Lockout

WorkSafeBC

WORKING TO MAKE A DIFFERENCE

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Workers' Compensation Board of B.C.

About WorkSafeBC

WorkSafeBC (the Workers' Compensation Board) is an independent provincial statutory agency governed by a Board of Directors. It is funded by insurance premiums paid by registered employers and by investment returns. In administering the *Workers Compensation Act*, WorkSafeBC remains separate and distinct from government; however, it is accountable to the public through government in its role of protecting and maintaining the overall well-being of the workers' compensation system.

WorkSafeBC was born out of a compromise between B.C.'s workers and employers in 1917 where workers gave up the right to sue their employers or fellow workers for injuries on the job in return for a no-fault insurance program fully paid for by employers. WorkSafeBC is committed to a safe and healthy workplace, and to providing return-to-work rehabilitation and legislated compensation benefits to workers injured as a result of their employment.

WorkSafeBC Prevention Information Line

The WorkSafeBC Prevention Information Line can answer your questions about workplace health and safety, worker and employer responsibilities, and reporting a workplace accident or incident. The Prevention Information Line accepts anonymous calls.

Phone 604 276-3100 in the Lower Mainland, or call 1 888 621-7233 (621-SAFE) toll-free in British Columbia.

To report after-hours and weekend accidents and emergencies, call 604 273-7711 in the Lower Mainland, or call 1 866 922-4357 (WCB-HELP) toll-free in British Columbia.

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WorkSafeBC Publications

Many publications are available on the WorkSafeBC web site. The Occupational Health and Safety Regulation and associated policies and guidelines, as well as excerpts and summaries of the *Workers Compensation Act*, are also available on the web site: <www.worksafebc.com>

Some publications are also available for purchase in print:

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Contents

What's inside

This booklet explains the requirements of WorkSafeBC (Workers' Compensation Board of B.C.) for de-energization and lockout. It discusses:

- The importance of locking out machinery and equipment
- The dangers of hazardous energy
- When lockout is required
- Basic and group lockout procedures
- Employer and worker responsibilities for safe lockout

Why lockout is important

Every year, workers in British Columbia are killed or seriously injured because machinery or equipment was not properly locked out. For example, accidents where workers are caught in machinery can result in severed fingers, crushed limbs, or death. These accidents can be prevented if machinery is locked out properly before obstructions are cleared or other maintenance work is done. Electrical shock, burns, and electrocution can also result if electrical equipment is not properly locked out.

WorkSafeBC takes lockout seriously. Employers who fail to implement and follow lockout requirements will face penalties, including fines.

Who should use this guide

Employers and supervisors should use this guide to:

- Establish their required lockout procedures
- Train workers in lockout
- Become familiar with the Occupational Health and Safety Regulation, Part 10: De-energization and Lockout

Workers should use this guide *only* as a supplement to WorkSafeBC requirements and company lockout procedures. Workers must follow their company's established lockout procedures and the lockout requirements of the Occupational Health and Safety Regulation at all times.

For easy reference, the Occupational Health and Safety Regulation, Part 10: De-energization and Lockout is reproduced on pages 34 to 38.

Follow lockout procedures before maintenance work begins.

1 Introduction to lockout

1. Introduction to lockout

What is lockout?

Lockout is the use of a lock or locks to render machinery or equipment inoperable or to isolate an energy source. The purpose of lockout is to prevent an energy-isolating device (such as a switch, circuit breaker, or valve) from accidentally or inadvertently being operated while workers are performing maintenance on machinery or equipment. Lockout makes sure machinery or equipment won't start and injure a worker.

Before you lock out any equipment or machine, you must remove the energy from it. This is known as "de-energization." For example, you might shut off the machine and unplug it, or you might use a disconnect switch before you apply a lock to prevent the machine from being started up accidentally.

Generally, you need to de-energize and lock out machinery and equipment before performing maintenance. Maintenance is any work performed to keep machinery or equipment in a safe operating condition. This includes installing, repairing, cleaning, and lubricating the equipment, as well as clearing obstructions to the normal flow of material. See page 10 for more details on how to assess when lockout is required.

Energy-isolating devices

This booklet and the Occupational Health and Safety Regulation use the term "energy-isolating device." This is a device that physically prevents the transmission or release of an energy source to machinery or equipment. Typical energy-isolating devices include switches, circuit breakers, and valves. When doing maintenance work on electrically controlled equipment, workers should be aware that stop buttons on control circuits and programmable logic controllers (PLCs) cannot be used as energy-isolating devices. During lockout, the main power source for the machinery or equipment must be disconnected and locked out at all times.

