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## LOCKOUT

### What is Lockout?

‘Lockout’ means placing a lock or locks at energy-isolating devices with the intent of controlling all hazardous energies associated with a piece of equipment. Lockout generally includes:

- Isolating or stopping all energy flows using an energy isolating device (for example, by turning off an electrical disconnect or closing a valve on a compressed air supply line)
- Locking in a safe position to prevent accidental activation during maintenance
- Securing a zero energy, de-energized state (for example, by applying blocks or blanks, or bleeding hydraulic or pneumatic pressure from lines)
- Verification of the zero energy state

### Why is Controlling Hazardous Energy with Lockout Necessary?

If a lockout is not performed, uncontrolled hazardous energies can lead to:

- Electrocution (contact with energized parts)
- 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 (resulting from arc flash, contact with hot parts, materials or equipment)
- Fires and explosions
- Chemical exposures (gases or liquids released from pipelines)

Often, when energy sources are inadvertently turned on, or valves are opened mistakenly before the work is completed, the result can be serious injuries and fatalities. Therefore, it is important not only to ensure that all hazardous energies are properly controlled, but also that they remain locked out until the work is completed.

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### How is a Lockout Conducted?

For lockout to be effective, a clear, well-defined lockout program supported by a documented lockout procedure, proper training and supervision, is essential. A systematic approach should include:

- Development of a lockout policy
- Identification of lockout situations
- Development of procedures
- Worker training
- Appropriate supervision

### Develop a Lockout Program

Your program should make reference to your company's general occupational health and safety policy. It should clearly outline responsibilities, the applicable legislation and refer the procedures that should 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)
- 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 and work activities to identify where and when lockouts are needed to control hazardous energy. Maintenance work will likely be the major focus of lockout needs, as indicated in section 74, "Lockout is usually required for cleaning, adjustments or repairs and is often associated with maintenance work." A useful source of information may be workplace inspections and recommendations from your joint health and safety committee or health and safety representative.

Identify the tasks, the hazards and evaluate the risk. Against each task, list the energy forms involved. Lockout is a common way to reduce the risk associated with maintenance activities. Different energy forms will require different procedures. More than one lockout may be required for a single machine or system.

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### Responsibilities

#### Safety Coordinator

- Identify authorized workers who should receive detailed training
- Other workers, who may only be affected by lockout, should receive awareness training
- Maintain records of training for all workers
- The Safety Coordinator should also participate in the development of the lockout program and procedures
- Receive reports of locks being cut or removed because of lost keys, etc. and report any recommendations to the employer

#### Supervisor

- Ensure that lockout procedures are understood and followed by all employees
- Co-ordinate transfer of lockout control with other supervisors as appropriate
- Participate in the development and validation of lockout program and procedures

#### 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.

#### Person Installing Lock

- Recognize that lockout is needed. If in doubt, ask your supervisor. Ensure that all hazardous energy sources are locked out and that safety blocks, as required, are used
- Attach and remove the lockout devices according to the company lockout program
- Support development and validation of lockout procedures
- Report any problems or deficiencies that could impact safety to your supervisor

### Develop Procedures

Procedures must be in writing and communicated to all employees. Administrative procedures for lockout practices in general should include the following:

- Supervisors to be notified of lockouts in their areas
- Lockout to stay in effect if work is not completed at the end of the shift

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Control procedures should involve the development of equipment-specific, written lockout procedures (placards) for each identified machine, device or process that may require hazardous energy control. The procedures should identify:

- The person(s) 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 isolation points (example, control panels, valves, blocking points, relief valves and/or blanking and bleeding points). A review of up-to-date schematics may be required to confirm the location of these devices
- Special considerations (for example, a flywheel that coasts for several minutes after power is removed or an electrical charge stored at capacitors)
- The personal protective equipment that must be used or worn (for example, eye protection, electrically insulated foot protection)
- The work order, if any, for the application of energy control devices
- The testing procedure to ensure that all energy sources are controlled (including possible stored energy)
- The step-by-step procedure for removing the lockout once work is complete

### Electrical Energy Lockout Example

- Review lockout placard for the equipment. Ensure all shutdown steps and means to control hazardous energy are understood. Advise other people in the area that the equipment will be shut down and locked out
- Shut down the machine using normal operational shutdown procedure and controls. This should be done by, or in consultation with, the machine operator
- Move the electrical isolation device to the 'off' position  
**Caution:** Equipment should be properly installed and maintained. If you become aware of strange sounds or smells at or near electrical equipment, immediately contact your supervisor or licensed electrician.
- Using your own personal lock, or one assigned by your supervisor, lock the electrical isolation device in the off position. Remove the key from your lock and maintain control of the key. Complete a lockout tag and attach to your lock. Each person working on the equipment must lock it out. The lock of the person in charge of the work should be installed first, remain in place throughout the task and be the last lock to be removed

