



UBC De-Energization and Lockout Program

1. Introduction & Background

Machinery, equipment and processes that are not de-energized and locked out can unexpectedly start when maintenance work is being done or can unexpectedly release hazardous energy, which can result in serious injuries to workers. Accidents can be prevented by properly locking out machinery, equipment and processes before any maintenance work begins. For this reason, UBC has developed and implemented a De-Energization and Lockout Program to ensure compliance with the British Columbia's Occupational Health and Safety Regulations and to protect individuals from serious injuries.

2. Scope

This document is applicable to all University employees (faculty, staff, and students) who owns, operates and maintains machinery and equipment.

The goal of this program is to identify roles and responsibilities, identify hazardous energy and assess risks, implement the hierarchy of controls to eliminate/minimize hazards and ensure employees follow established de-energization and lockout safe work procedures so that work can be carried out safely.

3. References

- British Columbia's Occupational Health and Safety (OHS) Regulation and Guidelines:
 - [Part 10 - De-Energization and Lockout](#)
 - [Part 9 - Confined Spaces](#)
 - [Part 16 - Mobile Equipment](#)
 - [Part 19 - Electrical Safety](#)
- [WorkSafeBC Controlling Hazardous Energy - De-Energization and Lockout Publication](#)
- [UBC Health and Safety Policy - SC1](#)

4. Legal Requirements

British Columbia's Occupational Health and Safety Regulation Part 10 outlines the regulatory requirements for de-energization and lockout of machinery and equipment. Part 10 also has guidelines and policies that help to interpret and implement the requirements. In addition to Part 10, additional requirements pertaining to de-energization and lockout can be found in Part 9 – Confined Spaces, Part 16 – Mobile Equipment and Part 19 – Electrical Safety.

This document outlines minimum requirements for de-energization and lockout of machinery and equipment. All employees are expected to understand the legislative requirements and what must be done to protect from hazardous energy in the workplace. Additional requirements may be applicable depending on the nature of the work being performed.



5. Definitions

De-energization: To remove hazardous energy from equipment or a machine before locking it out.

Energy Isolating Device: A device that physically prevents the transmission or release of an energy source to machinery or equipment.

Energy Source: Any electrical, mechanical, hydraulic, pneumatic, chemical, thermal or other source of energy of potential harm to workers.

Isolation: To physically separate a worker from an energy source by means of blanks and blinds, double block and bleed, or similar means.

Lockout: 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.

Personal Lock: 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.

Personal Tag: A tag placed in conjunction with a personal lock to signify that work is being carried out on machinery or equipment that is associated with the personal lock. This tag will be white with black lettering, with a distinctive hatched red border.

Personal Lockout: To place a personal lock on energy isolating devices to prevent hazardous energy from being released and to ensure personal lockout protection. Each personal lock must have a personal tag to identify the person applying it.

Scissor Hasp or Multi-Lock Hasp: A special device that allows several employees to attach their personal locks to a single lockout point. The scissor hasp is applied to the lockout point and employees then apply their personal locks to the scissor hasp.

Shop/Continuity Lock: A lock provided by the qualified supervisor for the removal from service of equipment for seasonal shutdowns, temporary shutdowns, shift or personnel changes or similar purposes. Shop locks and keys are under the control of the qualified supervisor will be issued as required for specific use. Each shop lock must have a status tag to indicate the status of the machinery or equipment and the reason for the shop lock. A shop lock **does not** constitute effective lockout and no one is to work behind a shop lock.

Status Tag: A tag used in conjunction with a Shop/Continuity Lock when a worker is not working on the machinery or equipment to indicate the status of the machinery or equipment and the reason for the Shop/Continuity Lock being placed on the energy isolating device. It must be indicated on the tag that the Shop Lock **does not** constitute effective lockout. This tag will be yellow with black lettering.

Shop/Continuity Lock Logbook: A logbook where the relevant information must be recorded when a Shop/Continuity Lock is applied.

Group Locks: Locks dedicated to group lockout, sufficient in number to lockout energy isolating devices in a group lockout procedure. Group locks have locks that are keyed alike. Keys are available only to the 2 qualified workers applying the group lockout and the qualified supervisor.

Group Lockout: The procedure used where there are more than 3 energy isolating devices to be locked out, and/or a large number of workers will be working on the equipment and/or where the energy isolating devices are a



considerable distance apart. Each group lock must have a group lockout tag to identify the machinery/equipment locked out and the qualified workers who applied the lock.

Group Lockout Tag: A tag that must be placed on all devices that have been locked out as part of a group lockout procedure, identifying the machinery or equipment locked out, and the names of the persons who applied the lock. This tag will be white with black lettering.

Group Lock Box: A sturdy container used to secure keys for group locks used in group lockout, capable of being secured and sealed.

Positive Sealing Device: A uniquely numbered one time use only device acceptable to WorkSafeBC that goes on a group lock box and secures it. It has a seal that will show if it has been tampered with.

Qualified Worker: A worker who is knowledgeable of the work, the hazards involved and the means to control the hazard by reason of education, training, experience or a combination thereof.

Lead Hand (LH): A qualified worker that takes on a lead role in group lockout to ensure all work is done in a safe manner and that group lockout procedures are followed.

Supervisor: A person who instructs, directs and controls workers in the performance of their duties. A supervisor can be any worker (management or staff) who meets this definition, whether or not they have the supervisor title. In this document, the supervisor is referenced as the “Qualified Supervisor” and is technically competent and has specialized knowledge of building systems and of the current work being carried out on those systems.