Some examples of energy-isolating devices are a disconnect switch (top), a circuit breaker (centre), and a valve (bottom).

Hazard alert

A worker noticed that the chains had dropped off the double idler sprocket at the bottom of the sawmill unscrambler. He turned the power off but did not lock out the power source. He then started to put the chains back on the sprocket.

Meanwhile, another worker noticed that the unscrambler was not running and turned the power back on. The machinery started up and caught the worker between the chain crossbar and the incline deck. He died from the crushing injuries he suffered. A routine lockout procedure could have prevented this death.

Dangers of hazardous energy

The purpose of de-energization and lockout is to prevent the release of an energy source that could activate moving parts on equipment or machinery. If these moving parts could cause injury, the energy source must be isolated and effectively controlled (by using locks, for example). An energy source that could cause injury or death to workers is considered hazardous energy.

Employers and workers often think primarily of disconnecting the electrical power when considering hazardous energy, since lockout is frequently used with machinery or equipment powered by electricity. However, there are other sources of hazardous energy, and these too must be considered when assessing the need for lockout. It is essential to identify and control any energy source that could cause injury when workers are doing maintenance. The box on page 7 describes the main types of hazardous energy that could result in injury or death to workers if lockout is not done properly.

Types of hazardous energy

Kinetic energy

Kinetic energy is the energy of moving equipment or moving materials. For example, materials may move along a conveyor belt even after the electricity is turned off and some parts may need to be restrained or guarded so that they cannot move and injure a worker.

Chemical energy

Chemical energy refers to the energy that can be released by a chemical reaction. Hazardous chemical energy can be released with flammable, combustible, and corrosive substances. For example, fertilizer stored near diesel fuel is a potential source of an explosion.

Potential energy

Potential energy is the energy in suspended, elevated, or coiled materials. A loaded spring is a source of energy, and precautions must be taken to prevent injuries. If gravity could cause something to fall or roll, then there is hazardous potential energy. For example, before a worker works under the forks of a fork-lift truck, the elevated forks carriage must be pinned or blocked.

Thermal energy

Thermal energy is the energy in heat, which is found in steam, hot water, fire, gases, and liquefied gases. For example, a steam pipe that supplies heat or that carries steam under pressure to drive a turbine has hazardous thermal energy and may take time to cool down.

Electrical energy

Conductors, motors, and generators are sources of electrical energy. Both low-voltage and high-voltage equipment and conductors can injure or kill workers. Maintenance work on lighting systems or electrical panels, for example, requires lockout.

Radiation

Radiation energy includes non-ionizing radiation (such as light and lasers) and ionizing radiation (such as X rays). For example, flow measurement equipment in pulp mills can be a source of radiation energy.

An electric motor is a source of electrical energy.

Treat radiation as a hazardous energy source.

2 When to lock out

2. When to lock out

When lockout is required

If machinery could unexpectedly activate or if the unexpected release of an energy source could cause injury, the energy source must be isolated and controlled. This is done through the lockout procedure.

If machinery or equipment is shut down for maintenance, no work may be performed until the following have been done:

- All parts and attachments have been secured against inadvertent movement.
- Where the work will expose workers to energy sources, the hazard has been effectively controlled.
- The energy-isolating devices (such as switches or valves) have been properly locked out.

Apply a lock to the electrical disconnect switches before doing maintenance.

Follow these steps to determine if you need to lock out equipment or machinery:

1. View the location where the work is to be done.
2. Identify all energy sources.
3. Ask yourself: What would be the result if any of the energy sources was released? Would the release of energy or an inadvertent movement be hazardous to a worker?

If there is a hazard to workers, lockout is required. Use a lock on energy-isolating devices to prevent hazardous energy being released, such as through a switch being accidentally turned on and starting a machine. Make sure that all parts and attachments are secured against inadvertent movement.

If there is no hazard to workers, lockout is not required and workers can follow normal safe work procedures.

Hazard alert

A sawmill worker suffered a broken ankle when a jammed lumber-sorting bin suddenly dropped, striking him. Although the sorting system had been locked out, the bin was jammed by lumber and the jammed bin sorter had some slack in the hoist. Another worker did not realize that someone was doing maintenance below the bin and pulled the jammed planks loose. The bin released, falling and striking the worker below. In this case, the potential energy in the raised bin was a source of hazardous energy.

