
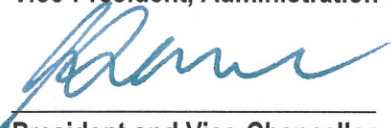


Complete Program Title: Lockout/Tagout (LOTO) Program for the Control of Hazardous Energy	Risk Management Manual (RMM) Number: 306
Approved by:  Vice-President, Administration  President and Vice-Chancellor	Date of Most Recent Approval: June 2016
Date of Original Approval: April 2007	Supersedes/Amends Program dated: January 2010
Responsible Executive: Vice-President, Administration	Enquiries: Environmental and Occupational Health Support Services (EOHSS) eohts@mcmaster.ca
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1 PURPOSE

- 1.1 To provide for the protection of persons (faculty, staff, students, contractors), equipment and the environment from the inadvertent release of hazardous energy sources while servicing and maintaining machinery and / or equipment and to outline general Lockout / Tagout (LOTO) procedures for electrical equipment, machinery, and pressure systems.
- 1.2 To ensure compliance with the Occupational Health and Safety Act (OHSA) and applicable Regulations.

2 SCOPE

- 2.1 All persons who are required to perform maintenance or routine service on equipment or machinery that may contain or produce an energy source that could cause harm to personnel or equipment by transferring or generating electrical energy; hydraulic; pneumatic; gas or steam pressure; vacuum; high temperature; cryogenic temperature; or stored mechanical energy. The Lockout / Tagout program applies to all departments within the University.
- 2.2 Contractors engaged to maintain or service such machinery or equipment must implement procedures, which adhere to the LOTO procedures established by this program.

3 Related Documents

- 3.1 Occupational Health and Safety Act, R.S.O. 1990
- 3.2 Regulations for Industrial Establishments, R.R.O. Reg. 851
- 3.3 Canadian standard CSA Z460-05 (R2010) "Control of Hazardous Energy - Lockout and Other Methods
- 3.4 Guide to Good Practices for Lockouts and Tag outs. (U.S. DOE – STD-1030 –96)
- 3.5 McMaster University Confined Space Program, RMM#305
- 3.6 McMaster University Electrical Safety Program, RMM#316
- 3.7 McMaster University [Contracting Work Safety Program / Due Diligence Program](#), RMM# 111
- 3.8 McMaster University [Standard Operating Procedures \(SOPs\) Program](#), RMM# 301
- 3.9 McMaster University [Working Alone Program](#), RMM# 304

4 DEFINITIONS

- 4.1 **Affected Person:** person whose job requires operation or use of a system, or work in an area in which servicing or maintenance is being performed under lockout/ tag out.
- 4.2 **Authorized Person:** person qualified to control hazardous energy sources because of their knowledge, training, and experience and has been assigned to engage in such control.
- 4.3 **Centrally Controlled LOTO Procedures:** procedures for work on machinery and equipment, which involves more than one energy source (e.g. electrical and hydraulic) and or more than one service group (e.g. electrical and mechanical trades).
- 4.4 **Constructor** – a person who undertakes a project for an owner and includes an owner who undertakes all or part of a project by himself / herself or by more than one employer; also called the general or prime contractor. The constructor has complete control of the work on behalf of the construction project owner, and has responsibility for regulatory compliance and safe work procedures on the job site.
- 4.5 **Energy Isolating Device:** a mechanical device that prevents the transmission or release of energy. Examples include; circuit breakers disconnect switches, blind flange, plug or block and any similar device used to block or isolate energy.
- 4.6 **Energy Source:** any source that could cause harm to personnel by generating or transferring electrical energy or potential (voltage), hydraulic, pneumatic, gas or steam pressure, vacuum, high temperature, cryogenic temperature or stored mechanical energy

- 4.7 **Individual Controlled Lockout / Tagout Procedures:** procedures covering work performed by single individuals who have control of machinery and or equipment having a single energy source and no potential for stored energy.
- 4.8 **Lockout / Tagout:** a general term for all methods of ensuring the protection of personnel from uncontrolled energy sources by installing locks and tags on energy isolating devices.
- 4.9 **Locked Out**—in respect of any electrical equipment, that the equipment has been de-energized and rendered inoperative and cannot be operated or be energized without the consent of the person who rendered it inoperative.
- 4.10 **Standard Operating Procedures** – Written procedures required by the OHSA under specific regulations and by McMaster University Programs that define the techniques, processes and best practices required to prevent injury and/ or occupational illness or damage to University equipment or the environment.
- 4.11 **Supervisor** – Person who has charge of a workplace or authority over a worker.

