



UNIVERSITY OF TORONTO

Lockout/Tagout Standard:

In University workplaces, the various forms of energy associated with machinery and equipment have the potential for causing severe injuries, including electrocution, burns, chemical exposures, cuts, bruises, crushing, amputation or death. To protect workers from the hazards associated with the inadvertent or accidental start-up of such machinery and equipment during servicing, maintenance or other activities, specific lockout/tagout procedures to control potentially harmful energy sources must be implemented. This standard is based on the American National Standards Institute (ANSI) Standard Z244.1-2003 "Control of Hazardous Energy Lockout Tagout and Alternative Methods", the Canadian Standards Association (CSA) Standard Z460-05, "Control of Hazardous Energy - Lockout and other Methods", and the Ontario Ministry of Labour Engineering Data Sheet No. 9-02 "Lock-Out Procedure for Machinery (Rev. 1990)."

SCOPE:

Any situation which may expose a worker to the hazards of unexpected energization, start-up or release of stored energy of a machine, equipment, device or process at the University of Toronto.

Note: In this standard, "worker" includes faculty, staff, contractors, students and visitors.

RESPONSIBILITIES:

Principal investigators, supervisors and all others in authority shall:

- Identify situations where lockout/tagout procedures are required to isolate energy sources when work is being conducted on machinery or equipment;
- Develop, document, and implement appropriate measures to isolate and lock/tag out; potentially harmful energy sources on machinery and equipment by using this standard or in conjunction with the Office of Environmental Health and Safety;
- Develop and maintain written lockout/tagout procedures that are machine or equipment-specific by reviewing drawings and technical maintenance manuals;
- Provide and maintain necessary equipment, tools and materials for lockout and tagout procedures, including padlocks, tags, signs, chains or seals;
- Ensure that workers authorized to conduct service or maintenance work on machinery and equipment receive appropriate training in lockout/tagout procedures;
- Ensure that other affected workers are informed that attempts to use, restart, or re-energize machines or equipment that are locked or tagged out are prohibited;
- Ensure, by regular inspection, that appropriate lockout/tagout procedures have been implemented by authorized workers to isolate and lock out energy sources prior to service or maintenance work; and
- Conduct periodic reviews of lockout/tagout procedures to ensure that they are appropriate to the processes and machinery/equipment involved.

Workers shall:

- Work in accordance with established lockout/tagout procedures for machinery and equipment;
- Not attempt to use, start or energize machinery or equipment that is locked or tagged out; and
- Bring to the attention of their supervisor any new conditions that may negatively impact the process.

LOCKOUT/TAGOUT PROCEDURES

The unexpected energization, start-up or release of stored energy during operation, servicing or maintenance work (e.g. inspection, repair, adjustment, cleaning), on machinery or equipment can lead to serious worker injuries. To prevent accidental release or transmission of energy, appropriate procedures must be implemented to deactivate the specific machine or equipment, to isolate it from its energy source, and to lock and tag out the energy isolating device (e.g. breaker, switch, valve, blocks, disconnect switch).

Supervisors must conduct an assessment of the machine or equipment and all associated energy sources (i.e. electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other) in order to determine the appropriate lockout/tagout procedures.

Appendix A summarizes general lockout guidelines for a range of energy forms and sources.

Requirements for Lockout/Tagout Procedures

Written lockout/tagout procedures specific to a particular machine or equipment, or to a similar grouping of machines or equipment, must outline the situations in which they are to be used, and the sequence in which they are to be used.

Lockout/tagout procedures shall clearly define the specific actions and responsibilities required during each of the following energy control sequences:

- 1) Preparation for shutdown
- 2) Equipment shutdown
- 3) Equipment isolation from the energy source
- 4) Application of lockout/tagout devices
- 5) Release of stored energy, de-energization
- 6) Verification of isolation
- 7) Release from lockout/tagout control once work is completed, including removal of lockout/tagout devices and restoration of energy to machinery/equipment.

Lockout and Tagout Devices

A combination of a lockout device and a tagout device shall be used for all lockable energy isolating devices. The lockout device (e.g. padlock) physically prevents the energizing of the machine or equipment. The tagout device (tag, sign) provides information about the nature of the lockout and warns workers to not operate the particular machine/equipment/device. A tagout device is also used when an energy isolating device is not lockable, along with additional protective measures to ensure maximum worker protection.

Each worker involved in service or maintenance work must apply his/her own assigned personal lock, and carry his/her own key. Combination type locks or locks with master or duplicate keys must not be used.

Lockout and tagout devices must be:

- durable for the environment in which they will be used;
- sturdy enough to minimize early or accidental removal;
- unique, distinctive, easily recognizable and clearly visible;
- standardized as to color, shape, size, type or format; and
- identifiable as to the worker(s) authorizing or applying them.

In addition, warning tags must:

- be made of non-conducting material;
- state the reason for energy isolation and lockout; and
- show the date on which the lockout was conducted.

Appendix A

GENERAL LOCKOUT GUIDELINES ACCORDING TO ENERGY FORMS AND SOURCES*

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"> • Shut 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.
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 fluid and blank lines as necessary.
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.

* adapted from "A Health and Safety Guideline for your Workplace," Industrial Accident Prevention Association, 2000