6. Roles and Responsibilities

The roles and responsibilities described in this document are in accordance with the OHS Regulation and University Health and Safety Policy - SC1.

6.1 Employer Responsibilities

- Protect employees from hazardous energy in the workplace by identifying all hazardous energy in the workplace and implementing the hierarchy of controls, in the order of elimination, substitution, engineering, administrative and personal protective equipment.
- Ensure lockout equipment are made available.
- Ensure written safe work procedures are developed.
- Provide instruction and training to supervisors and workers who will need to apply de-energization and lockout.
- Ensure documentation is maintained (e.g. training, hazard assessments, safe work procedures).
- Ensure compliance with British Columbia’s Occupational Health and Safety Regulation (OHS) Regulation.

6.2 Department Manager/Supervisor Responsibilities

- Complete De-Energization and Lockout training.
- Ensure employees receive de-energization and lockout training.
- Review site-specific hazard assessments and written safe work procedures with workers involved in de-energization and lockout and document the review took place.



- Develop task-specific de-energization and lockout safe work procedures and reviewing them regularly to ensure they are still relevant to the respective machinery, equipment or process.
- Implement controls using the hierarchy of controls to minimize the risk due to the hazard.
- Provide employees with personal lockout equipment (e.g. personal lock, key, tags, scissor hasp).
- Provide employees with other lockout equipment (e.g. shop/continuity locks, group locks, lockout devices), when necessary.
- Ensure employees are aware of procedures for reporting injuries immediately to UBC First Aid and Supervisor.
- Ensure employees understand and follow safe work procedures by conducting regular inspections.
- Understand British Columbia's OHS Regulation requirements that apply to the work and make sure those requirements are met.

6.3 Employee Responsibilities

- Complete de-energization and lockout training.
- Understand British Columbia's OHS Regulation requirements that apply to their work.
- Understand the different types of energy sources.
- Understand when and how to apply de-energization and lockout.
- Ensure de-energization and lockout is in place before starting work.
- Identify and assess hazardous energy related to the task performed and identify control that eliminate or minimize each risk.
- Review and follow de-energization and lockout safe work procedures.
- Remove personal locks when job is complete and apply a shop/continuity lock, if applicable.
- Keep control of key to personal locks and maintaining personal lockout equipment in good working order.
- Report to supervisor immediately should additional hazards be identified or if concerns arise.
- Report to UBC First Aid and Supervisor immediately if an injury occurs.

6.4 Safety & Risk Services (SRS) Responsibilities

- Ensure the UBC De-Energization and Lockout Program is complete and in compliance with Occupational Health and Safety (OHS) Regulation.
- Provide technical services, which includes interpretation of the OHS Regulation.
- Provide education and training on de-energization and lockout.
- Consult with supervisors, employees, Joint Occupational Health and Safety Committee members during the updating of this program.
- Participate in incident investigations involving de-energization and lockout.

6.5 Joint Occupational Health & Safety Committee Responsibilities

- Consult with the employer and employees on topics related to de-energization and lockout.
- Provide recommendations on the improvement of the health and safety of workers who apply de-energization and lockout.
- Monitor the effectiveness of the UBC De-energization and Lockout Program.
- Participate in inspections, investigations and inquiries as it pertains to de-energization and lockout.



7. Types of Hazardous Energy

The purpose of de-energization and lockout is to prevent the release of energy that poses a hazard to workers. If hazardous energy could cause injury, the energy source must be isolated and controlled. Hazardous energy is any energy source that could cause injury or death to employees.

7.1 Electrical Energy

Electrical energy is energy found live through power lines or wires/conductors, or be stored in batteries, capacitors or solar devices. Electrical energy is the most common form of energy used in workplaces. Electrical injuries can include electrocution, electric shock and burns from arc flash exposure.

7.2 Kinetic Energy

Kinetic energy is energy found in moving equipment or materials (e.g. materials may move along a conveyor belt or belt may continue to move when replacing a belt on an exhaust fan, even after the electricity is turned off). Hazards associated with kinetic energy include caught in, caught on and caught between situations for a worker.

7.3 Potential Energy

Potential energy is energy stored in suspended, coiled or elevated materials. When potential energy is released in an uncontrolled way, it may result in a worker being crushed or struck by machinery, equipment or other items. Potential energy includes the following:

Mechanical Potential Energy:

Energy contained in an item under tension (e.g. a spring that is compressed or coiled has stored energy that will be released in the form of movement when the spring expands).

Hydraulic Potential Energy:

Energy stored within a pressurized liquid used to move heavy objects, machinery or equipment (e.g. automotive car lifts, power presses).

Pneumatic Potential Energy:

Energy stored within pressured air used to move heavy objects and power equipment (e.g. power washers, machinery)

Gravitational Potential Energy:

Energy stored where gravity could cause something to fall or roll (e.g. before a worker works under the forks of a forklift truck, the elevated forks carriage must be pinned or blocked).

7.4 Thermal Energy

Thermal energy is energy in heat, found in steam, hot water, fire, gases and liquefied gases. Hazardous thermal energy can come from explosion, flame, objects with high or low temperatures or radiation from heat sources. Common injuries include burns, scales, dehydration and frostbite.



