

## Lockout

### What is Lockout?

“Lockout” means to physically neutralize all energies in a piece of equipment before beginning any maintenance or repair work. Lockouts generally involve:

- ▶ stopping all energy flows (for example, by turning off switches, or valves on supply lines)
- ▶ locking switches and valves
- ▶ securing the machine, device, or power transmission line in a de-energized state (for example, by applying blocks or blanks, or bleeding hydraulic or pneumatic pressure from lines)

### Why is a Lockout Necessary?

If a lockout is not performed, uncontrolled energies could cause:

- ▶ electrocution (contact with live circuits)
- ▶ cuts, bruises, crushing, amputations, death, resulting from:
  - entanglement with belts, chains, conveyors, rollers, shafts, impellers
  - entrapment by bulk materials from bins silos or hoppers
  - drowning in liquids in vats or tanks
- ▶ burns (contact with hot parts, materials, or equipment such as furnaces)
- ▶ fires and explosions
- ▶ chemical exposures (gases or liquids released from pipelines)

Often power sources are inadvertently turned on, or valves opened mistakenly before the work is completed, resulting in serious injuries and fatalities. Therefore, it is important not only to ensure that all energies are properly locked out, but also that they remain locked out until the work is completed.

### How is a Lockout Done?

For lockouts to be effective, a clear, well-defined lockout policy supported by administrative and control procedures, and proper training, is essential. A systematic approach would be to:

- ▶ develop a lockout policy
- ▶ identify lockout situations
- ▶ develop procedures
- ▶ train workers
- ▶ enforce and update your policy

### Develop a Lockout Policy

Your written lockout policy should make reference to your company’s general occupational health and safety policy. It should clearly outline responsibilities, and refer to procedures to be followed. It should state your company’s intent to protect all employees by:

- ▶ identifying all activities and machines, equipment, and processes which require lockouts (for example, repairs, maintenance, and cleaning of pipelines, tanks, and machines);

- ▶ making the appropriate persons responsible for lockouts
- ▶ ensuring that lockouts are performed by authorized persons only
- ▶ developing procedures for each specific lockout situation
- ▶ training those who will perform lockouts
- ▶ verifying the effectiveness of such training
- ▶ reviewing, updating, and enforcing the lockout policy

### Identify Lockout Situations

Assess all processes, machinery, energies, and work activities to identify where and when lockouts are needed. Maintenance work will probably be the major focus of lockout needs. A useful source of information may be workplace inspections, and recommendations from your joint health and safety committee or health and safety representative.

List every machine, devise, or process that will require a lockout. Against each, list the energy forms involved. Different energy forms will require different procedures. More than one lockout may be required for a single machine or system.

## Responsibilities

### Safety Coordinator

- ▶ Train all staff in lock out procedures and maintain records of this training
- ▶ Receive reports of locks being cut or removed because of lost keys, etc. and report to the General Manager any recommendations as needed

### Supervisor

- ▶ Ensure that lockout procedures are understood and followed by all employees as required
- ▶ Co-ordinate work beyond shift with other supervisors as appropriate

### Equipment Operator

- ▶ When assigned to operate equipment that had been locked out for any reason, review the condition of that equipment to ensure that all guards are in place and that the equipment is ready to begin operations
- ▶ If equipment is unsafe, report the condition to your supervisor. If you must leave the equipment to make this report and there is a possibility that someone else may operate it, lock the equipment out with your operator lock and tag before leaving the equipment

### Person Installing Lock

- ▶ Recognize that lock out is needed. If in doubt, ask your supervisor. Ensure that all energy sources are locked out and that ram blocks, etc., are used
- ▶ Attach the lock using the required attachments as appropriate. Test operating controls to see that the lock out has been effective
- ▶ Attach a tag to the lock or to equipment as required
- ▶ Remove lock and tag when your work is finished

### Develop Procedures

Procedures should be in writing and communicated to all employees and departments. Administrative procedures for lockouts in general should include the following:

