



Section:	Occupational Health and Safety Management System	Date of Issue:	2007.07.24
		Issued By:	Environment, Health & Safety
Part:	Hazard Identification and Assessment Hazard Control	Revision #:	2
		Revision Date:	2015.10.13
Pages:	14	Revised By:	TKM

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## **Purpose**

This program has been developed to provide guidance and direction to the Departments and Faculties of the University of Calgary when undertaking activities that require the control of hazardous energy.

## **Scope**

This control of hazardous energy program is applicable to all University of Calgary Faculties, Departments, and persons who may be tasked with servicing, repairing, testing, adjusting or inspecting machinery, equipment or powered mobile equipment on or off campus.

This scope does not include those working with hazardous energy as defined through the Alberta Electrical Utilities Act and Code (systems above 750 volts).

## **Responsibilities**

### **Managers are responsible for:**

- Managing the implementation of this program within specific Faculties or Departments,
- Assigning responsibilities, establishing accountability, and delegating the authority to implement this program,
- Ensuring that every worker who may be required to control hazardous energy as part of their work duties has the control of hazardous energy task identified on their job Hazard Assessment and Control Form (HACF)
- Ensuring workers have received training on controlling hazardous energy, the associated hazards, and, the applicable controls mitigating those hazards as detailed on the HACF

### **Workers are responsible for:**

- Complying with this Control of Hazardous Energy Program (IE: following all procedures and protocols when working with potentially hazardous energy),
- Completing FLHA(s) prior to work activities, as required,

### **Environment, Health and Safety is responsible for:**

- Periodically reviewing and updating this program as required.
- Periodically auditing faculties and departments for compliance to this program.

## Procedures

### SECURING ISOLATION BY INDIVIDUAL WORKER

The following lockout sequence will be used to ensure the machinery, equipment, or powered mobile equipment is stopped, isolated from all energy sources, locked out, and bump tested before workers perform any service or maintenance:

1. **NOTIFICATION:** Notify the appropriate personnel when servicing or maintenance is required on equipment. The notice will inform the appropriate personnel that the equipment must be shut down and locked out to perform servicing or maintenance.
2. **FIELD LEVEL HAZARD ASSESSMENT:** Worker to complete field level hazard assessment to document hazards related to the potential release of energy and the tasks to be completed during the lockout.
3. **SHUT DOWN:** If the equipment is operating, shut it down by the normal stopping procedure (e.g. Depress the “STOP” button, open switch, or close valve).
4. **ISOLATE ENERGY SOURCE:** All energy sources providing energy must be identified, isolated and secured to prevent energy from reaching the machinery, equipment, or powered mobile equipment. An energy isolating device will be attached to each energy source to prevent the transmission of energy to the machinery, equipment, or powered mobile equipment.
5. **LOCK OUT:** All energy isolating devices will be secured in place using a worker’s assigned Personal Safety Lock (PSLs). Tags will be applied to all locks, tags must state the worker’s name, date the tag was applied, and must indicate that the equipment to which it was attached may not be operated until the tag is removed.
6. **DE-ENERGIZE:** Stored or residual energy (such as that in capacitors, springs, elevated machine components, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure) must be dissipated or restrained by a method such as grounding, repositioning, blocking, or bleeding down.
7. **BUMP TEST:** the worker will verify the energy isolation by attempting to operate the machinery, equipment, or powered mobile equipment or by other testing to make certain it will not operate.  
**CAUTION:** *Return operating control(s) to neutral or the “OFF” position after verifying isolation.*
8. The machinery, equipment, or powered mobile equipment is now locked out.

#### RESTORING EQUIPMENT TO SERVICE:

9. **INSPECT EQUIPMENT:** Check the equipment and the immediate area around the equipment to ensure that non-essential items have been removed and that the equipment components are operationally intact.
10. **VERIFICATION:** Check the work area to ensure that all worker(s) have been safely positioned or removed from the area.
11. **NEUTRAL:** Verify that the controls are in neutral.