When lockout is not required

Situations may arise during **normal production work** when some production-related work needs to be done. Lockout may not be required in every case. Note that this applies only to normal production work, not to maintenance. Follow these steps in making a decision about whether or not lockout is required during normal production work:

1. Decide if there is a risk of injury to workers from the movement of the machinery or equipment or exposure to an energy source while the activity is carried out. When assessing the risk of injury, imagine what will happen if the unexpected occurs. All sources of hazardous energy must be considered, such as loaded springs and suspended equipment that could roll or fall.
2. If there is no risk of injury, then lockout is not required.
3. If there is a risk of injury, decide if the machinery or equipment is effectively safeguarded to protect workers from the risk. If there are effective safeguards in place, then lockout is not required.
4. Safe work procedures must be followed during the activity.

Working on energized equipment

Sometimes machinery or equipment has to be energized for a specific task — for example, when making fine adjustments or doing troubleshooting that can only be done with part of the equipment working. In those cases, only the parts that are vital to the maintenance process may remain energized.

Work on energized equipment must be performed by workers who:
– Are qualified to do the work
– Have been authorized by the employer to do the work
– Have been provided with and follow written safe work procedures

3 Implementing lockout

Personal locks

Every worker who is required to lock out machinery or equipment needs a personal lock and keeps the key to that lock in his or her possession. This lock ensures personal lockout protection. For example, the worker places the lock on the switch that controls the machine being worked on. Only that worker (or a supervisor) is able to remove the lock when the work is finished. Since no other worker has a key for that lock, the lock cannot be removed inadvertently. If more than one worker is working on the machinery, each worker must place a personal lock on the switch. Combination locks must not be used for lockout.

Five basic steps to locking out

Once you have determined that lockout is required, follow these five basic steps to lock out machinery and equipment. They apply to all types of machinery and equipment. Every worker must know these steps.

1. Identify the machinery or equipment that needs to be locked out.
2. Shut off the machinery or equipment. Make sure that *all* moving parts have come to a complete stop. Also ensure that the act of shutting off equipment does not cause a hazard to other workers.
3. Identify and de-activate the main energy-isolating device for each energy source.
4. Apply a personal lock to the energy-isolating device for each energy source, and ensure that all parts and attachments are secured against inadvertent movement.
5. Test the lockout to make sure it's effective and to verify that each energy source has been effectively locked out. First ensure that all workers are in the clear and that no hazard will be created if the lockout is not effective. Lockout can be tested after each energy-isolating device is locked out or after a group of nearby devices is locked out.

Locking out electrical equipment

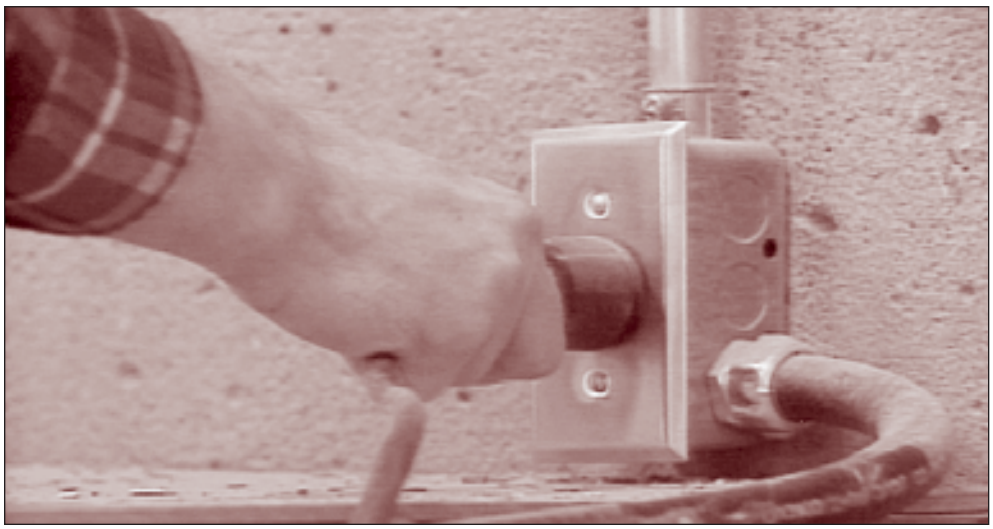
Electricity is the most common energy source that needs to be locked out. The two most common types of electrical machinery and equipment are:

- Plugged-in equipment
- Permanently connected or hard-wired equipment

Plugged-in equipment

Follow these steps to lock out plugged-in machinery and equipment:

1. Identify the machinery or equipment that needs to be locked out.
2. Shut off the machine or equipment and make sure that all moving parts have come to a complete stop.
3. Unplug the machine.
4. Apply a personal lock to the plug unless the worker doing the maintenance can keep the plug in view and under control while working on the equipment.
5. Test the lockout to make sure it's effective.