- ▶ supervisors to be notified of lockouts in their areas
- ▶ all lockouts to be authorized by a work permit
- ▶ lockout to stay in effect if work is not completed at the end of the shift
- ▶ completed work to be reported to the person in charge for signing off the work permit

Control procedures involve developing separate, detailed, written lockout procedures for each identified machine, device or process that may require to be locked out at some time. The procedure should identify:

- ▶ the person responsible for performing the lockout (for example, operator, millwright, electrician)
- ▶ the person responsible for ensuring that the lockout is properly performed (for example, maintenance supervisor and/or site supervisor)
- ▶ the energy sources to be controlled by the lockout
- ▶ the location of control panels, power sources (including electrical power boxes), switches, interlocks, valves, blocking points, relief valves and/or blanking and bleeding points (review schematics)
- ▶ special hazards (for example, a flywheel that spins for minutes after power is removed, electrical capacitors)
- ▶ the personal protective equipment that must be used or worn (for example, eye protection, electrically insulated foot protection)
- ▶ the step by step lockout procedure (that is, who does what, and when)
- ▶ the testing procedure to ensure that all energy sources are controlled
- ▶ the step by step procedure for removing the lockout

## Electrical Lockout

- ▶ Shut down machine using normal operational shutdown procedure and controls. This should be done by, or in consultation with the machine operator.
- ▶ After ensuring that the machinery has been completely shut down, and all controls in the “off” position, open the main disconnect switch located in the field. Some AC or DC drive units are located in a switch room, normally operated by electricians. In the case of DC drive units, a motor blower switch and a field switch must

also be switched off which are located inside of the cabinet. If training has been conducted to allow other persons to operate this switchgear, a record should be made of the training duration and dates. If racking out is required in a MCC, a qualified electrician must be contacted. If fuses are to be removed, qualified personnel must use fuse pullers due to the proximity of the bus bar that is still energized. **Removal of fuses only does not constitute a lockout**

***Caution:** Remember when disconnecting switches stand clear of the box, to one side, and face away while operating the switch with your left hand. This is to minimize risk of injury should the switch explode due to arcing. When opening the main disconnect, a quick step to the right should be taken, as the knives disengage or when closing the main disconnect, the knives engage.*

*If the machine is of a different configuration with the disconnect switch on the opposite side, reverse your position and use your right hand to operate the switch. Any difficulties should be reported to supervision.*

- ▶ Using your own personal padlock, or one assigned by your supervisor, lock the disconnect switch in the off position. Do not lock only the box. Remove the key and retain. Complete a lockout tag and affix to the disconnect switch. Each person working on the equipment must follow this step. The lock of the person doing the work or in charge must be installed first, remain throughout and be removed last
- ▶ Test the main disconnect switch and make sure it cannot be moved to the “on” position
- ▶ Try to turn start the machine using the normal operation controls and point of operation switches to make sure that the power has been disconnected

***Note:** In some instances, there may be more than one power source feeding equipment and steps must be taken to ensure that all sources are effectively locked out.*

- ▶ Other sources of energy that could create a hazard while working on the equipment must also be de-energized and appropriately “locked-out”
 

This can include flywheels, gravity, springs, capacitors, compressed air, hydraulics, steam and other pressurized or hazardous liquids and gases (see figure 1)
- ▶ When the work is completed, prior to removing the last lock, make sure the operational controls are in the “off” position so that the main disconnect switching is done under “no load”. Ensure all blocks, tools and other foreign materials are removed from machine. Also ensure that all personnel that may be affected are informed that the lock(s) will be removed
- ▶ Remove lock and tag, and close the main disconnect switch if permission has been given
- ▶ When the work has not been completed on the first shift, the next operator should install a personal lock and tag before the first operator removes the original lock and tag. If the next operator is delayed, a lock and tag could be installed by the next supervisor. Lockout procedures should indicate how the transfer is to be conducted