12. REMOVE & REENERGIZE: Remove the energy isolation device(s) and re-energize.
13. FINAL CHECK: Operate the machinery, equipment, or powered mobile equipment to confirm the repair or service has been successfully completed and the machinery, equipment, or powered mobile equipment is operating as intended.
14. NOTIFICATION: Notify the appropriate personnel that the servicing or maintenance is completed and the machine or equipment is ready for operation.

### **Securing Isolation by a Group of Workers:**

The following lockout sequence will be used to ensure that the machinery, equipment, or powered mobile equipment is stopped, isolated from all energy sources, and locked out before workers perform any service or maintenance. Where the Group Primary has been identified as responsible to carry out an action the Group Alternate will be responsible to confirm the action has been completed.

1. NOTIFICATION: The Group Primary notifies the appropriate personnel when service or maintenance is required. The notice will inform the appropriate personnel that the equipment must be shut down and locked out to perform servicing or maintenance.  
  
HAZARD ASSESSMENT: The Group Primary must investigate and identify the type and magnitude of energy supplied, understand the hazards of the energy, and know the procedures to control the energy.
2. ISOLATE ENERGY SOURCE: The Group Primary ensures all energy sources are identified and isolated using energy isolation devices before the activity begins. The energy isolation devices must prevent energy from reaching the machinery, equipment, or powered mobile equipment.
3. LOCK OUT: The Group Primary ensures all energy isolating device(s) are secured with group locks, key securing systems, and/or other control of hazardous energy equipment as required. Tags will be applied to all locks, tags must state the worker's name, date the tag was applied, and must indicate that the equipment to which it was attached may not be operated until the tag is removed.
4. DE-ENERGIZE: Stored or residual energy (such as that in capacitors, springs, elevated machine components, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure) must be dissipated or restrained by a method such as grounding, repositioning, blocking, or bleeding down.
5. BUMP TEST: the Group Primary will verify the energy isolation by attempting to operate the machinery, equipment, or powered mobile equipment or by other testing to make certain it will not operate.  
**CAUTION:** *Return operating control(s) to neutral or the "OFF" position after verifying isolation.*
6. POSTING the WORKSITE: The Group Primary will post a notice identifying all the equipment has been locked out.
7. RESTORING EQUIPMENT TO SERVICE: The Group Primary checks the equipment and the immediate area around the equipment to ensure that non-essential items have been removed and that the equipment components are operationally intact. The Group Primary ensures all workers are accounted for and have removed their PSLs from the group lockout device.

8. VERIFICATION: The Group Primary will ensure no other worker is endangered when the equipment is returned to service.
9. FINAL CHECK: The Group Primary will operate the machinery, equipment, or powered mobile equipment to confirm the repair or service has been successfully completed and the machinery, equipment, or powered mobile equipment is operating as intended (or, utilize another testing method to confirm the repair or service was successfully completed.)
10. NOTIFICATION: The Group Primary notifies the appropriate personnel when service or maintenance has been completed and the equipment is returned to service.