Pull the plug to disconnect the machine from the electric power supply.

In step 4 on page 15, if the plug is kept under the exclusive and immediate control of one worker at all times while the maintenance work is being done, then a lock may not be required. The worker should have the plug in sight and within reach so that no one else can accidentally plug in the equipment. However, if the worker leaves the equipment unattended without a lock and the work is incomplete, then the lockout procedure must be re-established when the worker returns. Alternatively, the worker can apply a lock when leaving the equipment.

Example: Locking out a radial arm saw

To lock out a radial arm saw before performing maintenance:
- Shut off the saw
- Unplug the saw
- Keep the plug in plain view and within reach while performing maintenance on the saw

Keep the plug in plain view and within reach while performing maintenance.

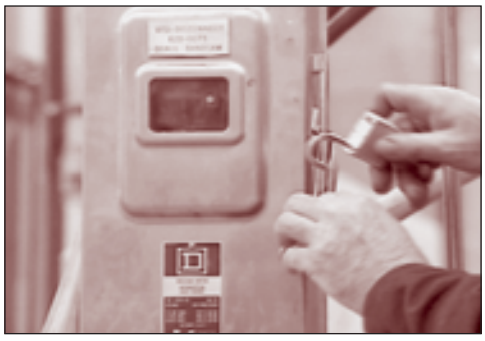
Permanently connected or hard-wired equipment

Follow these five steps to lock out permanently connected or hard-wired machinery or equipment:

1. Identify the machinery or equipment that needs to be locked out.
2. Shut off the machine and make sure that all moving parts have come to a complete stop.

Push the stop button to stop the machine.

3. Find the electrical source and disconnect the machine from the power supply.
4. Apply a personal lock to the energy-isolating device, if required. (If there is one switch that is within the exclusive and immediate control of the worker, then a lock may not be required.)

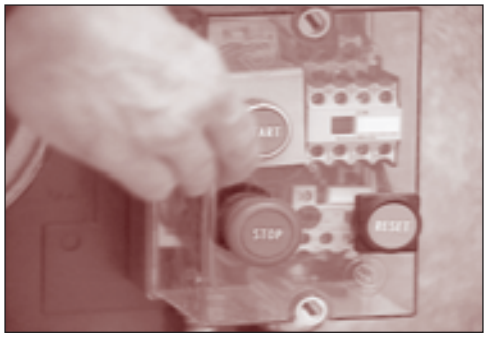


After disconnecting the machine from the electrical source, apply a personal lock.

Access to energy-isolating devices

When an energy-isolating device such as a switch or valve is locked out, the lock must not prevent access to energy-isolating devices for other machinery or equipment. For example, the panel door of a circuit breaker box should not be locked, just the individual breakers. Other workers may need access to the other devices for their own lockout or maintenance procedures.

5. After ensuring that all workers are in the clear, test the lockout to make sure it's effective.



Test the lockout by pressing the start button.

Continuity of lockout

In some cases, lockout must be maintained between shift changes to maintain lockout continuity. Procedures must be implemented for shift or personnel changes. This includes the orderly transfer of control of locked-out energy-isolating devices between outgoing and incoming workers.

If locks have not been left on the control devices between shifts, then the workers coming on shift must ensure that lockout is re-established if necessary.

Interlocked systems

Special considerations apply to locking out interlocked systems, such as conveyors. When testing a locked-out component within an interlocked system, one of the following must be done:

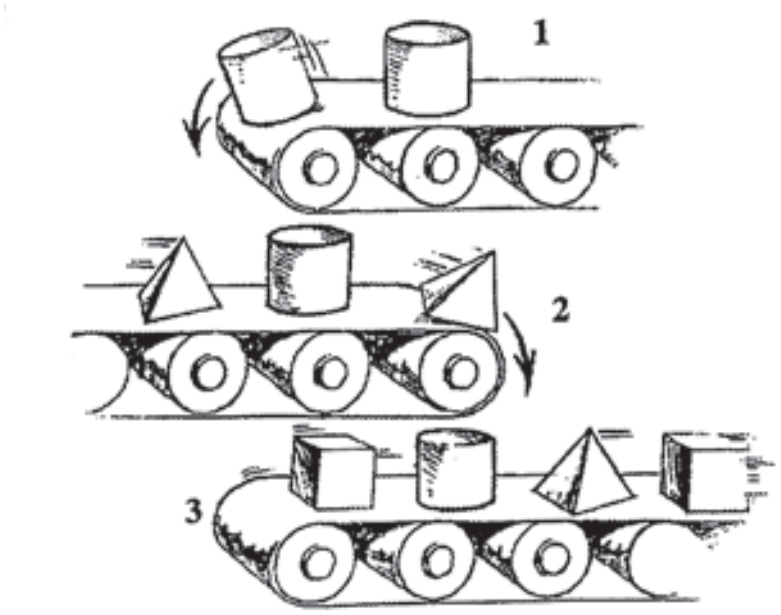
- The interlock sequence must be fully completed or overridden (see box on page 19).
- Another means must be used to verify that the energy-isolating device has been disconnected — for example, by consulting a qualified person who has knowledge of the interlocked system.

