THOMPSON RIVERS UNIVERSITY | Safety & Emergency Management

Safe Work Procedure

Lockout and Zero-Energy Procedures

OSEM 18.18.3

Program/Services	**Safe Work Procedures**		**Department:**
Facilities, Trades, Contractors			Safety and Emergency Management
Personal Protective Equipment or Devices Used • Safety Gloves • Personal Locks • Scissor Clips • Lockout Tag	**Training Requirements** • Training in lockout procedures	**Applicable Documents** • Lock removal form	**Effective Date:** May 1, 2023

ELECTRICAL HAZARD	**PINCH POINTS**
	
Do not attempt to service electrical wires.	Use LOCKOUT procedures when performing maintenance or conducting any work within 12” of an exposed pinch point. **NEVER** put your hands or feet near an exposed pinch point or gears.

Note: This procedure applies to all Thompson Rivers University (TRU) employees, students, and any contractors working on TRU equipment or machinery.

Contents

1. Purpose

The purpose of this document is to provide guidance to all TRU Employees in the de-energization and lockout of all systems and/or machinery that workers may need to maintain or otherwise perform work on. The control of hazardous energy and the de-energization of systems, equipment and machinery is a critical step in ensuring the safety of workers. Attaining a zero-energy state through isolating or removing energy sources (Electrical, Chemical, Thermal, Kinetic and Potential) is the purpose of this procedure. In cases where this cannot be attained, effective controls and/or safeguards must be in place before work can proceed.

When is “Lockout" Required?

Occupational Health and Safety Regulations require that any person (employee or student) performing maintenance or otherwise performing work on machinery or equipment must secure all parts and attachments against inadvertent movement, where the work will expose workers to energy sources. The hazard must be effectively controlled, and the energy isolating devices must be locked out as required in these procedures through compliance with this lockout procedure, any person working on a piece of machinery for any period of time, can be assured of not being injured due to accidental or inadvertent engagement of any power supply system. The intention is to ensure that the machine or equipment is placed in a "zero-energy state".

2. Responsibilities

2.1. Supervisors are assigned the responsibility to ensure that all persons are adequately instructed in lockout procedures and that all energy sources for equipment and machinery are deactivated and secured in the “off” position through the use of appropriate locks.

2.2. Supervisors must enforce the use of lockout devices and ensure procedures are applied in their area of operations.

2.3. It is the responsibility of all persons engaged in maintenance activities (as defined by the Worksafe BC regulations) to know and comply with the lockout procedures. Failure to follow these lockout procedures is cause for disciplinary action.

2.4. It is the responsibility of all persons engaged in maintenance activities or otherwise involved in work on energized equipment to ensure all equipment has been disconnected from energy sources, verified as in a state of “zero-energy”, and tested to ensure effectiveness of the lockout.

2.5. In the event a worker violates a lockout procedure, the Supervisor shall also be held accountable for the workers failure to comply.

2.6. Contractors or service technicians not in the direct employ of TRU shall be responsible for providing their own locks. Under no circumstances will TRU provide locks to non-employees.

3. Training

3.1. Training in lockout procedures will be provided to all persons who are required to use this or similar procedures. Training will be provided and confirmed by their immediate supervisor or other trained person.

3.2. When the findings of an incident investigation indicate that an employee requiring knowledge in lockout has demonstrated a lack of understanding of the requirements and/or a failure to follow these requirements, they shall be required to take additional training prior to being allowed to engage in any work activity which requires the protection of lockout.

4. Authorization

4.1. Maintenance of TRU equipment or machinery will only be conducted by persons authorized and trained to perform such work.

4.2. Contractors or outside services personnel will sign-in with the appropriate department (usually Facilities) prior to commencing their work.

5. General

5.1. Some means of attaching a lock and securing the control device in an inoperable position will be provided for all types of control devices encountered within TRU.

5.2. When the control device is a circuit breaker, special lockout devices will be attached before the use of multiple lock attachments and locks.