### **Process Maps**

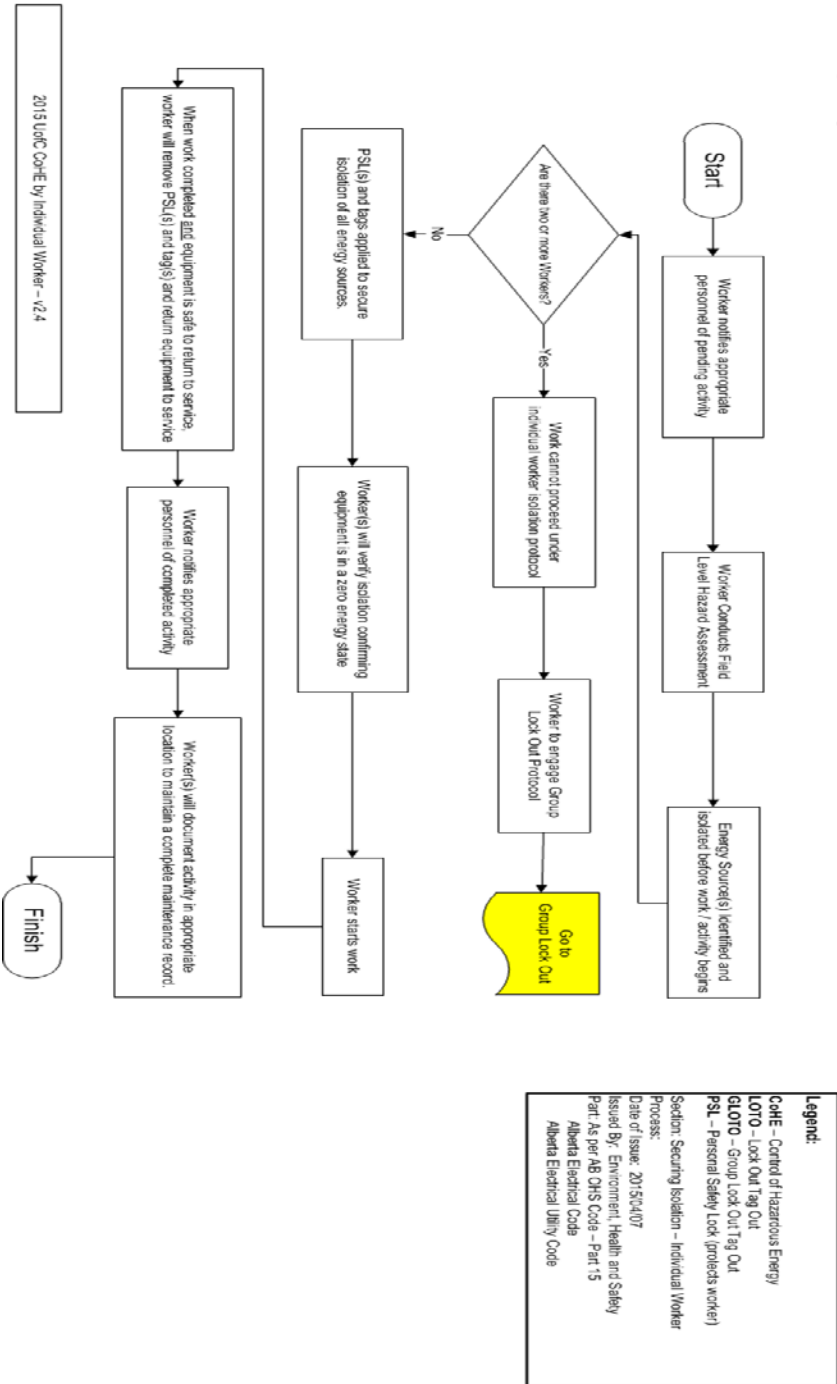
University of Calgary Securing Isolation by Individual Workers – Figure 1



Securing Isolation by Individual Workers  
For the  
Control of Hazardous Energy

Securing Isolation by Individual Workers  
Process Map – Figure 1

**Locks and Tags to be used when machinery, equipment or powered mobile equipment is serviced, repaired, tested, adjusted or inspected.**  
This process to be used when a worker is servicing, repairing, testing, adjusting or inspecting machinery, equipment or powered mobile equipment and controlling hazardous energy is required.  
This process will apply when a worker must apply locks and tags to control hazardous energy while performing their duties.