Worker – worker” means any of the following, but does not include an inmate of a correctional institution or like institution or facility who participates inside the institution or facility in a work project or rehabilitation program:

1. A person who performs work or supplies services for monetary compensation.
 2. A secondary school student who performs work or supplies services for no monetary compensation under a work experience program authorized by the school board that operates the school in which the student is enrolled.
 3. A person who performs work or supplies services for no monetary compensation under a program approved by a college of applied arts and technology, university or other post-secondary institution.
 4. A person who receives training from an employer, but who, under the *Employment Standards Act, 2000*, is not an employee for the purposes of that Act because the conditions set out in subsection 1 (2) of that Act have been met.
 5. Such other persons as may be prescribed who perform work or supply services to an employer for no monetary compensation; (“travailleur”)
- 4.12 **Zero Energy State:** the mechanical potential energy in all elements of a machine is eliminated so that operation of any control will not produce a movement that could cause personal injury or damage to the machine.

4.13 **Acronyms:**

CJHSC Central Joint Health and Safety Committee;

EOHSS Environmental & Occupational Health Support Services

FHS Safety Office Faculty of Health Science Safety Office

JHSC Joint Health and Safety Committee

LOTO Lockout /Tagout

SOP Standard Operating Procedures

5 RESPONSIBILITIES

1.2 Role of Senior Managers (Directors, Deans, Chairs, Department Managers):

- provide the resources and direction necessary to ensure that an effective Lockout / Tagout Program is in place and strictly adhered to; and
- ensure that only authorized persons trained in LOTO procedures service and maintain machinery or equipment in all areas under their control.

1.3 Role of Facility Services Department:

Responsible for the maintenance and installation of all plant and facility related machinery and equipment and shall:

- provide the resources and direction necessary to ensure that an effective Lockout / Tagout Program is in place and strictly adhered to;
- ensure that only authorized persons trained in LOTO procedures, service and / or maintain machinery or equipment controlled by the Facility Services Department;
- provide approved LOTO equipment and hardware e.g. locks, tags multiple lock holders etc;
- ensure that all affected persons are notified when equipment and machinery is locked out;
- ensure that contractors or subcontractors follow the requirements of the lockout / tagout program; and
- keep and maintain records of training

5.3 Role of Supervisors:

The Responsible Supervisor shall ensure that:

- all equipment that may contain or produce an energy source or may start if energized, is locked out and/or tagged out prior to maintenance on that equipment;
- only authorized workers trained in LOTO procedures work on equipment or machinery that may contain or produce an energy source that could cause harm to personnel or equipment by transferring or generating electrical energy; hydraulic; pneumatic; gas or steam pressure; vacuum; high temperature; cryogenic temperature; or stored mechanical energy;
- specific LOTO procedures are drafted and implemented as required by this Program;
- the requirements of the LOTO Program are strictly enforced; and

- provide approved LOTO equipment and hardware e.g. locks, tags multiple lock holders etc.

5.4 **Role of Authorized Person:**

Persons authorized by their supervisor to maintain machinery or equipment shall:

- work in compliance with the University's LOTO program;
- ensure the security of their personal locking devices;
- follow documented lockout procedures; and
- ensure that all relevant information is shown on the Lockout Tag i.e. reason for lockout, date of lockout and name of authorized person, after hours contact if appropriate.

5.5 **Role of Contractor:**

- Companies and Individuals contracted to service and / or maintain machinery or equipment shall work in compliance with the University's LOTO Program.

5.6 **Role of Environmental & Occupational Health Support Services (EOHSS) and/or Faculty of Health Sciences Safety Office (FHS):**

EOHSS and/or FHSc Safety Office shall:

- in cooperation with Facility Services provide LOTO training for University employees;
- consult on specific LOTO procedures as required;
- review and update the LOTO program on a regular basis;
- assist in the implementation of the LOTO program in Research facilities as required.

5.7 **Joint Health and Safety Committee JHSC's**

The JHSC's shall:

- review and provide comment on the LOTO program and specific lockout procedures on a regular basis;

5.8 **Central Joint Health and Safety Committee (CJHSC):**

- The CJHSC shall review and make comment on the LOTO Program on a scheduled basis.