5.3. On circuit breaker panels, the use of the built-in lock on the panel cover door will not be used for lockout.

5.4. If equipment is fitted with interlocks, the interlocks will be disabled and locked out.

5.5. An electrical disconnect must not be disengaged (pulled) while it is under load. Such action can cause arcing or an explosion and result in injury or property damage.

5.6. The removal of fuses for the sole purpose of disconnecting power is prohibited.

5.7. In High Voltage installations (voltage over 750 volts) only a qualified electrician should operate the main disconnect.

5.8. The use of "Do Not Start" or "Lockout" tags in place of locks is prohibited within all TRU campuses.

6. Locks and Keys

6.1. Each authorized person will be issued with their own personal locks (a minimum of 3), which must be clearly and permanently marked, labelled or stamped with that person's name in order to identify the owner of the locks.

6.2. Locks shall be keyed alike for each individual. No two people shall have matching locks. A sufficient number of keys will be issued to each person for their own locks.

6.3. No duplicate keys will be retained by the supervisor or any person other than the worker to whom the locks were assigned. No keys for lockout locks shall be retained in the Facilities Service Department key cabinet.

6.4. In the event that a person's keys are lost, the locks will be removed in accordance with WorkSafeBC Regulations and the Lock Removal process in this policy.

6.5. Any person losing their keys and/or locks must report that loss to their

Supervisor immediately. Where keys are lost, if the individual does not have replacement keys, new locks will be issued or the existing locks re-keyed if possible.

6.6. Under no circumstances are an individual's personal locks to be loaned or borrowed.

7. Maintenance Department Locks

7.1. "Maintenance Department Locks" or "Facilities Service Locks" are used to secure equipment in an inoperable condition for a long period of time.

7.2. These locks are different in size, shape and colour from the type of locks used by individuals.

7.3. They are numbered consecutively and the number is recorded.

7.4. Control of these locks and their keys is the responsibility of the Manager, Mechanical and Electrical Services.

7.5. A register/log is maintained to account for the whereabouts of these locks. A record is kept of who signed the lock out and where the lock it to be used. Upon return, each lock is logged back in.

7.6. These locks are not to be used in place of personal locks under any circumstances.

8. Plugged in Equipment

8.1. Lockout is not required when one person is working on equipment that is connected to a wall or floor mounted socket or receptacle by removable plug, subject to the person performing maintenance work being able to keep exclusive and immediate control over the plug at all times.

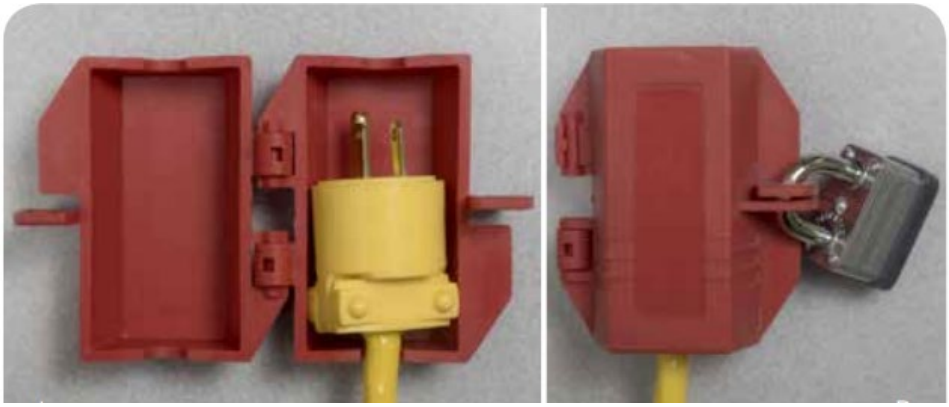
8.2. Before doing any maintenance work on such equipment the plug must be removed from the outlet.

8.3. Removal of the correct plug must be verified before work commences to ensure that the machine has been disconnected. This must be done through test to confirm that the equipment does start when not plugged in and does not when unplugged.

8.4. Additionally, to ensure that the plug cannot be plugged into an outlet accidentally, the worker can apply a smaller personal lock through the holes in the prongs of the plug if available.

8.5. If the prongs cannot be disabled via use of a lock or when more than one person works on a piece of plug in equipment, a specialized plug lock box shall be attached to the free end of the cord and normal lockout procedures shall be followed using multiple lock attachments. See Figure 1.