**Legend:**  
 COHE – Control of Hazardous Energy  
 LOTO – Lock Out Tag Out  
 GLOTO – Group Lock Out Tag Out  
 PSL – Personal Safety Lock (protects worker)  
 Section: Securing Isolation – Individual Worker  
 Process:  
 Date of Issue: 2015/04/07  
 Issued By: Environment, Health and Safety  
 Part – As per AB OHS Code – Part 15  
 Alberta Electrical Code  
 Alberta Electrical Utility Code

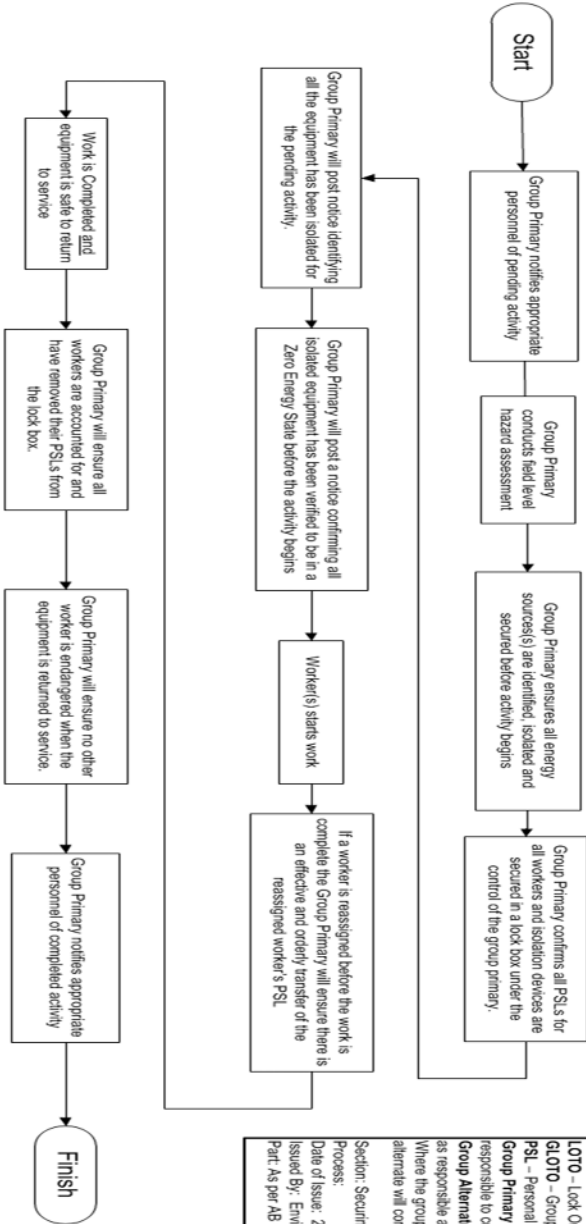
2015 UofC COHE by Individual Worker – v2.4



Securing Isolation by a Group of Workers  
For the  
Control of Hazardous Energy

**Locks and Tags to be used when machinery, equipment or powered mobile equipment is serviced, repaired, tested, adjusted or inspected.**  
This process to be used when more than two workers are servicing, repairing, testing, adjusting or inspecting machinery, equipment or powered mobile equipment and securing hazardous energy is required.  
This process will apply when a more than two workers must apply locks and tags to control hazardous energy while performing their duties.

Group Lock Out / Tag Out  
Process Map- Figure 2



**Legend:**

COHE - Control of Hazardous Energy  
 LOTO - Lock Out Tag Out  
 GLOTO - Group Lock Out Tag Out  
 PSL - Personal Safety Lock (protects worker)  
 Group Primary - Worker designated by the employer as responsible to confirm all requirements are verified  
 Group Alternate - Worker designated by the employer as responsible as a back up to the Group Primary. Where the group primary is assigned an action the group alternate will confirm the action is completed.