7.5 Chemical Energy

Chemical energy is energy released when a substance undergoes a chemical reaction. A common result of hazardous chemical reaction is fire or explosion. Chemical exposures may also be present on select rooftops and during maintenance of laboratory ventilation systems, such as fume hoods, ductwork and their components.

7.6 Radiation Energy

Radiation energy is energy from electromagnetic sources, including laser, microwave, infrared, ultraviolet and x-ray. Effects may include burns, changes to genetic material or reproductive systems or functional disorders.

8. Hazardous Energy Identification and Risk Assessment

It is important that an assessment take place to identify all potential sources of hazardous energy involved in a machine or process and determine how to de-energize and lockout each identified energy source.

The following steps will help to identify hazardous energy and to assess risks:

1. Identify all tasks to be performed. Consider normal operations as well as non-standard events (e.g. maintenance, shutdowns, power outages, emergencies, etc.).
2. For each piece of machinery or equipment, identify the following:
 - a. Tasks
 - b. Hazards as a result of release of energy, inadvertent startup or movement
 - c. Type of energy that must be controlled
 - d. Energy-isolating devices
3. Assess risk level for each task and corresponding hazard.
4. Identify controls that eliminate or minimize each risk.
5. Develop written safe work procedures that list steps for each de-energized energy control device that must be locked out.

Identifying and assessing hazardous energy related to the task performed must be done through a review of drawings, identification data, testing or similar means. When the correct device has been identified, de-energized and locked out, all stored energy must be drained or bled off, pressure released and any potential for movement removed or positively blocked against movement.

Various stakeholders should be involved in the above process, including workers, supervisors, Joint Occupational Health and Safety Committee and other subject matter experts.

9. Safe Work Procedures (SWP)

If machinery or equipment could unexpectedly activate or if the release of an energy source could cause injury, the energy source must be isolated and controlled. This is done by securing the devices in a safe position using locks in accordance with established de-energization and lockout safe work procedures.

Safe work procedures must be in place for each unique machine, piece of equipment or process and made available to employees who perform de-energization and lockout. (See [Appendix A for a De-Energization and Lockout Safe Work Procedure Template](#)).



Every de-energization and lockout process will involve these 5 steps:

1. Identify the machinery or equipment that needs to be locked out.
2. Shut off the machinery or equipment.
3. Identify and de-energize all hazardous energy sources.
4. Apply a personal lock to the energy-isolating device for each hazardous energy source.
5. Verify/test the effectiveness of the de-energization and lockout process.

The de-energization and lockout safe work procedures should be readily accessible, close to the machine, equipment, or process.

9.1 Personal Lockout SWP

Each worker required to perform lockout must be assigned a set of personal locks keyed alike complete with a key, personal tags, and lockout scissor.

Application and Removal of Personal Lock

- Personal locks must be marked or tagged to identify the person applying it.
- A worker who has been assigned to carry out the work must place a lockout scissor, personal lock, personal tag on the energy-isolating device after it has been switched off or otherwise placed in a safe position.
- The following information must be identified on the personal tag: Name, Shop/Department, Contact Phone Number.
- The worker must verify/test the effectiveness of the de-energization and lockout process by attempting to operate the machinery or equipment to confirm that it will not start up or operate.
- Any additional worker who is required to work on that machinery or equipment must place their own personal lock and personal tag on the lockout scissor.
- A personal lock must not be placed in the last hole of a lockout scissor. Instead, another lockout scissor must be applied and the personal lock placed on the additional lockout scissor.
- A worker's personal lock will remain in place at all times while there is a hazard to the worker.
- When a worker who placed their personal lock is no longer working on the machinery/equipment, and the work is incomplete, the worker must remove their personal lock and tag and replace with a shop/continuity lock and status tag. A shop lock **does not** constitute effective lockout. No one is to work behind a shop lock (*see 9.2 Shop/Continuity Lock SWP*).
- A worker is responsible for removing their own personal lock.

9.2 Shop/Continuity Lock SWP

Shop/continuity locks, if required, are provided by the qualified supervisor and are used for securing equipment or machinery for seasonal shutdowns, temporary shutdowns, shift or personnel changes or similar purposes. A shop lock **does not** constitute effective lockout and no one is to work behind a shop lock.

Shop locks have locks that are keyed alike and must be identifiable by shop/department.

Application and Removal of Shop/Continuity Lock



- The locks and keys are under the control of the qualified supervisor and will be issued as required for specific use.
- A status tag must be used in conjunction with a shop lock. The following information must be identified on the status tag: Name, Shop/Department, Date, Contact Phone Number, Reason for Applying Shop Lock.
- A shop/continuity lock logbook must be available for each Department/Shop with shop locks. Any time a shop lock is applied, the following information must be recorded in the shop lock logbook by the worker who applied the lock: Name, Date, Shop Lock Number, Location, Machinery/Equipment or Device, Reason for Applying Shop Lock.
- Shop locks can only be removed by a qualified and authorized worker provided they have been directed by the qualified supervisor and:
 - Reviewed all pertinent information recorded in the shop lock logbook,
 - Are aware of the scope of work involved, and
 - Contacted qualified supervisor if any information identified above is not available or is not understood.

9.3 Group Lockout SWP

Group lockout is applicable in situations where any machinery or equipment requires more than 3 energy isolating devices to be locked out, and/or a large number of workers will be working on the equipment and/or where the energy isolating devices are a considerable distance apart. Group locks have locks that are keyed alike.