6 TRAINING

- 6.1 All persons who are required to maintain and / or service machinery or equipment shall be trained in LOTO procedures.

The training shall include but not be limited to:

- Responsibilities under the Lockout / Tagout Program (See LOTO Program Section 5. Responsibilities);
- Regulations respecting work on or near energized machinery and or equipment i.e. O Reg. Industrial Establishments, Sections 42, 43, 75, and 76 (See Appendix A);
- LOTO Equipment. (See Lock out / Tagout Program Section 7.1);
- Individual Controlled LOTO. (See Lockout / Tagout Program Section 7.2 Procedures for Individual Controlled LOTO);
- Centrally Controlled LOTO. (See Lock out / Tagout Program Section 7.3 Procedures for Centrally Controlled LOTO); and
- LOTO Procedural Guidelines (See Appendix B)

7 PROCEDURES

7.1 LOTO Equipment:

Departments involved in servicing and maintaining equipment shall provide and maintain LOTO equipment. Such equipment shall include but not be limited to the following:

- Standardized padlocks issued on an individual basis with the serial number being assigned and logged in the authorized employee's name. Padlocks should be colour coded to identify the trade group or related department;
- Padlocks will be assigned to authorized persons with the serial number being logged against that person's name;
- Waterproof Lockout Tags made from a non-conductive material to be provided to all authorized service persons who will ensure that when placed on locked out machinery or equipment is secured to the lock and states the reason for the lockout, date of lockout and name of person involved and after hours contact;
- Lockout Bars to accommodate multiple locks where more than one service person or trade group are involved; and
- A supply of lockout devices i.e. chains, blanks, plugs and blocks accessible in areas where such equipment will be required to isolate and achieve zero energy within the machinery and equipment being serviced e.g. Power Plant.

7.2 Individual Controlled LOTO Procedures:

Supervisors will provide a generic LOTO Standard Operating Procedure (SOP) for work by single individuals on specific machinery and equipment where the following criteria is met:

- the machinery and equipment is under the control of the individual conducting the work;
- the machinery or equipment has no potential for stored or residual energy or re-accumulation of stored energy;
- the machine or equipment has a single energy source that can readily be identified and isolated;
- the isolation, locking and tagging of that energy source will completely de-energize and deactivate the machinery or equipment;
- a single lockout device will achieve a locked out condition;
- one step verification that the energy source has been isolated can be achieved;
- the lockout device is under the exclusive control of the authorized person performing the maintenance; and
- the maintenance does not create potential hazards for other personnel.

NB. Individual Controlled LOTO SOPs can only be implemented in situations where all of the above conditions are met.

Individual Lockout Procedures:

Individual LOTO Procedures will include but not be limited to:

- identification of the supervisor responsible for the machinery and or equipment e.g. Area Service Managers, Power Plant Chief Engineer and Research Supervisors;
- the machinery and or equipment covered by the Individual Lockout Procedures;
- identification of the service groups covered by the Individual Lockout Procedures;
- a description of the procedural steps necessary to isolate the work area from the energy source on all such machinery and equipment;
- identification of the location of the lock and tag on all such equipment and machinery;
- instruction that the description of the work being conducted on the machinery or equipment must be clearly indicated on the Lockout Tag;
- a description of the steps required to verify that a zero energy state has been achieved in the work area; and
- the need to notify affected persons whose work may be affected by the shutdown of the machinery or equipment or who may work routinely in the area where the area where repair or service work is being performed.

7.3 Centrally Controlled LOTO Procedures (CCLP):

Supervisors will provide task specific Centrally Controlled LOTO Procedure for work on machinery and equipment which involves more than one energy source (e.g. electrical and hydraulic) and /or more than one service group (e.g. electrical and mechanical trades). The CCLP will include but not be limited to:

- identification of the supervisor responsible for the machinery and or equipment or their authorized designate e.g. Area Service Manager, Power Plant Chief Engineer or Research Supervisor;
- a description of the machinery and or equipment and its location;
- a description of the work to be carried out on the machinery and or equipment and the trade group(s) involved;
- a description of all potential energy sources and the potential for any stored or residual energy;
- a description of the steps necessary to dissipate any stored or residual energy;
- a description of the procedural steps necessary to isolate the work area from all sources of energy and hazardous materials;
- identification of the location for all locks and tags and any other energy isolation devices which may be required;
- direction that the Lockout Tag must be securely fixed beside the padlock and clearly indicate the reason for the lockout, the date of the lockout and the name of the authorized person and after hours contact;
- a description of the steps required to verify that a zero energy state has been achieved in the work area. **NB. on electrical systems over 700 Volts the system must be grounded;**
- the provision of multiple lockout bars and specific instructions for the placing and removal of padlocks and tags by authorized persons, with clear indication that the padlock(s) and tag (s) belonging to the responsible supervisor or his designate will be the first to be put in place and the last to be removed; and
- the notification of affected persons whose work may be affected by the shutdown of the machinery or equipment or who may routinely work in the area where repair or service work is being performed.