Section: Securing Isolation - Group COHE  
 Process:  
 Date of Issue: 2015/02/06  
 Issued By: Environment, Health and Safety  
 Part As per AB OHS Code - Part 15

## LOCK REMOVAL

On occasion it may be necessary for a lock to be removed by someone other than the worker who applied it. When the worker who applied the lock is absent the following procedure will be applied before the lock is removed:

1. The supervisor will make every reasonable attempt to contact the worker before removing the lock. If successfully contacted the worker is made aware of the situation and asked to come back to the worksite to remove the lock.
2. If the supervisor is unable to contact the worker they must confirm the status of the equipment or process and verify it to be in a state that will allow for the safe removal of the lock and that no person will be put at risk when the lock is removed.
3. The lock and tag are removed with a witness present and secured by the individual responsible for the removal.
4. Provisions are made to ensure the owner of the lock is notified that their lock and tag have been removed.
5. The individual responsible for the lock removal will complete a lock removal report detailing why it was necessary to remove the lock and what steps were taken to verify the equipment or process was in a state allowing for the safe removal of the lock. The lock removal report will be retained by the employer for three years.

[See Appendix: University of Calgary Lock Removal Form](#)

## Other Methods

Traditional lock out to a full zero energy state is not practical in all situations. When lockout affects tasks that are integral to the process by design, or traditional lock out prohibits the completion of specific tasks, other hazardous energy control methods may be used. Control options must be used in accordance with the hazard assessment and hierarchy of controls to ensure effective protection.

Standard operating procedures must be documented and must identify the specific equipment, machinery or powered mobile equipment for which they apply. A separate procedure must be created for each piece of equipment and must include specific steps for shut down, isolation, blocking and securing equipment to control hazardous energy. Multiple machines may be grouped under a single procedure if the magnitude of hazardous energy and the energy controls are similar. Specific steps for the placement, removal and transfer of lock out/ tag out devices should also be included.

## Education & Training

All University of Calgary workers who may be asked to work with hazardous energy must receive adequate training, including the awareness level online training course provided by EHS. The required training will be defined within the job profile and/or the Hazard Assessment and Control Form (HACF).

Where necessary, the worker's faculty or department will provide or arrange for training on site specific requirements, standard operating procedures, safe work instructions and emergency procedures.



Additional training will be required at regular intervals to ensure workers remain competent to perform the work and requirements of the applicable programs and procedures.

Records of worker training must be maintained by the worker's faculty or department.

### **Program Review and Audit**

The goal of program review is to continuously improve the Control of Hazardous Energy Program.

Environment, Health & Safety will regularly review the Control of Hazardous Energy Program and conduct periodic audits / assessments of the Faculty and Departmental compliance to the program.

Program review and audit will include a review of the written program, training records, incident investigations, control of hazardous energy requirements and any other safe work procedures.

## Definitions

**Authorized individual:** a person who is designated by the employer and is qualified to engage in hazardous energy control (application of Personal or Equipment Lock) because of knowledge, training, experience.

**Competent:** In relation to a person, means adequately qualified, suitably trained and with sufficient experience to safely perform work without supervision or with only a minimal degree of supervision,

**Contractor:** Any external employer engaged to perform services for a University representative.

**Control System Isolating Device:** means a device that physically prevents activation of a system used for remotely controlling the operation of equipment.

**Effective and Orderly Transfer of Control:** means the transfer of control of an isolated process from one authorized or qualified and competent worker to another. An effective and orderly transfer will ensure that the continuity of the isolated process is protected and no other worker or person will be placed at risk while the control is transferred.

**Energy Isolating Device:** is a mechanical device that is used to physically restrain and prevent, regulate, direct, or dissipate the transmission or release of energy.

**Energy Isolation Point:** the location on the equipment, machinery or powered mobile equipment where isolation of energy can occur.

**Equipment Lock:** Equipment locks are **not safety locks**, they are used to secure assets or equipment in a non-operational or zero energy state so they cannot be energized, operated or started for a variety of reasons. Equipment locks are to be used for the operational isolation of equipment, machinery or powered mobile equipment.

**Group Locks:** Group locks are **safety locks** intended for the sole purpose of protecting a group of workers. Group locks are uniquely keyed and are used in group lock out / tag out protocols in the control of hazardous energy.