Example: Locking out an interlocked system

The drawing below is an example of an interlocked system. In this kind of cascade conveying system, if a conveyor belt is not moving, any upstream conveyors will stop so that materials do not pile up on the non-moving belt. The downstream conveyors, however, will continue to move. In the drawing, if conveyor 3 is not moving, conveyors 2 and 1 won't start. If conveyor 2 is not moving, conveyor 1 won't start, but conveyor 3 can operate. If conveyor 1 isn't moving, conveyors 2 and 3 can still operate.

To lock out conveyor 2, follow the five basic lockout steps on page 14. To test the lockout in step 5, push the start button for conveyor 3 to get the belt moving. Then push the start button for conveyor 2. If the lockout is effective, conveyor 2 should not run.

Alternatively, if there is an override system, you can override the interlock by using the "jog" button. You can then lock out and test only conveyor 2 because this conveyor is no longer interlocked with conveyors 1 and 3.



Hydraulic or pneumatic systems

To lock out hydraulic or pneumatic systems, such as a cylinder that operates a drop gate, follow these five steps:

1. Identify the machinery or equipment that needs to be locked out.
2. Stop the machine. Make sure that all moving parts have come to a complete stop.
3. Find the energy source and disconnect it using one of these methods:
   - Disconnect the electrical power to the pump or compressor.
   - Close the valve feeding the cylinder.
4. Apply a personal lock to the electrical disconnect or the valve. To make sure that all parts have been secured against inadvertent movement, you may have to pin or block a drop gate or a weight that is being supported by the stored pressure in the cylinder.

Apply a personal lock after the valve has been closed.

5. Test the lockout to make sure de-energization is effective. Test to make sure the pump or compressor won't start and that the flow doesn't bypass the valve. **Make sure there is no residual pressure in the lines, reservoirs, or accumulator feeding the cylinder. Bleed any residual pressure.** Test to ensure that there is zero energy in the system.

Pin lever arms to help support lever weight.

Hazard alert

A worker was unscrewing a filler cap to add oil to a cylindrical tank. As he reached the last few threads, the cap blew off, striking him on the forehead. He suffered a fractured skull. The tank was pressurized to 60 psi. Tanks under pressure must have the air supply shut off and the pressure bled before servicing.

Multiple person lockout

Each person working on the machinery or equipment is responsible for locking out the energy-isolating device. Multiple locks can be applied with scissor adapters.

The first worker who applies the lock must make sure the lockout is effective and the equipment will not start. When each worker has finished maintenance, the worker removes only his or her own personal lock that was placed on the energy-isolating device. The worker who removes the last lock should check that all workers are in the clear and that the equipment can be safely restarted.

Use scissor adapters when applying multiple locks.

Emergency lock removal

Generally, a personal lock must be removed only by the worker who installed the personal lock. If necessary, the supervisor or manager in charge may remove the lock, but only if the person in charge:
– Makes every reasonable effort to contact the worker who installed the lock
– Has made sure that the machinery or equipment can be operated safely before removing the lock

The worker must be notified at the start of his or her next shift that the worker's personal lock has been removed. The emergency lock removal should be documented.

Multiple point lockout

To effectively lock out equipment with multiple energy sources, you will need to lock out several energy-isolating devices.

Rather than using several locks, you may prefer to use cables for securing several disconnects:

- Run the cable through the lock hole in each switch you are locking out.
- Fix one end of the cable to a point at the motor control centre.
- The opposite end of the cable should have an eye that will accept a lock. After securing the final switch, place a lock on the cable eye. The cable diameter must be large enough to prevent the switch from being activated accidentally.

If more than one person is required to lock out, a scissor adapter may be required.

If you need to perform multiple point lockouts, a specific lockout procedure may need to be posted by the machinery or equipment.

Use a cable to lock out several disconnect switches.

Example: Multiple point lockout of a widget-maker

This example shows how to lock out a fictitious widget-maker before performing maintenance.

1. Identify the machine to be locked out.
2. Stop the system using the stop button on the operator console. Make sure that all moving parts have come to a complete stop.
3. Pull the following disconnect switches to the OFF position:
   - Widget-maker infeed drive
   - Widget-maker feed drive
   - Widget-maker outfeed drive
   - Widget-maker power head
   - Widget-maker hydraulic pump
   - Widget-maker refuse conveyor
   - Widget-maker exhaust blower
4. Have each worker apply a personal lock to each switch.
5. Test the lockout by pressing the start button.

Group lockout

The group lockout procedure was formerly known as the key-box procedure. This procedure reduces the number of locks required and saves time. If a number of workers are working on machinery or equipment — particularly if a large number of energy-isolating devices must be locked out — you can use a group lockout procedure.

Before implementing a group lockout, a knowledgeable person must plan the procedure ahead of time and develop a written group lockout procedure. This written procedure must be conspicuously posted at the place where the system is in use.

In a group lockout procedure, two qualified workers lock out the energy-isolating devices.

In a group lockout procedure, instead of each worker putting a personal lock on each energy-isolating device, two qualified workers lock the devices. Their keys are then placed in a key-securing system — for example, a box that can be locked or that can have a seal placed on it. If it has a seal, it must be an approved positive sealing device that cannot be tampered with.

A "qualified" worker means one who is knowledgeable about the work, the hazards involved, and the means to control the hazards, by reason of education, training, experience, or a combination of those. The two qualified workers are responsible for doing the following:

- Independently lock out the energy-isolating devices.
- Secure the keys for the personal locks that were used to lock out those devices. This is done by having each of the two qualified workers apply a personal lock on the key-securing system or by using another approved positive sealing device.
- Complete, sign, and post a checklist that identifies the machinery or equipment components covered by the lockout.

Each worker who is doing maintenance on the locked-out components must apply a personal lock to the key-securing system used by the two qualified workers. After finishing the maintenance work, each worker removes his or her personal lock from the key-securing system. This ensures that no one can remove the locks on the energy-isolating devices until all workers have finished working on the locked-out equipment.

After maintenance is complete and all workers have removed their personal locks from the key-securing system, it should be determined if it is safe to end the lockout. If so, the two qualified workers are responsible for removing their personal locks from the key-securing system. If there is a positive sealing device instead, any two workers can be instructed to remove the seal.

Once the keys are removed from the key-securing system, the group lockout has ended. The locks may then be removed from the individual energy-isolating devices by any qualified individual.

A positive sealing device has a seal that will show if the seal has been tampered with.

Example: Group lockout

In this example, a company needs to lock out a piece of equipment with 50 energy sources that's used by 20 workers. Without a group lockout procedure, the company would need 1000 personal locks to lock out this equipment.

20 workers x 50 energy-isolating devices = 1000 locks

A group lockout procedure can use as few as 120 locks.

1. Two qualified workers each take 50 locks and a checklist for the equipment components covered by the lockout. Each worker places one lock on each of the 50 energy-isolating devices. As they go along, they verify that each device has isolated the energy source, and they check off each component on the checklist.

   2 qualified workers x 50 locks = 100 locks

   The locks used by the first worker can all be keyed to the same key and the locks used by the second worker to a different key; in this way, only two keys are used.

2. After locking out all 50 energy-isolating devices and testing the lockout, the qualified workers place the keys for the locks in a key-securing system. Both qualified workers sign the checklist and post it by the key-securing system.

3. The two qualified workers each place a personal lock on the key-securing system or, alternatively, they use a positive sealing device, which will have to be broken to get into the key-securing system. The positive sealing device must have a serial number, which the qualified workers record on the checklist.

4. Each worker who works on the locked-out equipment marked on the checklist checks to make sure the serial number on the positive sealing device matches the serial number on the checklist (if the sealing device is used instead of two personal locks). Then each worker places a personal lock on the key-securing system.

   20 workers x 1 lock = 20 locks

In this example, a total of 120 locks was used.

2 qualified workers x 50 locks	= 100 locks
20 workers x 1 lock	= 20 locks
Total	= 120 locks

For this total, the positive sealing device was used. If the two qualified workers instead each place a personal lock on the key-securing system, then 122 locks are needed.

4 Responsibilities for lockout

4. Responsibilities for lockout

Post lockout notices as part of your lockout system.

Employer responsibilities

The employer is responsible for establishing the lockout system to be implemented within the worksite. Procedures for lockout must be written. Depending on the size and complexity of the operation, other aspects of the lockout system may have to be established in writing — for example, emergency lock removal and multiple point lockout. These procedures become supplements to the health and safety program.

Provision of personal locks

The employer must make sure that each worker required to lock out machinery or equipment has access to enough personal locks to perform the required lockout procedure. These locks must be used for lockout purposes only. Each worker's lock should be opened only by a key that is in the worker's possession and by a key under the control of the supervisor or manager in charge. Combination locks must not be used for lockout.

Each personal lock must be marked or tagged to identify the person who applies it. For example, the worker's name could be engraved on the lock or referenced by a serial number in a document.

Written procedures

When energy-isolating devices are locked out, the devices must be secured in the safe position using locks in accordance with a written lockout procedure. This procedure must be available to all workers who work on the machinery or equipment.

Training and supervision

Safe work procedures for maintenance and production are essential. When lockout is required (see pages 10–11) it must be implemented. Workers, employers, and supervisors must understand and use a well-established lockout system.

Training and supervision are the best ways to make sure workers lock out. WorkSafeBC requires that all workers be trained to a level of demonstrated competency in de-energization and lockout. WorkSafeBC also requires that workers be supervised in lockout, as they would be in any other task.

Contractor co-ordination

Companies must ensure that all contractors meet company and WorkSafeBC lockout requirements before commencing a job.

Hazard alert

A sawmill worker suffered multiple injuries while attempting to clear a plug-up at a multiple trim saw outfeed. When he leaned across an operating drive shaft, his jacket became entangled in an unused but rotating end sprocket. The investigation revealed the following:

- The worker had not been adequately trained in his job.
- Although lockout procedures were posted, the intent of lockout had not been explained to the worker.
- The worker had not been issued personal locks.
- The worker did not know which control panel to use to lock out the equipment.

Workers are responsible for removal of their personal locks.

Worker responsibilities

All workers who work on machinery or equipment requiring lockout are responsible for:

- Locking out the energy-isolating device or placing a personal lock on the key-securing system in a group lockout procedure
- Removing their personal locks on the completion of their work
- Keeping control of the keys to personal locks throughout the duration of the work

5 Occupational Health and Safety Regulation

Part 10: De-energization and Lockout

Definitions	**10.1**	In this Part
"control system isolating device"		means a device that physically prevents activation of a system used for controlling the operation of machinery or equipment;
"energy isolating device"		means a device that physically prevents the transmission or release of an energy source to machinery or equipment;
"energy source"		means any electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other source of energy of potential harm to workers;
"key securing system"		means a system which physically prevents access to keys when locks or positive sealing devices are applied in a group lockout procedure;
"lockout"		means the use of a lock or locks to render machinery or equipment inoperable or to isolate an energy source in accordance with a written procedure;
"maintenance"		means work performed to keep machinery or equipment in a safe operating condition, including installing, repairing, cleaning, lubricating and the clearing of obstructions to the normal flow of material;
"normal production"		means work that is routine, repetitive, and integral to the normal use of machinery or equipment for production;
"personal lock"		means a lock provided by the employer for use by a worker to ensure personal lockout protection such that each lock when applied is operable only by a key in the worker's possession, and by a key under the control of the supervisor or manager in charge.
General requirement	**10.2**	If the unexpected energization or startup of machinery or equipment or the unexpected release of an energy source could cause injury, the energy source must be isolated and effectively controlled.
When lockout required	**10.3**	(1) If machinery or equipment is shut down for maintenance, no work may be done until (a) all parts and attachments have been secured against inadvertent movement,

(b) where the work will expose workers to energy sources, the hazard has been effectively controlled, and

(c) the energy isolating devices have been locked out as required by this Part.

(2) If machinery or equipment is in use for normal production work, subsection (1) applies if a work activity creates a risk of injury to workers from the movement of the machinery or equipment, or exposure to an energy source, and the machinery or equipment is not effectively safeguarded to protect the workers from the risk.

Lockout procedures

10.4 (1) When lockout of energy isolating devices is required, the devices must be secured in the safe position using locks in accordance with procedures that are made available to all workers who are required to work on the machinery or equipment.

(2) The employer must ensure that each worker required to lock out has ready access to sufficient personal locks to implement the required lockout procedure.

(3) Combination locks must not be used for lockout.

(4) Each personal lock must be marked or tagged to identify the person applying it.

(5) Procedures must be implemented for shift or personnel changes, including the orderly transfer of control of locked out energy isolating devices between outgoing and incoming workers.

(6) If the use of a personal lock is not practicable for lockout, another effective means, if approved by the board, may be used in place of a personal lock to secure an energy isolating device in the safe position.

Access to energy isolating devices

10.5 When an energy isolating device is locked out, the lock must not prevent access to other energy isolating devices supplying machinery or equipment that could cause injury to workers.

Checking locked out equipment

10.6 (1) Effective means of verifying lockout must be provided and used.

(2) Before commencing work, a worker must verify that all energy sources have been effectively locked out.

Worker responsibilities **10.7** Each worker who works on machinery or equipment requiring lockout is responsible for

(a) locking out the energy isolating devices before starting work, except as provided by section 10.9,

(b) removing personal locks on the completion of his or her work, and

(c) maintaining immediate control of the key(s) to personal locks throughout the duration of the work.

Removal of locks **10.8** (1) A personal lock must only be removed by the worker who installed it, or if this is not possible, the matter must be referred to the supervisor or manager in charge, who will be responsible for its removal.

(2) The supervisor or manager in charge must

(a) make every reasonable effort to contact the worker who installed the lock, and

(b) ensure that the machinery or equipment can be operated safely before removing the lock.

(3) A worker must be notified at the start of his or her next shift if the worker's personal lock(s) have been removed since the worker's previous shift.

Group lockout procedure **10.9** (1) If a large number of workers are working on machinery or equipment or a large number of energy isolating devices must be locked out, a group lockout procedure that meets the requirements of subsections (2) to (7) may be used.

(2) In a group lockout procedure 2 qualified workers must be responsible for

(a) independently locking out the energy isolating devices,

(b) securing the keys for the locks used under paragraph (a) with personal locks or other positive sealing devices acceptable to the board, and

(c) completing, signing and posting a checklist that identifies the machinery or equipment components covered by the lockout.

(3) Before commencing work each worker working on the locked out components must apply a personal lock to the key securing system used in subsection (2)(b).

(4) Workers may lock out a secondary key securing system if 2 qualified workers lock out the primary key securing system and place their keys in the secondary system.

(5) On completion of his or her work, each worker referred to in subsections (3) and (4) must remove his or her personal lock from the key securing system.

(6) When the requirements of subsection (5) have been met and it has been determined that it is safe to end the group lockout, 2 qualified workers must be responsible for removing their personal locks or the positive sealing device(s) from the key securing system or systems containing the keys for the locks used under subsection (2)(a), and once those keys are released, the system is no longer considered to be locked out.

(7) The written group lockout procedure must be conspicuously posted at the place where the system is in use.

Alternative procedures

10.10 (1) If lockout of energy isolating devices as required by section 10.3 is not practicable,

(a) in the case of a power system as defined in Part 19 (Electrical Safety), the requirements of that Part must be followed,

(b) in the case of mobile equipment as defined in Part 16 (Mobile Equipment), the requirements of that Part must be followed,

(c) in the case of machinery or equipment designed and equipped with effective control system isolating devices, the devices must be locked out as required by sections 10.4 to 10.9, and 10.10(2), and

(d) in an emergency, the energy isolating devices or control system devices must be effectively controlled to prevent inadvertent start up or hazardous energy release.

(2) Control system isolating devices and the procedures for using them must be approved in writing by the board, and must be used by workers qualified and authorized to carry out the work.

Locks not required

10.11 The application of a lock is not required under section 10.3 or 10.10 if

(a) the energy isolating device is under the exclusive and immediate control of the worker at all times while working on the machinery or equipment, or

In the Regulation

"De-energization and Lockout" on pages 34 to 38 is Part 10 of the Occupational Health and Safety Regulation. The Regulation lists minimum requirements for health and safety standards enforced by the Workers' Compensation Board of British Columbia.

The complete Regulation is available on the WorkSafeBC web site www.worksafebc.com under Occupational Health and Safety Regulation.

(b) a tool, machine or piece of equipment which receives power through a readily disconnected supply, such as an electrical cord or quick release air or hydraulic line, is disconnected from its power supply and its connection point is kept under the immediate control of the worker at all times while work is being done.

Work on energized equipment

10.12 If it is not practicable to shut down machinery or equipment for maintenance, only the parts which are vital to the process may remain energized and the work must be performed by workers who

(a) are qualified to do the work,

(b) have been authorized by the employer to do the work, and

(c) have been provided with and follow written safe work procedures.

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