Figure 1 – Plug Lock Box



9. Locking Out

Five basic steps to a de-energization and lockout procedure.

Worksafe BC defines the basic steps as follows:

9.1. Identify the machinery or equipment that needs to be locked-out.
9.2. 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 for other workers.
9.3. Identify and de-energize all hazardous energy sources.
9.4. Apply a personal lock to the energy-isolating device for each hazardous energy source. Check that the machinery or equipment is in a zero-energy state.
9.5. Verify the effectiveness of the de-energization and lockout process. First ensure that all workers are clear of the hazards and that no hazard will be created if the process is not effective. Test de-energization and lockout after each energy-isolating device is locked out or after a group of nearby devices is locked out. The most common way to test the effectiveness is to attempt to start the equipment and confirm it does not start.

Source: https://www.worksafebc.com/en/health-safety/tools-machinery-equipment/lockout

10. Primary Authorized Worker (First Person Locking out)

10.1. Must verify that hazardous energy sources are isolated so that maintenance can be performed.
10.2. Inform employees who will be affected by the shutdown.
10.3. Use the start/stop switch to turn the machine off and ensure that the machine is no longer running.
10.4. Disconnect from power supply - face AWAY from the breaker and using your non-dominant hand operate the switch into the OFF position using a continuous motion.
10.5. Apply a scissor-clip to the switch and place your lock on to the scissor-clip.
10.6. In addition to the regular lockout procedures, airlines running to machinery that may put an employee in any danger, must be locked out by using a lock and scissor clip. Ensure that the airline remains open by either locking open or

having an open line so that the system cannot be re-pressured. After locking out the airline, the Operator must then bleed the line(s) in the machine, ensuring that no air pressure remains.

10.7. Any hydraulically actuated machinery that may be dangerous must be put in the "DOWN" position before the machine is locked out and the hydraulic lines must be isolated as above for airlines remaining open.

10.8. Ensure that your scissor-clip and lock effectively prevent somebody else from turning the power back on.

10.9. Test the effectiveness of the lockout by carefully trying to start the machine.

11. Verifying Zero-Energy

A zero-energy state is attained when all energy sources have been removed or controlled, and all stored or residual energy has been discharged.

11.1. Ensure all sources of hazardous energy have been identified and controlled through lockout and/or de-energization.

11.2. Ensure that all workers are clear of the hazards and that no hazard will be created if the process or machinery does inadvertently start.

11.3. Conduct a test to try starting equipment which will be worked on. This may include activating "Start" switches but should also include reviewing of actuators, schematics, and circuits for complex/automated systems for stored hazardous energy.

12. Multiple Lock Attachments/Scissor Clips

12.1. Each authorized TRU person shall be issued with a minimum of three (3) multiple lock attachments.

12.2. A sufficient number of multiple lock attachments shall be readily available in each motor control centre (MCC) or other location where they might be required.

12.3. When using these devices, never apply a lock to the last available opening. Always apply another multiple lock attachment.

13. Complex Group Lockout (when others are working on same machine)

13.1. If a large number of workers are working on machinery or equipment, or a large number of energy isolating devices must be locked out, the following group lockout procedure can be used.

13.2. In a group lockout procedure 2 qualified persons are responsible for:

13.3. Independently locking out the energy isolating devices.

13.4. Securing the keys for the locks used with personal locks or other positive sealing devices deemed acceptable by WCB.

13.5. Completing, signing, and posting a checklist that identifies the machinery or equipment components covered by the lockout.

13.6. Prior to starting work, each worker must apply a personal lock to the key securing system.

13.7. 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.
13.8. When work is completed, people remove their keys from the key securing system.
13.9. When it is determined that it is safe to end the group lockout, the 2 qualified persons identified in subsection 2 remove their locks.
13.10. This procedure must be posted where the system is in use.

If in doubt about any lockout or lockout procedure, then ask your supervisor or Safety & Emergency Management Department.

Every employee working on a locked-out machine must have their own lock or locks applied to lockout all power sources and sources of energy.