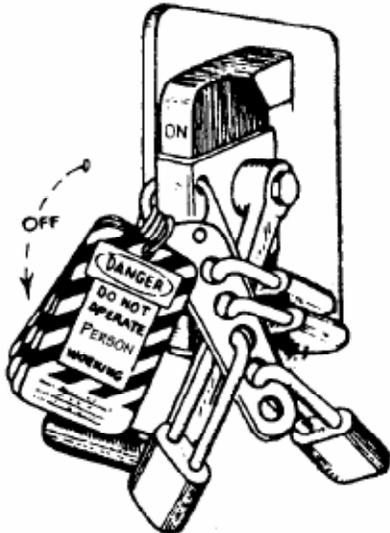
**Figure 1**  
**Energy forms, energy sources, and general lockout guidelines**

Energy Form	Energy Source	General Lockout Guideline
<b>Electrical Energy</b>	power transmission lines; machine power cords; motors; solenoids; capacitors (stored electrical energy)	turn off power at machine first (i.e., at point of operation switch), and then at the main disconnect switch for the 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.
<b>Hydraulic Energy</b>	hydraulic systems (e.g., hydraulic presses, rams, cylinders, hammers)	shut off, lock (with chains, built-in lockout devices, or lockout attachments) and tag valves; bleed off and blank lines as necessary.
<b>Pneumatic Energy</b>	pneumatic systems (e.g., lines, pressure reservoirs, accumulators, air surge tanks, rams, cylinders)	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.
<b>Kinetic Energy</b> (energy of a moving object or materials moving object may be powered or coasting)	blades; flywheels; materials in supply lines of bins or silos	stop and block machine parts (e.g., stop flywheels 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; blank as required.
<b>Potential Energy</b> (stored energy that an object has the potential to release due to its position)	springs (e.g., in air brake cylinders); actuators; counterweights; raised loads; top or movable part of a press or lifting device	if possible, lower all suspended parts and loads to the lowest (rest) position, block parts that might be moved by gravity; release or block spring energy.
<b>Thermal Energy</b>	supply lines; storage tanks and vessels	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.

## Locks

It is important that, for their personal protection, each worker and/or foreperson working in or on a machine places his/her own safety lock on the disconnect switch. Use tags to spotlight work in progress and give details of work being done (see figure 2). Only when the work is completed and the work permit signed off, may each worker remove his/her lock. The last lock to be removed should be that of the person supervising the lockout and this responsibility should not be delegated.

**Figure 2**  
**A locked out and tagged disconnect switch**



## Communication

The existence of this procedure will be communicated to all employees through orientation.

### Train Your Workers

All workers performing lockouts and their supervisors must receive training. The training should address:

- ▶ importance of lockouts
- ▶ legal requirements for lockouts
- ▶ company policy on lockouts
- ▶ the energy forms, hazards and procedures (administrative and work-related) that must be followed
- ▶ the importance of following procedures
- ▶ lockout errors to be avoided (for example, assuming the equipment is inoperable or that the job is too small to warrant a lockout)
- ▶ the use and care of personal protective equipment
- ▶ proper use of all tools

Test employees by having them perform mock lockouts. Provide refresher training at least quarterly.

### Enforce and Update Your Lockout Policy

Identify persons responsible for ensuring lockouts are properly followed and hold them accountable. The best way to do this is to include this in their job descriptions.

Review lockout procedures periodically (semi-annually) and revise them in light of any problems that may have been identified. When you change a process or equipment, lockout requirements may also change. Review and revise your lockout procedures whenever changes are made.

## Legislation

The following sections of the Regulations for Industrial Establishments (R.R.O. 851/90) deals with lockouts:

- ▶ s. 32: tumbling mills/dryers
- ▶ s. 42: power supply
- ▶ s. 50: silos, bins, hoppers
- ▶ ss. 68-71: confined spaces
- ▶ ss. 75-76: machinery
- ▶ s. 78: drums, tanks, pipelines

## References

Ministry of Labour Engineering Data Sheet 9-02: Lockout Procedure for Machinery.

To obtain a copy of this data sheet, contact the Ontario Ministry of Labour at (416) 326-7731 or toll-free 1 (800) 268-8013.

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Revised: May 2007

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