Application and Removal of Group Lockout

- Group locks, with keys available only to the two qualified workers applying the procedure and the qualified supervisor in charge, must be used for group lockout procedures.
- A group lockout tag must be used in conjunction with group locks and the following information must be identified on the group lockout tag: Name, Department/Shop, Date, Contact Phone Number, Machinery/Equipment or Device
- Qualified supervisor to hold a pre-job meeting with all workers who will be applying personal locks and working on the machinery or equipment. During the pre-job meeting, the Qualified supervisor will review the written site-specific Group Lockout Safe Work Procedure (*see [Appendix B for a Group Lockout Safe Work Procedure template](#)*), identify the 2 qualified workers and the Lead Hand. The Lead Hand will be responsible for verifying that all work has been completed and that removal of Group Lockout can proceed. Name of Lead Hand is to be documented on the Group Lockout Checklist (*see [Appendix C for a Group Lockout Checklist](#)*).
- In group lockout, instead of each worker putting a lock on each energy isolating device, two qualified workers will take responsibility to:
 - Ensure a written site-specific group lockout procedure must be in place and followed.
 - Ensure there is an established Group Lockout Checklist that lists all the necessary energy isolating devices that require lockout.
 - Independently lock out using group locks and attach group lockout tags to all energy-isolating devices identified on the Group Lockout Checklist.



- Clearly print their names and contact phone numbers on the Group Lockout Checklist and sign the Group Lockout Checklist.
- Place the two keys that were used to lock out the energy isolating devices in group lock box.
- Secure group lock box with a positive sealing device acceptable to WorkSafeBC and record the identification number of the positive sealing device on the Group Lockout Checklist.
- When all energy-isolating devices have been identified and isolated, all stored energy must be drained or bled off, pressure released and any potential for movement removed or positively blocked against movement.
- Verify the effectiveness of the de-energization and lockout process by attempting to operate the machinery or equipment to confirm that it will not start up or operate.
- Post the Group Lockout Checklist and Group Lockout Safe Work Procedure by the group lock box and position the group lockbox in a prominent location as near as possible to the machinery or equipment shut down by the lockout.
- Each worker doing maintenance on the locked out components **MUST** understand the parameters of the work and review the Group Lockout Checklist and Group Lockout Safe Work Procedure, then apply a personal lock and tag to the group lock box.
- On completion of work, each worker removes their personal lock and tag from the group lock box.
- Once all workers have removed their personal locks, Lead Hand will confirm that all work has been completed and the Lead Hand will sign the Group Lockout checklist and notify the two qualified workers that it is safe to end group lockout.
- Once it is determined it is safe to end group lockout, two qualified workers will verify that no locks are on the group lockbox. The two qualified workers are then responsible for removing the positive sealing device from the group lock box, which ends the group lockout.
- Group locks and tags can then be removed from the individual energy-isolating devices by the two qualified workers.
- If the two qualified workers removing the positive sealing device are different than the two qualified workers who applied the positive sealing device, they must also clearly print their names and contact phone numbers on the Group Lockout Checklist and sign the Group Lockout Checklist.
- The two qualified workers are to give the completed Group Lockout Checklist to the qualified supervisor for record keeping.

9.4 Emergency Lock Removal

In situations where a personal lock has been left on a device and it is necessary to remove that lock and the worker is not available, the immediate qualified supervisor and manager will be responsible for its removal and must complete the Emergency Lock Removal Form and the following procedure must be adhered to (*See Appendix D for an Emergency Lock Removal Form*).

- The immediate qualified supervisor must:
 - Make every reasonable effort to contact the worker who placed the personal lock.
 - Determine reason for the lockout.
 - Determine if the machinery/equipment/system is safe to energize before removing the lock.
 - Contact manager for approval to remove the lock.
 - Take necessary steps to ensure it is made safe to remove the lock



- Provide a qualified worker to witness the lock removal.
- The manager must:
 - Review, approve and sign the Emergency Lock Removal Form.
 - Remove lock in the presence of the qualified worker, once the above steps are complete.
 - Inform the worker at the start of their next shift that their lock has been removed.
 - Initiate a CAIRS investigation report. The completed Lock Removal Form must be submitted with the CAIRS investigation report.

9.5 Alternate Methods of Hazardous Energy Control

Alternate procedures may apply in the following situations if lockout of energy isolating devices is not practicable. It is important to note that all reasonable options must be considered before choosing an alternative method. Time savings or convenience is not an acceptable reason to use alternative methods for hazardous energy control. Written safe work procedures for alternate methods of hazardous energy control must be established and followed.

Alternate Methods – Locks Not Required

Application of a lock is not required if:

- 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
- A tool, machine or piece of equipment can be disconnected from its power supply (e.g. electrical cord, quick release air or hydraulic line) and its connection point is kept under immediate control of the worker at all times while work is being done.

For example:

- For plugged-in equipment, a worker unplugs a tool, machine or equipment and places the plug in plain view close to themselves while ensuring it is not accessible by any other workers who might inadvertently plug the device back in. This application would need to be documented in a safe work procedure. Although a lock is not required in this example, to maintain consistent lockout practices, a lockable cover can be put on the plug and the worker can install a personal lock and tag on the cover.
- On electrical distribution panels where a qualified and authorized electrical worker disconnects the wires from the breaker, appropriately insulates the wire ends and places a personal tag on the wires.

Written safe work procedures specific to what tasks can be done without the application of a personal lock must be in place and workers must be trained in and follow those procedures.

Alternate Methods – Mobile Equipment

Mobile equipment includes, but is not limited to lift trucks, elevated work platforms, loaders and vehicles.

Depending on the task, traditional lockout to a zero-energy state on mobile equipment may not always be practicable. Consider the hazards associated with the tasks before choosing the method of hazardous energy control. The following are some methods used to control hazardous energy of mobile equipment:

- Using a battery power disconnect switch
- Disabling start circuits
- Blocking machine components



- Chocking wheels
- Dissipating thermal and stored energy.

During maintenance and service of mobile equipment, it is important to always lockout according to manufacturer's instructions.

For mobile equipment as defined in OHS Regulation Part 16 – Mobile Equipment, the requirements of that Part must be followed.

Alternate Methods – Power Systems

High voltage electrical equipment must be completely isolated, grounded and locked out before starting work on it.

When working on a UBC high voltage power system or part of the electrical associated to it, workers shall contact UBC Energy & Water Services Utilities Electrical Department (power system owner). The Person in Charge (PIC) is assigned the exclusive authority to establish the conditions for and to issue Safety Protection Guarantees for the power system or a part of it.

A Safety Protection Guarantee is a written assurance that a power system or part of the power system is electrically isolated and will remain isolated. Only workers authorized by the PIC may receive safety protection guarantees or work on the power system, while following established safe work procedures. Contact UBC Energy & Water Services Utilities Electrical Department (604-822-4943) to obtain approval and to obtain established safe work procedures.

For power systems as defined in OHS Regulation Part 19 – Electrical Safety, the requirements of that Part must be followed.

Alternate Methods – Working on Energized Equipment

If it is not practicable to shut down machinery or equipment for maintenance, only parts which are vital to the process may remain energized. Typically, this type of work involves diagnostic work and troubleshooting. Only when specific safe work procedures have been developed to work on energized equipment can qualified and authorized workers work on energized equipment.

Alternate Methods – Emergency Situations

In an emergency where a worker may get caught in a machine or otherwise be injured by a hazardous release of energy, the de-energization and lockout procedure should include provisions for worker rescue and extraction. The area must be made safe for the rescuers and the injured worker through de-energization and lockout.

In an emergency, where lockout cannot be immediately applied, rescuers may need to act outside of the de-energization and lockout procedures already in place. However, the energy isolating devices or control system devices must be effectively controlled to prevent inadvertent start up or a hazardous energy release. As soon as the emergency is controlled, lockout must be applied to complete repairs.

Alternate Methods – Isolation

Isolation is to physically separate a worker from an energy source by means of blanks and blinds, double block and bleed, or similar means.



- Blanks and Blinds are engineered devices used within piping systems to isolate workers from the contents of the piping. It closes up adjacent piping through a plate or cap, which can withstand the maximum pressure of adjacent piping, to eliminate any possibility of fluid entering into the space (e.g. confined space).
 - Blank: Refers to a solid plate installed through the cross-section of a pipe, usually at a flanged connection.
 - Blind: Refers to a solid plate installed at the end of a pipe that has been physically disconnected from a piping system at that point.
- Double Block and Bleed involves locking out a drain or vent valve in the open position between two locked-out valves in the closed position. Closing one or more valves and locking them in the “off” position is not considered adequate isolation, except when it is used as part of a double block and bleed system. Work in confined spaces is an example of where double block and bleed is used.
 - Written lockout procedures for double block and bleed must identify the specific lockout points and valves by name. The names on the procedures must match the markings on the piping system.
 - Double block and bleed is not to be used if the harmful substance in the piping is a gas, a vapour or a liquid volatile enough to produce a hazardous concentration of an air contaminant from the discharge from the piping.

Alternate Methods – Control System Isolating Devices

Control system isolating devices (CSIDs) are devices that physically prevents activation of a system used for controlling the operation of machinery or equipment so that it prevents risk of injury to workers from the movement of the machinery and/or equipment, or exposure to an energy source. Examples of CSIDs include light barriers, guarding interlocks, and electronic gate safeguards.

CSIDs are specialized electromechanical devices that are highly reliable and meet performance levels and standards, and can be used to manage hazardous energy and work by controlling the main power of the equipment, machine, or process, rather than de-energizing it. However, CSIDs can be complex and difficult to design. Employers should consult with a qualified professional to ensure the requirements of applicable standards are met.

In addition, CSIDs cannot replace the use of de-energization and lockout methods without prior written approval from WorkSafeBC. Contact Safety & Risk Services for consultation and guidance should this alternate method be considered.

10. Education and Training

All employees applying and working under de-energization and lockout and/or involved in the safe work procedures must undergo education and training as part of their new employee orientation/onboarding, prior to performing work involving de-energization and lockout. This training will include:

- Understand what is de-energization and lockout
- Learn the different hazardous energy types and how to identify hazardous energy and assess risks
- Understand when lockout is required



- Learn the 5 steps involved in every de-energization and lockout process
- Understand specific de-energization and lockout safe work procedures that may apply.
- Understand the Occupational Health and Safety Regulations that pertain to de-energization and lockout.

Workers must complete training every 3 years to ensure knowledge and understanding are maintained.