**Group Alternate:** The group alternate is the worker designated by the University as responsible to back-up the group primary. Where the group primary is assigned an action the group alternate will confirm the action has been completed.

**Group Primary:** The group primary is the worker designated by the University to direct or oversee a control of hazardous energy group lockout activity. The Group Primary will be responsible to remove the group locks from the energy isolating devices and ensure that no workers will be in danger when the equipment is returned to operation.

**Hazard:** is a situation, condition, process, material or thing that may cause an injury or illness to a worker.

**Hazardous Energy:** means electrical, mechanical, hydraulic, pneumatic, chemical, nuclear, thermal, gravitational, or other form of energy that could cause injury due to the unintended motion, energizing, start-up, or release of such stored or residual energy in machinery, equipment, piping, pipelines, or process systems.

**Isolate:** means the use of a mechanical device to restrain, regulate, direct, or dissipate hazardous energy.

**Isolated:** means to have separated, disconnected, de-energized or depressurized.

**Isolation:** means to disconnect all energy sources from the machinery, equipment or powered mobile equipment to be worked on. An energy isolating device is any mechanical device that is used to physically restrain and prevent, regulate, direct, or dissipate the transmission or release of energy. The energy isolating device must be “positive”, meaning that once secured into position, it cannot fall off or be moved from its off or safe position.

**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.

**Locks:** Locks must be acquired by the Faculty or Department and used **specifically** for lock out applications only. (Contact the University Lock Shop for more information: <http://www.ucalgary.ca/fmd/directory>). Combination locks are **NOT** acceptable in the control of hazardous energy.

**Lock Out:** means to isolate all energy sources from equipment or components of that equipment, to dissipate any residual energy in a system or component, and to secure the isolation by a locking device

**Lock Out Device:** is any device operated by a key (such as a personal lock) or other similar device that holds an energy isolating device in its off or safe position, preventing equipment from becoming energized.

**Managers:** an Employee who has management responsibility and includes academic staff members and management and professional staff members who have management responsibility and direct reports. All members of the Senior Leadership Team (SLT) are Managers.

**Personal Safety Lock (PSL):** keyed padlock used to control hazardous energy while worker is working on equipment; traceable to the worker who owns and installs it, with its key under the control of the worker identified on the lock.

**Render Inoperative:** means to remove the equipment from service in a manner that prevents its accidental reactivation and provides equal or greater protection that the protection afforded under the lock out of the equipment.

**Securing Isolation:** means applying a positive locking device to the machinery, equipment or powered mobile equipment that will prevent any other person from reenergizing while the worker is working on it.

**Supervisor:** means an Employee who supervises other Employees; it does not include a Manager. Supervisors have direct reports.

**Tag Out:** means a worker has attached a tag, on energy isolating device(s) used to lock out machinery, equipment or powered mobile equipment during a lock-out procedure, the warning tag directs workers not to start or operate the equipment and is marked with the date that the tag was attached and identifies the worker who attached the tag.

**Verifying Isolation:** means positively confirming the disconnection of all energy sources has been successful and any latent or residual energy has been dissipated.

**Warning Tags:** Warning tags are to be attached to each lockout device use to lockout equipment during a control of hazardous energy procedure. The warning tag directs workers not to start or operate the equipment and must be marked with the date that the tag was attached.

Warning tags should be securely fastened to the device and should clearly indicate that the equipment to which it is attached may not be operated until the tag is removed. If the warning tag cannot be attached directly to the device, it should be located as close as safely possible to the device, in a position that will be immediately obvious to anyone attempting to operate the device.

There are three different types of “Danger” warning tags used at the University of Calgary: Equipment tags, Personal Tags, and Group Tags. These tags must be securely fastened to the lockout devices and must indicate that the equipment to which it is attached may not be operated until the tag is removed. If the warning tag cannot be attached directly to the lockout device, it should be located within as close a proximity to the device as is safely possible.

### Personal Tags (White)

White (with black and red) “Danger” tags are to be used with Personal locks and indicate a worker is actively working on the equipment, machinery or powered mobile equipment. These white danger tags must state the worker’s name, tag applied date and must indicate that the equipment to which it was attached may not be operated until the tag is removed.



### Equipment Tags (Yellow)

Equipment locks are used with yellow “Danger” tags to indicate that equipment or machinery is locked out for an extended period of time. These yellow danger tags must state the worker’s name, tag applied date and should indicate that the equipment to which it was attached may not be operated until the tag is removed.



### Group Tags (Orange)

Orange “Danger” tags are used with group protocols in the control of hazardous energy to indicate multiple workers are working on the isolated equipment. These orange danger tags must have the name of the “Group Primary” and “Group Alternate” worker listed, along with their contact information, directly on the tag.



**Worker (employee):** means an individual who is engaged to work for the University under an employment contract. This includes academic staff, support staff, management and professional staff, senior leadership team, researchers, faculty members, visiting scholars, post-doctoral fellows, volunteers, graduate students who are remunerated by the University and students performing work on behalf of the University or their instructor.

**Zero Energy State:** Zero Energy refers the complete dissipation of any latent or residual energy that may remain in the equipment after the isolation of an energy source.

## References and Additional Resources

Alberta Occupational Health & Safety Act, Regulation & Code

Canadian Standards Association (CSA), CSA Z460-05 *Control of hazardous energy – Lockout and other methods*, Update No.1, May 2006


Alberta Electrical Utility Code

University of Calgary Occupational Health & Safety Policy

## Revision History

Date	Revision	Author
October 2015	Updated program document from previously published 2007 version. Includes addition of process maps, lock removal form and modified structure to improve readability. Input to the updated program was provided by manager and worker representatives from the University's Operations and Maintenance department, the Energy and Utilities department and the Environment, Health and Safety department. (Specifically: Robb Nesbit, Ken Brewer, Jim Bauert, Raymond Mohl, Mike Kramer, James Rendell, Peter May and Tom Williamson)	T Mochinski
August 2012	A stakeholder review of the program was done in 2012. Representatives from the University's Operations and Maintenance department, the Energy and Utilities department and the Environment, Health and Safety department were engaged. This review did not result in a formal update/revision to the Program.	Various
July 2007	Original publication of the Control of Hazardous Energy Program.	Various

**Appendix A: University of Calgary Lock Removal Form**

 <b>UNIVERSITY OF CALGARY</b>		<b>Control of Hazardous Energy Program Lock Removal Form</b>	
Section:	Occupational Health & Safety Management System	Date of Issue:	2015.03.13
		Issued By:	Environment, Health & Safety
Part:	Control of Hazardous Energy Program	Revision #:	
		Revision Date:	
Pages:	2	Revised By:	

Date \_\_\_\_\_

Time \_\_\_\_\_

Location \_\_\_\_\_

Equipment \_\_\_\_\_

Lock Out / Tag Out by \_\_\_\_\_

Reason for Lockout \_\_\_\_\_

Removal Requested by: \_\_\_\_\_

(Name & Department)

Reason for Removal:  
 \_\_\_\_\_  
 \_\_\_\_\_

Was contact made with owner of the lock? Yes  No

Have all involved workers been accounted for? Yes  No

The Person removing lock has verified no other worker is endangered. Yes  No

Authorized by: \_\_\_\_\_  
 (Responsible Supervisor)

Date \_\_\_\_\_

\_\_\_\_\_  
 (Person removing lock)

Date \_\_\_\_\_

\_\_\_\_\_  
 (Witness)

Date \_\_\_\_\_

This document will be maintained by the UofC Lock Shop for a minimum of three years as per the Lock Shop lock removal SOP. Lock removal statistics will be reported quarterly.