7.4 Special Procedures for Electrical Equipment / Systems / Conductors

The LOTO procedures noted in Sections 7.1 and 7.2, apply to work on electrical installations, equipment and conductors, however;

O Reg. 851 Section 42(3) (a) provides that Lockout is not required:

- a) if the conductors are adequately grounded with a visible grounding mechanism: or
- b) if the voltage is **less than 300 volts** and there is no locking device for the circuit breakers or fuses and procedures are in place adequate to ensure that the circuit is not inadvertently energized.

Specific Operating Procedures must be put in place for all situations meeting the above criteria. In addition to the procedure noted in Section 7.1 and 7.2 such procedures shall include but not be limited to:

- shutting off breaker and installing a breaker lockout adapter to accommodate the placement of a lock and tag; and
- shutting off breaker and removing load wire or wires from breaker or fuses and connecting to grounding system, applying LOTO warning tag to breaker.

8 RECORDS

To facilitate external audits by regulatory agencies e.g. Ministry of Labour copies of all Lockout Procedures must be retained for a minimum of three years by:

- The Department responsible for the Lockout / Tagout Procedures; and
- Environmental & Occupational Health Support Services/FHS Safety Office as appropriate

Appendix A

OHSA – Ontario Reg. Industrial Establishments Sections 42, 43, 44, 75, 76

- 42.** (1) The power supply to electrical installations, equipment or conductors shall be disconnected, locked out of service and tagged before any work is done, and while it is being done, on or near live exposed parts of the installations, equipment or conductors.
- (2) Before beginning the work, each worker shall determine if the requirements of subsection (1) have been complied with.
- (3) Locking out is not required,
- (a) if the conductors are adequately grounded with a visible grounding mechanism; or
 - (b) if the voltage is less than 300 volts and there is no locking device for the circuit breakers or fuses and procedures are in place adequate to ensure that the circuit is not inadvertently energized.
- (4) If locking out is not required for the reason set out in clause (3)(b), the employer shall ensure that the procedures required by that clause are carried out.
- (5) If more than one worker is involved in the work referred to in subsection (1), the worker who disconnected and locked out the power supply shall communicate the purpose and status of the disconnecting and locking out.
- (6) If a tag is used as a means of communication, the tag,
- (a) shall be made of non-conducting material;
 - (b) shall be secured to prevent its inadvertent removal;
 - (c) shall be placed in a conspicuous location;
 - (d) shall state the reason the switch is disconnected and locked out;
 - (e) shall show the name of the worker who disconnected and locked out the switch; and
 - (f) shall show the date on which the switch was disconnected and locked out.
- (7) The employer shall establish and implement written procedures for compliance with this section. O. Reg. 630/94, s. 1.
- 42.1** (1) This section applies and section 42 does not apply if it is not practical to disconnect electrical installations, equipment or conductors from the power supply before working on, or near, live exposed parts of the installations, equipment or conductors.
- (2) The worker shall use rubber gloves, mats, shields and other protective equipment and procedures adequate to ensure protection from electrical shock and burns while performing the work.

