personal lock(s) from energy isolating device(s).
3. Incoming authorized employee installs their personal lock(s) on energy isolating device(s) and removes process lock(s) and places them back on the lockout board.
 - a. Process locks can only be removed by authorized employees who have had the transfer of knowledge of the specific work being done and the required tasks to complete the job.

ABANDONED/FORGOTTEN LOTO DEVICE REMOVAL PROCEDURE

Only the authorized employee who applied their personal, red in color, lockout device shall remove that device. However, when that employee is not available and the device(s) must be removed, the following procedure shall be followed:

1. A Management member (this can be a Supervisor) must verify that the authorized employee has left the immediate work area and ensure that all reasonable efforts have been made to contact the authorized employee.
2. If it is not feasible for the lock's owner to return to remove it, or no contact can be made, then the Management member will determine if the lock can be removed.
3. The Management member will inspect the situation and will remove the lock, in the presence of a competent person, if they have determined it is safe to do so.
4. The Management member must document this process using [Appendix D Lockout Device and Information Tag Removal Report](#), and forward a copy to the Environmental Health and Safety Office.
5. The Management member must ensure that the authorized employee has been informed that their lockout device(s) has been removed before they resume their work using [Appendix E Notice to Employee](#).

MACHINE SPECIFIC ENERGY CONTROL PROCEDURE (MSECP)

Written Machine Specific Energy Control Procedure (MSECP) is a tool to help the Authorized Employees know the key hazards of machinery and/or equipment, and identify all energy sources have to be locked, or secured. MSECP's are required when the machinery and/or equipment has multiple energy sources and energy isolating devices.

MSECP documents must be prepared by someone who is a skilled, knowledgeable and a trained person (i.e. maintenance employee, engineer or contractor) in the workings of machinery and equipment.

MSECP documents are posted at the machine or equipment, and must be removable. A permanent identifier marks the MSECP's place and lets others know that it is in use or misplaced. Labels that identify the type and magnitude of energy to be controlled will also be placed on lockout points as described in the MSECP.

Each Unit/Department is responsible for ensuring MSECP's are developed, posted and that annual MSECP reviews take place. When machines and/or equipment are altered, the MSECP must be reviewed and updated as appropriate.

See [Appendix F](#) for *MSECP Template*

TRAINING AND INSTRUCTION

Authorized employees: require specific training in how to recognize hazardous energy sources, the type and magnitude of the energy available in the workplace, the methods and means necessary for energy isolation and control, and the means of verification and control.

Affected employees: require specific training on the purpose and use of the energy control procedure.

Authorized and affected employee training is to be provided by a competent trainer, before employees are exposed to the risk of hazardous energy. Training shall be conducted every three years, as applicable. Training certificates must be kept and be available on file by the responsible Unit/Department for the duration of employment.

Refresher training must be considered when job assignments change; there is a change in machines, equipment or processes that creates a new hazard; change involving the LOTO program, or if observations or inspections reveal that an employee is not following or does not fully understand the LOTO procedures.

PROCEDURE REVIEW

Each Unit/Department is required to conduct and document an annual review of their written Machine Specific Control Procedures to evaluate their effectiveness, identify necessary changes, and update as required.

Whenever deficiencies in the lockout procedure are identified; or when equipment, machinery or energy supplies undergo changes or modifications that may affect the lockout system, lockout procedures must be immediately reviewed and updated.