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- Try to move the electrical isolation device to make sure it cannot be moved to the 'ON' position with your lock in place
- Emergency stop and interlocking devices can prevent equipment from starting. Ensure emergency stop buttons are reset and any interlocked doors are closed before testing the equipment. Try to start the machine using the normal operation controls to make sure that the equipment does not operate  
**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 hazardous energy that could endanger a person while working on the equipment must also be de-energized and appropriately secured. 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 electrical switching is done under 'no load'. Ensure all blocks, tools and other foreign materials are removed from machine. Coordinate with other people that may have been working in the same area in which energy will be restored. Ensure all personnel that were affected by the lockout are aware that the lock(s) will be removed and energy will be restored to the equipment
- When it is safe to do so, remove lock and tag, and restore energy to the equipment
- When the work has not been completed the incoming worker should install a personal lock and tag before the first worker removes their lock and tag. If the next worker is delayed, a lock and tag could be installed by a supervisor to control the equipment until the next authorized worker arrives. Lockout procedures should indicate how the transfer is to be conducted

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**Figure 1**

### Energy forms, energy sources, and general lockout guidelines

| Energy Form       | Energy Source   | General Lockout Guideline  |
|-------------------|---|--|
| Electrical Energy | <ul style="list-style-type: none"> <li>▪ Power transmission lines</li> <li>▪ Machine power cords</li> <li>▪ Motors</li> <li>▪ Solenoids</li> <li>▪ Capacitors (stored electrical energy)</li> </ul> | <ul style="list-style-type: none"> <li>▪ Shut down the machine using acceptable procedures. Isolate the hazardous energy – depending on the task to be completed this might be a local control or a main disconnect</li> <li>▪ Lock and tag the isolation point</li> <li>▪ Be aware of any residual or stored energy. Ensure you understand how to control stored electrical energy according to manufacturer’s instructions. Only do so if you have the correct tools and training</li> </ul> |
| Hydraulic Energy  | <ul style="list-style-type: none"> <li>▪ Hydraulic systems (e.g. hydraulic presses, rams, cylinders hammers)</li> </ul>   | <ul style="list-style-type: none"> <li>▪ Shut off system in accordance with manufacturer’s instructions</li> <li>▪ Bleed off and blank lines as necessary</li> <li>▪ Lock and tag (with chains – if needed to secure valve in a safe position, built-in lockout devices, or lockout attachments for valves), block any possible movement of machinery</li> </ul>   |
| Pneumatic Energy  | <ul style="list-style-type: none"> <li>▪ Pneumatic systems (e.g., lines, pressure reservoirs, accumulators, air surge tanks, rams, cylinders)</li> </ul>  | <ul style="list-style-type: none"> <li>▪ Shut off system in accordance with manufacturer’s instructions</li> <li>▪ Bleed off excess air; if pressure cannot be relieved, block any possible movement of machinery</li> <li>▪ Lock and tag (with chains – if needed to secure valve in a safe position, built-in lockout devices, or lockout attachments for valves). Block any possible movement of machinery</li> </ul>   |

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| Energy Form   | Energy Source  | General Lockout Guideline   |
|---|--|---|
| Kinetic Energy<br>(energy of a moving object or materials moving; an object may be powered or coasting) | <ul style="list-style-type: none"> <li>Rotating Blades</li> <li>Flywheels</li> <li>Materials in supply lines or bins or silos</li> </ul> | <ul style="list-style-type: none"> <li>Isolate all energies that can create equipment motion</li> <li>Ensure that all motions are stopped</li> <li>Block material from moving into area of work</li> </ul>  |
| Potential Energy<br>(stored energy that an object has the potential to release due to its position)     | <ul style="list-style-type: none"> <li>Springs</li> <li>Actuators</li> <li>Counterweights</li> <li>Raised loads</li> </ul>               | <ul style="list-style-type: none"> <li>If possible, lower all suspended parts and loads to the lowest position</li> <li>Block parts that might move due to gravity</li> <li>Release or block spring energy</li> </ul>   |
| Thermal Energy  | <ul style="list-style-type: none"> <li>Supply lines</li> <li>Storage tanks and vessels</li> </ul>  | <ul style="list-style-type: none"> <li>Lock and tag (with chains – if needed to secure valve in a safe position, built-in lockout devices, or lockout attachments for valves), block any possible movement of machinery</li> <li>Bleed off excess liquids or gases. Blank lines as necessary</li> </ul> |

### Locks

For personal protection, it is important that each person working on a machine places their personal lock to secure the energy isolating devices. The use of an information tag is a means of communication and should provide details of work being done (see figure 2). Only when the work is completed, may each worker remove his/her lock. Note: A work permit may not be used at all workplaces, so follow the employer's lockout policy on completed work

**Figure 2**

#### A locked out and tagged disconnect switch



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### Communication

The lockout program should be communicated to all employees through orientation. Training should be suitable for the responsibilities expected of individual.

### 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

Verification of knowledge and routine audits should be performed and will provide guidance for refresher training.

### Enforce and Update Your Lockout Policy

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

Review lockout procedures on a regular basis. The results of inspections, new equipment or technology can also be used to initiate a review of lockout practices.

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### Legislation

The following sections of the *Regulations for Industrial Establishments (R.R.O. 851/90)* deal with lockout:

- s.32: tumbling mills/dryers
- s.42: electrical power supply
- s.50: silos, bins, hoppers
- s.74– 76: machinery
- s.78: drums, tanks, pipelines
- O.Reg 632 Confined Spaces

### References

- Canadian Standards Association, CAN/CSA Z460: Control of Hazardous Energy – Lockout and Other Methods

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