- (3) If the installation, equipment or conductor is operating at a nominal voltage of 300 volts or more, a suitably equipped competent person who is able to recognize the hazards and perform rescue operations, including artificial respiration, shall be available and able to see the worker who is performing the work.
- (4) Subsection (3) does not apply to equipment testing and trouble-shooting operations. O. Reg. 630/94, s. 1.
- 42.2** Work performed on electrical transmission systems or outdoor distribution systems rated at more than 750 volts shall be performed in accordance with,
 - (a) the *Rule Book, Electric Utility Operations* published in 1990 by the Electrical Utilities Association of Ontario, Incorporated; or
 - (b) the *Ontario Hydro Corporate Safety Rules and Policies*, dated 1994. O. Reg. 630/94, s. 1; O. Reg. 144/99, s. 3.
- 43.** Tools and other equipment that are capable of conducting electricity and endangering the safety of any worker shall not be used in such proximity to any live electrical installation or equipment that they might make electrical contact with the live conductor. R.R.O. 1990, Reg. 851, s. 43.
- 44.** (1) Cord-connected electrical equipment and tools shall have a casing that is adequately grounded.
 - (2) Subsection (1) does not apply to cord-connected electrical equipment or tools that are adequately double-insulated and whose insulated casing shows no evidence of cracks or defects.
 - (3) Subsection (1) does not apply to a portable electrical generator in which the equipment is not exposed to an external electric power source if the casings of portable electrical tools connected to the generator are bonded to a non-current-carrying part of the generator. O. Reg. 630/94, s. 2.
- 44.1** When used outdoors or in wet locations, portable electrical tools shall be protected by a ground fault circuit interrupter installed at the receptacle or on the circuit at the panel. O. Reg. 630/94, s. 2.
- 44.2** A ground fault that may pose a hazard shall be investigated and removed without delay. O. Reg. 630/94, s. 2.
- 75.** A part of a machine, transmission machinery, device or thing shall be cleaned, oiled, adjusted, repaired or have maintenance work performed on it only when,
 - (a) motion that may endanger a worker has stopped; and
 - (b) any part that has been stopped and that may subsequently move and endanger a worker has been blocked to prevent its movement. R.R.O. 1990, Reg. 851, s. 75.
- 76.** Where the starting of a machine, transmission machinery, device or thing may endanger the safety of a worker,
 - (a) control switches or other control mechanisms shall be locked out; and
 - (b) other effective precautions necessary to prevent any starting shall be taken. R.R.O. 1990, Reg. 851, s. 76; O. Reg. 230/95, s. 1.

Appendix B

LOTO Procedural Guidelines

- *Assess type of lockout required and ensure that written procedures are in place:*
 - i. *Individual Controlled (LOTO Program Section. 7.2)*
 - ii. *Centrally Controlled (LOTO Program Section. 7.3)*
- *Assess type of lockout equipment required to control accidental release of energy and hazardous materials: Padlocks, tags, lockout, bars, chains, blocks, blanks etc;*
- *Inform other people affected by the shutdown of the equipment or machinery;*
- *Assess and identify all energy sources to and from the machinery, equipment or pressure systems;*
- *Identify the shutdown procedures necessary to achieve a zero energy state;*
- *Isolate all energy sources. e.g., electrical and mechanical energy, pneumatic, hydraulic, steam or gas pressure, vacuum, cryogenic gases and gravity;*
- *Use padlocks, lockout bars, chains, blocks and blanks as necessary to isolate energy sources;*
- *Take steps necessary to dissipate any stored energy. e.g. compressed air, hydraulic pressure, electrical and mechanical energy;*
- *Verify that all energy sources have been isolated;*
- *Ensure that persons authorized to work on the machinery, equipment or pressure system, apply a Lockout and Tagout to all energy isolating devices and retain possession of the key;*
- *Information on Tags shall identify the date, machine, equipment or pressure system being serviced, authorized persons name and supervisor's name;*
- *Identify the sequence of steps to be taken by authorized persons to remove the padlocks and tags and re-energize the machinery, equipment or pressure system after service has been completed; and*
- *Notify affected persons that the machine, equipment or pressure system has been returned to service.*

Appendix C

**LOCKED
OUT**

THIS DEVICE IS
LOCKED OUT TO
PROTECT THOSE
WORKING ON A PIECE
OF EQUIPMENT.

**DO NOT
REMOVE**

UN-AUTHORIZED
REMOVAL OF THIS
LOCK COULD
SERIOUSLY INJURE OR
KILL THOSE
WORKING ON THE
EQUIPMENT.

SEE OVER FOR CONTACT INFO...

NAME OF INDIVIDUAL
WITH KEY TO THIS LOCK:

DATE LOCK INSTALLED:

WORK REQUEST #:

TITLE/DESCRIPTION OF
WORK BEING DONE:

CONTACT NUMBER
EXT: _____

SUPERVISOR'S
EXT: _____

ALTERNATE CONTACT:
FACILITY SERVICES EXT: 24740
AND REFER TO THE ABOVE
NOTED WORK REQUEST #

**AFTER HOURS OR WEEKENDS
CONTACT SECURITY AT
EXT: 24281**