11. Documentation and Record Keeping

The following forms of documentation must be kept and maintained:

- Records of education and training;
- De-energization and lockout safe work procedures need to be reviewed and updated accordingly;
- Completed group lockout checklist forms kept on record by the qualified supervisor;
- Emergency Lock Removal Form must be submitted as part of a CAIRS investigation report.

12. Program Review

The De-energization and Lockout Program will be reviewed and updated as needed by Safety & Risk Services and UBC stakeholders to include any necessary changes.

Supervisors are required to review their safe work procedure documents to ensure they are still relevant to the machinery, equipment and process and the work being performed. Supervisors are also required to perform inspections to ensure lockout equipment used is correct and used appropriately.

13. Appendices

- Appendix A – De-Energization and Lockout Safe Work Procedure Template
- Appendix B – Group Lockout Safe Work Procedure Template
- Appendix C – Group Lockout Checklist
- Appendix D – Emergency Lock Removal Form



Appendix A: De-Energization and Lockout Safe Work Procedure Template

If machinery or equipment could unexpectedly active or if the release of an energy source could cause injury, the energy source must be isolated and controlled. UBC De-Energization and Lockout Program outlines the roles and responsibilities and the Occupational Health and Safety regulatory requirements.

This de-energization and lockout safe work procedure (SWP) must be in place and followed for each machinery, equipment or process and be reviewed by trained and authorized employees who will perform de-energization and lockout.

MACHINERY/EQUIPMENT SPECIFIC INFORMATION			
DEPARTMENT		ROOM NUMBER	
BUILDING			
MACHINERY/EQUIPMENT NAME Include photos, if possible			MACHINERY/EQUIPMENT NUMBER
REQUIRED WORK: List ALL applicable work activities for when lockout is applied			
HAZARDOUS ENERGY SOURCE Select ALL the hazardous energy source(s) that need to be controlled	<input type="checkbox"/> Electrical		
	<input type="checkbox"/> Kinetic		
	Potential:	<input type="checkbox"/> Mechanical Potential Energy	
		<input type="checkbox"/> Hydraulic Potential Energy	
		<input type="checkbox"/> Pneumatic Potential Energy	
<input type="checkbox"/> Gravitational Potential Energy			
<input type="checkbox"/> Thermal			
<input type="checkbox"/> Chemical			
<input type="checkbox"/> Radiation			
ENERGY ISOLATING DEVICE(S)/LOCKOUT POINT(S) List all energy isolating device(s) that need to be locked out and their locations. Include photos, if possible			
EQUIPMENT REQUIRED FOR LOCKOUT	<input type="checkbox"/> Personal Locks <input type="checkbox"/> Scissor or Multi-Lock Hasps <input type="checkbox"/> Personal Lockout tags <input type="checkbox"/> Electrical Lockout devices (e.g. circuit breaker, electrical plug) <input type="checkbox"/> Cable lockout devices <input type="checkbox"/> Valve lockout devices (e.g. gate valves, ball valves, plug valves, butterfly valves) <input type="checkbox"/> Other: _____		



Appendix A: De-Energization and Lockout Safe Work Procedure Template (cont.)

PRE-LOCKOUT PROCEDURE	
Describe detailed procedures to be followed prior to applying lockout	<p>Prior to de-energization and lockout, ensure:</p> <ul style="list-style-type: none"> every employee is trained in de-energization and lockout and has reviewed this safe work procedure all lockout equipment is available and in good working condition this safe work procedure is made readily available.
LOCKOUT PROCEDURE	
Describe detailed procedures to be followed as to how to perform lockout	<p>The authorized employee(s) will:</p> <ol style="list-style-type: none"> Identify the machinery or equipment that needs to be locked out Shut off the machinery or equipment in accordance with manufacturer’s instructions. Identify and de-energize all hazardous energy sources. Remove any stored energy still in the system, as per manufacturer’s instructions. Each apply a personal lock and personal tag to the energy isolating device for each hazardous energy source. Verify/test the effectiveness of the de-energization and lockout process after lockout devices have been applied, by attempting to operate the machinery or equipment and confirming it does not operate. Make sure all affected employees are clear of the machinery or equipment prior to verifying/testing. The machinery or equipment is now de-energized and locked out and maintenance work may proceed. <p>***NOTE: Elaborate on the above steps so that it is specific to the machinery or equipment that needs to be locked out.</p>
LOCKOUT REMOVAL PROCEDURE	
Describe detailed procedures to be followed when work is complete and lock is to be removed.	<p>Upon completion of maintenance work, the authorized employee(s) will:</p> <ol style="list-style-type: none"> Ensure all affected employees are clear of the machinery or equipment and in a safe location, prior to removing lockout. Ensure all tools and maintenance equipment has been removed from the area. Confirm the machinery or equipment has been inspected and is ready to return to service. Verify the controls are in a neutral or “off” position and that the machinery or equipment is safe to be restarted. Each remove their personal lock and personal tag. Start the machinery or equipment according to normal operating procedures. Notify affected employees that maintenance is complete and operation may resume. <p>***NOTE: Elaborate on the above steps so that it is specific to the machinery or equipment that needs to be locked out.</p>

THIS SAFE WORK PROCEDURE WAS DEVELOPED BY:

NAME (PLEASE PRINT)	SIGNATURE	DATE



Appendix B: Group Lockout Safe Work Procedure Template

If machinery or equipment could unexpectedly active or if the release of an energy source could cause injury, the energy source must be isolated and controlled. UBC De-Energization and Lockout Program outlines the roles and responsibilities and the Occupational Health and Safety regulatory requirements.

This group lockout safe work procedure (SWP) must be in place and followed when there are more than 3 energy isolating devices to be locked out, and/or a large number of workers will be working on the equipment and/or where the energy isolating devices are a considerable distance apart. This group lockout SWP must be reviewed by trained and authorized employees who will perform de-energization and lockout.

MACHINERY/EQUIPMENT SPECIFIC INFORMATION			
DEPARTMENT		ROOM NUMBER	
BUILDING			
MACHINERY/EQUIPMENT NAME(S) Include photos, if possible			MACHINERY/EQUIPMENT NUMBER(S)
REQUIRED WORK: List ALL applicable work activities for when lockout is applied			
HAZARDOUS ENERGY SOURCE Select ALL the hazardous energy source(s) that need to be controlled	<input type="checkbox"/> Electrical		
	<input type="checkbox"/> Kinetic		
	<input type="checkbox"/> Potential:	<input type="checkbox"/> Mechanical Potential Energy <input type="checkbox"/> Hydraulic Potential Energy <input type="checkbox"/> Pneumatic Potential Energy <input type="checkbox"/> Gravitational Potential Energy	
	<input type="checkbox"/> Thermal		
	<input type="checkbox"/> Chemical		
	<input type="checkbox"/> Radiation		
ENERGY ISOLATING DEVICES/LOCKOUT POINTS	<input type="checkbox"/> Group Lockout Checklist established that lists all necessary energy isolating devices that require lockout		
EQUIPMENT REQUIRED FOR LOCKOUT	<input type="checkbox"/> Personal Locks <input type="checkbox"/> Scissor or Multi-Lock Hasps <input type="checkbox"/> Personal Lockout tags <input type="checkbox"/> Electrical Lockout devices (e.g. circuit breaker, electrical plug) <input type="checkbox"/> Cable lockout devices <input type="checkbox"/> Valve lockout devices (e.g. gate valves, ball valves, plug valves, butterfly valves) <input type="checkbox"/> Other: _____		



Appendix B: Group Lockout Safe Work Procedure Template (cont.)

PRE-GROUP LOCKOUT PROCEDURE	
Describe detailed procedures to be followed prior to applying group lockout	<p>Prior to de-energization and lockout, Qualified Supervisor must ensure:</p> <ul style="list-style-type: none"> a pre-job meeting is held with all workers who will be applying lockout and working on the machinery. During the pre-job meeting, 2 Qualified Workers applying group lockout and Lead Hand will be identified every employee is trained in de-energization and lockout and has reviewed this safe work procedure group locks and keys are available only to the 2 qualified workers and qualified supervisor Group Lockout Checklist has been established that lists all the necessary energy isolating devices that require lockout Lead Hand will take on a lead role in group lockout to ensure all work is done in a safe manner and that group lockout procedures are followed all lockout equipment is available and in good working condition Qualified Supervisor develops this safe work procedure and it is made readily available.
GROUP LOCKOUT PROCEDURE	
Describe detailed procedures to be followed as to how to perform group lockout	<p>The 2 Qualified Workers must take responsibility to:</p> <ol style="list-style-type: none"> 1. Ensure a Group Lockout Checklist that lists all the necessary energy isolating devices that require lockout has been established 2. Individually lock out all energy isolating devices identified on the Group Lockout Checklist using group locks and group lockout tags and fill out the Group Lockout Checklist 3. Clearly print their names and contact phone numbers on the Group Lockout Checklist 4. Sign the Group Lockout Checklist 5. Place all group lockout keys in the group lock box and secure group lock box with a positive sealing device acceptable to WorkSafeBC. Record the identification number of the positive sealing device on the Group Lockout Checklist 6. Position group lock box in a prominent location as near as possible to the machinery or equipment that is locked out 7. Post the signed Group Lockout Checklist and this site-specific group lockout SWP by the group lockbox. 8. Verify/test the effectiveness of the de-energization and lockout process after group lockout applied, by attempting to operate the machinery or equipment and confirming it does not operate. Make sure all affected employees are clear of the machinery or equipment prior to verifying/testing. 9. Group lockout is now in place, but before maintenance work can proceed, all authorized employees must apply their personal lock and personal tag. <p>All authorized employees assigned to perform maintenance work on the machinery or equipment will:</p>



Appendix B: Group Lockout Safe Work Procedure Template (cont.)

GROUP LOCKOUT PROCEDURE	
	<ol style="list-style-type: none"> 1. Apply a personal lock and personal tag to the lock box. Each authorized employee must make sure the serial number of the positive sealing device matches the serial number recorded on the Group Lockout Checklist 2. Once all personal locks and personal tags have been applied, machinery or equipment is now de-energized and locked out and maintenance work may proceed. <p>***NOTE: Elaborate on the above steps so that it is specific to the machinery or equipment that needs to be locked out.</p>
GROUP LOCKOUT REMOVAL PROCEDURE	
<p>Describe detailed procedures to be followed when work is complete and group lockout is to be removed.</p>	<p>Upon completion of maintenance work, the authorized employee(s) will:</p> <ol style="list-style-type: none"> 8. Remove their personal lock and personal tag. <p>Once all authorized workers have removed their personal locks and personal tags, Lead Hand will:</p> <ol style="list-style-type: none"> 1. Confirm that all work has been complete in a safe manner, that group lockout procedures were followed, and that the machinery or equipment is safe to be restarted 2. Sign the Group Lockout Checklist 3. Notify the 2 qualified workers that it is safe to end the group lockout. <p>Once Lead Hand confirms it is safe to end group lockout, the 2 qualified workers will:</p> <ol style="list-style-type: none"> 1. Confirm Lead Hand signed the Group Lockout Checklist 2. Verify that no personal locks are on the group lock box 3. Ensure all affected employees are clear of the machinery or equipment and in a safe location, prior to removing group lockout 4. Ensure all tools and maintenance equipment has been removed from the area. 5. Remove positive sealing device from group lock box. If the 2 qualified workers are different than the 2 qualified workers removing the positive sealing device are different, they must also clearly print their names and contact phone numbers on the Group Lockout Checklist and sign the Group Lockout Checklist. Once the positive sealing device has been removed from the group lock box, the group lockout is no longer in effect 6. Remove all group locks and group lockout tags. 7. Start the machinery or equipment according to normal operating procedures. 8. Notify affected employees that maintenance is complete and operation may resume. 9. Give completed Group Lockout Checklist to the Qualified Supervisor for record keeping. <p>***NOTE: Elaborate on the above steps so that it is specific to the machinery or equipment that needs to be locked out.</p>

THIS SAFE WORK PROCEDURE WAS DEVELOPED BY:		
NAME (PLEASE PRINT)	SIGNATURE	DATE



Appendix C: Group Lockout Checklist

If more than 3 energy isolating devices must be locked out, and /or a large number of workers will be working on the machinery or equipment and/or where the energy isolating devices are a considerable distance apart, job-specific group lockout procedures must be established and this form must be completed, signed and posted.

Building Name:		
Date (MM/DD/YY):	Time:	AM/PM Positive Sealing Device #:
Reason for Group Lockout:		

Room or Manhole #	Equipment	Device	Energy Source	Description	Open or Close	Qualified Worker 1 (QW1)				Qualified Worker 2 (QW2)				Lock Off (Initial)		
						Tag	Lock	Test	Initial	Tag	Lock	Test	Initial	QW1	QW2	

THIS EQUIPMENT HAS BEEN SHUTDOWN, DE-ENERGIZED AND LOCKED OUT BY 2 QUALIFIED WORKERS AND IS SAFE TO START MAINTENANCE WORK ON THIS EQUIPMENT

_____	_____	_____	_____	_____	_____	_____	_____
Qualified Worker 1 Name	Phone Number	Qualified Worker 1 Signature	Date (MM/DD/YY)	Qualified Worker 2 Name	Phone Number	Qualified Worker 2 Signature	Date (MM/DD/YY)

Lead Hand (LH) VERIFIED MAINTENANCE WORK ON THIS EQUIPMENT IS COMPLETE AND IT IS READY TO BE RETURNED TO SERVICE

_____	_____
Lead Hand (LH) Name	Lead Hand (LH) Signature
_____	_____
Date (MM/DD/YY)	

2 QUALIFIED WORKERS TO REMOVE GROUP LOCKOUT

_____	_____	_____	_____	_____	_____	_____	_____
Qualified Worker 1 Name	Phone Number	Qualified Worker 1 Signature	Date (MM/DD/YY)	Qualified Worker 2 Name	Phone Number	Qualified Worker 2 Signature	Date (MM/DD/YY)



Appendix D: Emergency Lock Removal Form

When it is deemed necessary to have a lock removed by a person other than the owner of the lock, this form must be filled out by the immediate qualified supervisor and manager, BEFORE THE LOCK IS REMOVED and an incident investigation report must be completed, as per section 9.4 of the UBC De-Energization and Lockout Program. A copy of this completed form signed by the manager must be attached to the incident investigation report.

Date of Removal (MM/DD/YY):	Time of Removal: AM/PM
Lock Applied By:	Department/Shop:
Location of Lock:	
Reason for Lock Removal:	

EMERGENCY LOCK REMOVAL PROCEDURE (Please check <input checked="" type="checkbox"/>)			
1	Immediate qualified supervisor in charge makes every reasonable effort to contact the worker who installed the lock.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
2	Immediate qualified supervisor in charge determines reason for the lockout.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
3	Immediate qualified supervisor in charge determines if the machinery/equipment/system is safe to energize before removing the lock.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
4	Immediate qualified supervisor in charge contacts manager for approval to remove the lock.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
5	Immediate qualified supervisor in charge takes necessary steps to ensure it is made safe to remove the lock.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
6	Immediate qualified supervisor provides a qualified worker to witness the lock removal.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
7	Manager to remove lock in the presence of the qualified worker once the above steps are complete.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
8	Manager notifies the owner of the lock that the lock has been removed, at the start of their next work shift.	Yes <input type="checkbox"/>	No <input type="checkbox"/>

_____	_____	_____
Qualified Supervisor Name	Qualified Supervisor Signature	Date (MM/DD/YY)
_____	_____	_____
Qualified Worker Name	Qualified Worker Signature	Date (MM/DD/YY)
_____	_____	_____
Manager Name	Manager Signature	Date (MM/DD/YY)

LOCK REMOVED BY:

_____	_____	_____
Manager Name	Manager Signature	Date (MM/DD/YY)
Date and Time Owner of Lock was notified:	_____	_____ AM/PM
	Date (MM/DD/YY)	TIME