14. Energizing equipment for testing or troubleshooting

In some cases, total de-energization and lockout is not possible, or some processes may need to be tested or used for troubleshooting.

Employee locking out:

14.1. Workers engaged in work on live equipment will be fully authorized and trained.
14.2. The workers will ensure that a lockout tag will be affixed to the piece of equipment where live work is being performed.
14.3. The person must ensure that they will NOT be exposed to any potential hazard as illustrated in Section 3.
14.4. There must be at least one other person in the area who knows how to turn off or disengage the machine in an emergency situation.
14.5. The person must secure the area to ensure that all people in the area know that the machine is being worked on.
14.6. The Employee must walk around the machine to ensure that all other persons are clear and that it is safe to energize the machine, i.e. belts have been replaced and tools removed.
14.7. The Employee may then energize only the part of the machine necessary to do the required work.
14.8. Once the work that required the machine to be energized is complete, regular lockout or operation procedures then apply.

15. Lock removal under normal circumstances

15.1. When leaving work, or going off shift, your relief must put their own personal lock on BEFORE you remove yours. Otherwise the lockout is ended.
15.2. People are forbidden to remove locks belonging to another employee, contractor, or student. Doing so will result in disciplinary action. Locks can only be removed by the person who installed them, or through completing the Lock Removal process described in this Policy.

15.3. In the case of an emergency, locks can only be removed after following the lockout removal process and completing forms as laid out in this procedure.
15.4. End the lockout by removing locks after work completed.

Before you remove your lock - ENSURE THAT:

- Any defective guards and safety devices are repaired or replaced.
- All components are properly installed including guards and safety devices.
- The equipment or process is free of incomplete work, obstructions and other unnecessary items.
- You know the sequence for lock removal and start-up.
- Everyone is clear and remains clear of danger during start-up.
- On completion of the work, remove your lock (and clip if you are the last lock remaining).
- Restore power - face AWAY from the breaker and using your non-dominant hand operate the switch into the ON position using a continuous motion.

Removing another employee's lock is a serious matter and is <u>prohibited</u> unless the removal is authorized and completed by following the procedure below. The need to remove another employee's lock must be referred to the Supervisor or Manager in charge.

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16. Removing a lock belonging to another employee or in the case of an emergency

*If it is not known why a machine is locked out and the person who installed the lockout is not available, the **Supervisor** or **Manager** will be notified.*

Supervisor / Manager in charge will:

16.1. Make every reasonable effort to contact the lock owner and document the attempts on the Lock Removal Form.
16.2. Contact the chairperson (for instructional staff), or the appropriate Manager (for non-instructional staff) to request their attendance to the area for inspection and lock removal.
16.3. Contact a member of the Safety & Emergency Management Department, if on site, and ask them to be involved in the site inspection to ensure safety and the removal of the lock(s).
16.4. Check with Maintenance Personnel to ensure that the machine or equipment can be operated safely before removing the lock.
16.5. Have at least one worker representative present during the inspection and lock removal.
16.6. If the lock owner cannot be located, the area has been inspected and verified to be clear of hazards the lock may be removed.
16.7. Fill out and distribute the Lock Removal Form.

16.8. Forward the cut lock and form to the Safety & Emergency Management Department for follow-up if no S&EM Department member was on site at the time.
16.9. Notify the worker at the start of their next shift that their lock has been removed. Action taken as a result of the lock removal will be documented.

Violation of lockout procedures and/or rules will not be tolerated. Disciplinary action will result.

Definitions

Assigned Lock - Refers to a lock for which the worker personally controls the key.

Authorized Person - Refers to a person who has been authorized by a TRU supervisor to perform the maintenance work being conducted. May refer to an employee, student or contractor.

Control Device - means the device controlling the flow of power to the machinery or equipment and includes, but is not limited to: switches, circuit breakers, valves and clutches. In the case of electrical controls, it means the device controlling the flow of current to the branch circuit which supplies power to the machinery or equipment. Individual control buttons or switches in control circuits are excluded.

Control Power - A term often used to refer to the energy source which powers only the control circuit for the machinery or equipment, rather than the machine or equipment itself.

Disconnect - A mechanism which disconnects the machinery or equipment from the power source. (see "control device").

Hazardous Energy - see "power source".

Intermediate Disconnect - Refers to a control device installed between the main motor control centre [MCC] and the piece of machinery. The intermediate disconnect is usually located near the machinery to be serviced. These devices are often used for the convenience of workers to reduce time delays which might occur by having to go to the MCC to perform lockout functions. Where such devices are installed for the purposes of lockout, they shall simultaneously disconnect both the motor and the motor control circuits (control power) from their sources of supply.

Lock - Means a keyed padlock which will secure a control device in the "off" position and prevent it from being reactivated. Combination locks or locks using magnetic keys or bars are not acceptable.

Lockout - Is the term applied to a system or procedure designed to control all situations where the unexpected energization, start-up, or release of stored energy of the

equipment, machinery or process, would be likely to endanger or injure personnel. Also, may be used to refer to the actual task of applying proper locks.

Lockout Loop - Refers to the loop provided on the handles of electrical disconnects, or in specialized lockout devices for the purpose of attaching locks or multiple lock attachments.

Maintenance - Means the work of keeping the machine or equipment in a safe operating condition and includes, but is not limited to repairing, adjusting, cleaning, lubricating and the clearing of obstructions to the normal flow of material.

Motor Control Centre (MCC) - Usually refers to a centralized location of the main control devices which service the machines or equipment of a given area. These centres may be located some distance from the machinery which they serve.

Multiple Lock Attachment - Means a device designed to be used to secure a control device in the "off" position and has the provision to accommodate several locks. Includes device commonly called "scissors clips", etc. May also include the use of cable lock systems, chains, etc.

Plug-in Equipment - Includes electrical equipment or machinery which is not wired directly to its power source, but uses an electrical wire or cord fitted with a pronged plug on the end of the cord.

Power Source - Means any source of power which provides the energy required to drive a piece of machinery or equipment and includes, but is not limited to: electrical, steam, hydraulic, water, air, mechanical radiation, and thermal forms of energy. Also includes any elevated object or part which could injure or endanger a worker in the event that it unexpectedly moved.

Tags - Refers to "Do Not Operate" tags or another similar label used to indicate that the device is not to be operated. The use of "Do Not Operate" tags within the TRU work environment is prohibited. The TRU Lockout Procedure must be followed.

Records/Verification of Understanding

Records

All Lockout Checklists and Lock Removal Forms must be maintained by the Supervisor in charge.

Verification of Understanding

A training master log will be maintained by Supervisors of employees required to lockout and TRU Health and Safety Department.

Summary of Changes

Revision #	Date	Change (include section #)	Issued By
1	01/23/2014	NEW	OHS Officer
2	04/17/2019	Review, Revision and New Format	Safety Officer
3	04/18/2023	Review and revise to include zero-energy. **Need to update webpage here:** **https://www.tru.ca/risk-management-services/safety/safety-programs/work/lockout.html**	Safety Manager

THOMPSON RIVERS UNIVERSITY
Safety & Emergency Management

TRU LOCK REMOVAL FORM

OSEM 10.15.2

Lock(s) Owner:	**Date:**	**Time:**

Persons witnessing lock(s) removal:

Supervisor's name:

Location and equipment/job affected:

Reason(s) for lock(s) removal:

Has all equipment been cleared and area safe prior to removal?

Attempts to contact the owner of the lock(s)

Time:	**Place:**
Time:	**Place:**
Time:	**Place:**
Time:	**Place:**

Area or equipment checked for:

- ☐ **Obstructions**
- ☐ **Tools**
- ☐ **Personnel**
- ☐ **Signs of work**
- ☐ **Safe to operate**

Lock removed by:

Lock out restored:

Equipment started and checked for correct operation:

Signatures:

Witness(es)	Supervisor	Manager	S&EM Officer
Information reviewed by Manager, Safety and Emergency Management and Lock Owner			
Date:	**Time:**		
Action Taken:			
Lock Owner's Name: (Print)	Signature:	OHS Manager Name (Print)	Signature: