

UNIVERSITY OF CALGARY | VP SERVICES | Environment, Health and Safety

Control of Hazardous Energy Standard and Procedures

EHSMS Element: Control of Hazardous Energy

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Change Control		
Version	Description	Effective Date
1	Publication of Control of Hazardous Energy Program	2007.07.24
2	Updated program document from previously published 2007 version. Includes addition of process maps, lock removal form, and modified structure to improve readability.	2015.10
3	Publication of updated Control of Hazardous Energy Standard to reflect 2022/23 changes to the OHS Code related to transferring locks, individual worker securement, and group control. A new complex procedure was added, and flowcharts were updated to reflect the program changes.	

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1. ACRONYMS AND DEFINITIONS

ACRONYMS	
UCalgary	The University of Calgary
University	The University of Calgary

DEFINITION	
Affected Individual	a person whose job requires them to operate or use a machine or equipment or who may be in the area affected by lockout.
Authorized individual	a person who is qualified to engage in hazardous energy control because of knowledge, training, and experience and has been assigned to engage in such control.
Competent	concerning 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.
Control	the power to direct, regulate, or restrain hazardous energy.
De-energized	disconnected from all energy sources and not containing residual or stored energy.
Energy Isolating Device	a mechanical device that physically prevents the transmission or release of energy.
Guard	a physical barrier that prevents access to areas of a machine, equipment, or a process where a hazard exists.
Hazard	a potential source of harm to personnel.
Group Alternate	the group alternate is the worker designated by the University as responsible for backing 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 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.
Hazardous Energy	electrical, mechanical, hydraulic, pneumatic, chemical, nuclear, thermal, gravitational or any 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, powered mobile equipment, piping or pipelines;
Hazardous Energy Control	describes the use of procedures, techniques, designs, and methods to protect personnel from injury due to the inadvertent release of hazardous energy.
Key Securing System	means a system that physically prevents access to keys when locks or positive sealing devices are applied in a group lockout procedure.

DEFINITION	
Lockout	placement of a lock or tag on an energy-isolating device following an established procedure, thereby indicating that the energy-isolating device is not to be operated until removal of the lock or tag following an established procedure.
Lockout Appliance	a mechanical means of locking that uses an individually keyed lock to secure an energy-isolating device in a position that prevents energization of a machine, equipment, or a process.
Managers	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.
Render Inoperative	means to remove the equipment from service in a manner that prevents its accidental reactivation and provides equal or greater protection than the protection afforded under the lockout of the equipment.
Securing Isolation	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	an Employee who supervises other Employees; it does not include a Manager. Supervisors have direct reports.
Tag Out	a worker has attached a warning tag, on the energy isolating device(s) used to lockout machinery, equipment, or powered mobile equipment during a lock-out procedure.
Verifying Isolation	positively confirming the disconnection of all energy sources has been successful and any latent or residual energy has been dissipated.
Tags	warning tags are to be attached to each lockout device used to lockout equipment during the control of hazardous energy procedures. The warning tag directs workers not to start or operate the equipment and must be marked with the date that the tag was attached.
Worker (employee)	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, postdoctoral fellows, volunteers, graduate students who are remunerated by the University, and students performing work on behalf of the University or their instructor.

2. PURPOSE

In UCalgary workplaces, individuals are routinely exposed to various types of hazardous energy when they operate, maintain, and service machinery, equipment, powered mobile equipment, and piping or pipelines.

The purpose of the Control of Hazardous Energy Standard is to mitigate the inherent hazards associated with working with or around hazardous energy by establishing specific criteria to prevent unintended motion, energizing, start-up, or release of stored or residual energy.

3. SCOPE

	IN SCOPE	OUT OF SCOPE
	University of Calgary (UCalgary) Faculties, departments, and individuals who may be tasked with servicing, repairing, testing, adjusting, or inspecting machinery and equipment- whether on or off-campus.	Work on cord and plug connected electric equipment for which exposure to the hazards of unexpected energization or start-up of the equipment is controlled by unplugging the equipment from the energy source and by the plug being under the exclusive control of the employee performing the servicing or maintenance.

Types of Hazardous Energy That Require Control

- Electrical – energy from electricity; may be stored in live power lines, batteries, capacitors
- Mechanical – energy from moving parts
- Pneumatic – energy stored within pressurized air, such as spraying devices
- Hydraulic – energy stored in pressurized liquids
- Chemical Energy – energy released when a substance undergoes a chemical reaction; usually released as heat
- Thermal Energy – energy related to temperature
- Radiation – energy related to ionizing, low-frequency electromagnetic, optical, or radio-frequency electromagnetic radiation
- Gravity Potential – energy related to the mass of an object and its distance from the ground, such as machine parts that could descend or fall if unsecured

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4. ROLES AND RESPONSIBILITIES

Role	Responsibility
Managers and Supervisors	Manage the implementation of this program within their specific Faculties or Departments, ensuring compliance with its requirements and applicable regulations.
	Assign responsibilities, establish accountability, and delegate the authority to implement this program.
	Ensure 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).
	Ensure that all personnel that service and/or maintain machines and equipment or are impacted by the servicing and/or maintenance of the machines and equipment receive appropriate training and are competent in all applicable control of hazardous energy procedures.
	Identify situations when energy control procedures are required and aid in the development, documentation, and implementation of control of hazardous energy procedures.
	Ensure that equipment has current manufacturers' operating and maintenance instructions.
	Ensure the provision and maintenance of equipment, tools, and materials for energy control procedures.
	Ensure that established energy control procedures are being adhered to by authorized workers and conduct periodic reviews of such procedures.
	Maintain all records associated with energy control procedures, including training.
Authorized Individuals	Be responsible for performing hazardous energy control in compliance with the University of Calgary Hazardous Energy Control Program, and energy control procedures.
	Know and understand the associated hazards of the equipment that they will be working with.
	Attend the training determined necessary by their manager or supervisor.
	Inform individuals whose work is, or maybe in the area where energy control procedures are to be utilized on the lock out/tag out (LOTO) procedure to be used and to not attempt to restart or reenergize the affected equipment/machines.
	Bringing to the attention of their supervisor any new conditions that may negatively impact the lockout process or activities.
	Work following established energy control procedures.
	Affected Individuals
Once informed by an Authorized Employee that equipment/machine has been de-energized do not attempt to restart or reenergize it.	

Role	Responsibility
Prime Contractors	Prime Contractors shall employ procedures and practices in their program that comply with regulatory requirements.
	Shall follow the requirements of the University of Calgary Contractor Safety Management Program and will meet or exceed the requirements of the University of Calgary Control of Hazardous Energy Program when working on University of Calgary owned equipment.
Contractors	Contractors shall employ procedures and practices that meet or exceed regulatory requirements and the requirements of the University of Calgary Hazardous Energy Control Program.
	Shall follow the requirements of the University of Calgary Contractor Safety Management Program. In cases where UC owned equipment must be locked out for a contractor to perform their work, the contractor shall follow UC procedures.
Environment, Health and Safety	Develop, maintain, and update this program in consultation with stakeholders.
	Act as a resource for the campus community on control of hazardous energy processes.
	Provide faculties and departments assistance with the creation of their specific control of hazardous energy procedures.
	Support and monitor adherence to this program.

5. TRAINING

All University of Calgary employees involved in tasks requiring control of hazardous energy must complete:

- A university approved eLearning awareness course
- Training on the content and application of this standard and related procedures
- Training on the specific lockout procedures for the equipment and the tasks they will be performing.

6. REQUIREMENTS

No university employee or contractor shall undertake any work on equipment:

- unless the equipment is fully secured against the unintended motion, energizing, start-up, or release of stored or residual energy of equipment during servicing, maintenance, or other activities.
- Manufacturers' specifications shall be followed if available for control of hazardous energy processes on equipment. Alternatively, use the procedures in the appendices. If the procedures in the appendices are not applicable to the equipment, consult your manager for direction.
- If energized testing must be done, follow the steps outlined in appendix E.

6.1 SECURING

There are specific requirements for the following situations: securing by individual worker, securing by group control, securing by complex group control and securing remotely controlled systems.

6.1.1 Securing by Individual Worker

Individual workers shall follow the Standard Procedure for Control of Hazardous Energy by Individual Worker in appendix A.

6.1.2 Securing by Group Control

Group lockout is to be used when individual securement does not provide adequate protection due to the number of workers or energy isolating devices involved.

When a group lockout procedure is used, the number of lockout devices on the key securing system (i.e. lockbox) must equal the number of workers working on the equipment. The energy-isolating devices must be isolated and secured with a group lock.

A designated “Group Primary” worker is responsible for locking out the energy isolating devices with group locks from the group lockout kit, securing the key for the group locks in an appropriate key securing system (i.e. lockbox).

A second “Group Alternate” worker must verify the isolation and control of hazardous energy. Additionally, every worker, including the designated “Group Primary” worker and “Group Alternate” worker, must apply a personal lock to the key securing system before working on the equipment.

After completing work, each worker must remove their personal lock from the key securing system (i.e. lockbox). Group lockout must not end until all personal locks have been removed.

The “Group Primary” worker is ultimately responsible to remove the group locks from the energy isolating devices and ensure that no workers will be in danger if the energy isolated equipment is returned to operation.

Standard Procedure for Group Control of Hazardous Energy in Appendix B shall be used.

6.1.3 Securing by Complex Group Control

In some cases, it may not be reasonably practicable to use an individual or group lockout process. To maintain worker safety, normal group lockout practices may need to be adapted or modified. A complex group control procedure must be developed and subsequently approved by a professional engineer that is familiar with complex group control.

The complex group control process relies on written procedures and a work permit (appendix C) to ensure the safety of workers. These two elements replace or enhance the traditional approach of each worker placing a personal lock on each energy-isolating device or a group lockbox.

The reasons for choosing to use a complex group control process most likely involve a combination of several of the following factors:

- The physical size and extent of the machinery, equipment, piping, pipeline, or process system.
- The relative inaccessibility of the energy-isolating devices.
- The number of workers or authorized worksite parties involved in the work requiring hazardous energy control.
- The number of energy-isolating devices involved.
- An extended length of time of the isolation.
- The interdependence and interrelationship of the components in the system or between different systems.

To determine what work should be controlled using group lockout vs complex group lockout the “Group vs Complex Lockout Checklist” (Appendix D) should be completed jointly by the Manager, Operator In Charge and Qualified Utility Employee. The checklist only needs to be completed once for tasks that are considered routine and limited in scope. Work or tasks that are considered unique or non-routine need to be evaluated to jointly agree upon the best method of lockout.

Contractors hired by the U of C that wish to use their own set of complex lockout policies must meet or exceed the procedures discussed within this document and its appendices.

Complex group control shall ensure the following is completed:

- 1) A hazard assessment has been completed that identifies the type and location of hazardous energy sources.
- 2) Procedures are written and implemented to ensure continuous safe performance of the work requiring isolation of hazardous energy. The procedures must be approved by a professional engineer.
- 3) A work permit is implemented so that either each involved worker or crew leader signs on the job before commencement of work and signs off the job upon completing the work.
- 4) The group primary designated by the employer has activated all energy-isolating devices to control hazardous energy and has secured all energy-isolating devices.
- 5) The group alternate designated by the employer has verified that all sources of hazardous energy are effectively isolated and secured.

Refer to Appendix C and D from complex group lockout permit process and forms.

6.1.4 Securing Remotely Controlled Systems

Situations may arise in which it is not practicable to lockout the energy isolating device of equipment that is remotely controlled (e.g., process control equipment located kilometers away from the computer that controls it). To achieve protection equal to or greater than lockout of the equipment and remove and render safe any hazardous conditions, a combination of control system isolating device(s) and special procedures must be used.

A control system isolating device is a device that physically prevents activation of a system used for remotely controlling the operation of the equipment. In the case of a computer-controlled system, a password or series of passwords does not physically prevent activation of the control system. Before defaulting to using control isolation devices for lockout, more traditional alternatives, including rendering the equipment inoperative should be considered. If alternatives are not possible or practicable, physical prevention of activation of the control system may include:

- Locking out the ports on the computer(s) to prevent control devices such as keyboard or mouse from being used; and
- Locking out the room in which the controlling computer(s) is located.

6.2 EXCEPTIONS TO PROCEDURES

Exceptions to manufacturers' specifications or the procedures in the appendices must be evaluated with Department or Faculty management prior to work being authorized. If manufacturer's specifications allow machinery or equipment to remain operative, or if there are no specifications and it is not reasonably practicable to stop or render the machinery or equipment inoperative, then the following must be completed:

- Control options must be used following the hierarchy specified (engineering controls, administrative controls, and personal protective equipment as a last resort) 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 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 lockout/tag-out devices should also be included.
- The procedures to be used shall be approved by a supervisor or manager.

6.3 LOCKOUT APPLIANCES

Lockout appliances used in conjunction with the traditional locks, such as hasps, multi-hasps, valves, cables, chains, etc. may be used for locking out all types of energy isolation points. All lockout appliances used must be capable of withstanding the usage environment and be strong enough to prevent removal except by excessive force or with special tools, such as bolt cutters.

6.3.1 Locks

Locks are recognized as an authorized method of isolating and controlling energy isolation points on equipment, machinery, and powered mobile equipment. Locks that are utilized in the isolation and control of hazardous energy must not be used for any other purpose. Locks must be purchased and used specifically for lockout applications only. Locks must be of such design and durability that removal by other than normal means requires excessive force or unusual techniques. In addition, they must possess a unique identifier and an individual keying capability. Combination locks are not acceptable in the control of hazardous energy.

6.3.1.1 Personal Locks

Personal locks are unique to the individual worker they are assigned to. A personal lock must have a unique identifier on it that differentiates the worker from others (i.e. full name and contact information). The worker identified by the lock must be readily available during the time the equipment is isolated and secured.

Personal locks are used in situations where energy is identified as a potential hazard during the field level hazard assessment. Worker(s) completing the work must control hazardous energy of equipment, machinery, or powered mobile equipment to protect themselves. A person must not remove a personal lock from the isolated and secured equipment unless the person is the worker who installed the lockout device(s) or, as a last resort, the responsible supervisor or their designate and following the process described in section 8.

6.3.1.2 Equipment Locks

Equipment locks are designed to isolate and secure the hazardous energy of equipment, machinery, and powered mobile equipment, and are to be used when the work progresses beyond the end of a workers' shift. Equipment locks must contain a unique identifier of the worker's department. Standardized tags must be used in conjunction with the Equipment locks.

Each worker working on the isolated and secured piece of machinery, equipment, or powered mobile equipment must apply a personal lock in addition to the Equipment lock already applied to ensure the equipment is secured under their control.

6.3.1.3 Group Locks

Group locks are uniquely keyed and are used in group protocols in the control of hazardous energy.

6.3.1.4 Removal of Locks by Someone Other than the Worker Who Applied It

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 Procedure for Removal of Locks (appendix F) shall be followed and the Lock Removal Form (appendix G) shall be completed.

Refer to appendix F and G for the procedure and form.

6.4 TAGS

All isolated and secured equipment, machinery, or powered mobile equipment must be tagged, regardless of the length of lockout time, with an appropriate tag that includes all relevant information. There are five different types of tags used at the University of Calgary:

- 1) Personal Tags,
- 2) Equipment Tags,
- 3) Group Tags,
- 4) Grounded Tags
- 5) Long Term Equipment Tags.

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 tag cannot be attached directly to the lockout device, it shall be located within as close proximity to the device as is safely possible.

Refer to appendix H for an example of each type of tag and description of when it must be used.

7. REFERENCES

The following documents and resources are available for use in conjunction with this standard to support its implementation:

- Alberta Occupational Health & Safety Act, Regulation & Code
- Alberta Occupational Health & Safety <http://www.alberta.ca/occupational-health-safety>
- Canadian Centre for Occupational Health & Safety <http://www.ccohs.ca/>
- Energy Utilities Department– Electrical Safety Program

8. APPENDICES

- Appendix A: Single Worker Control of Hazardous Energy Procedure and Flowchart
- Appendix B: Group Control of Hazardous Energy Procedure and Flowchart
- Appendix C: Complex Group Lockout Permit Procedure and Flowchart
- Appendix D: Determination of Complex vs Group Lockout
- Appendix E: Energized Testing Procedure
- Appendix F: Procedure for Removal of Lock by Someone Other than the Worker Who Applied It
- Appendix G: Lock Removal Form
- Appendix H: Tag Examples

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Single Worker Control of Hazardous Energy Procedure

Standard Procedure for Control of Hazardous Energy 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 the equipment. The notice, either written or verbal, 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 work including 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 and isolated 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. **LOCKOUT:** All energy isolating devices will be secured in place using a worker's assigned Lock. Tags will be applied to all locks, tags must state the worker's name, the 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 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 another testing to make certain it will not operate.
8. **CAUTION:** *Return operating control(s) to neutral or the "OFF" position after verifying isolation.* The machinery, equipment, or powered mobile equipment is now locked out.

RESTORING EQUIPMENT TO SERVICE:

When the servicing or maintenance is completed and the machine or equipment is ready to return to normal operating condition, the following steps will be used:

1. **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.
2. **VERIFICATION:** Check the work area to ensure that all worker(s) have been safely positioned or removed from the area.
3. **NEUTRAL:** Verify that the controls are in a neutral or off position.

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

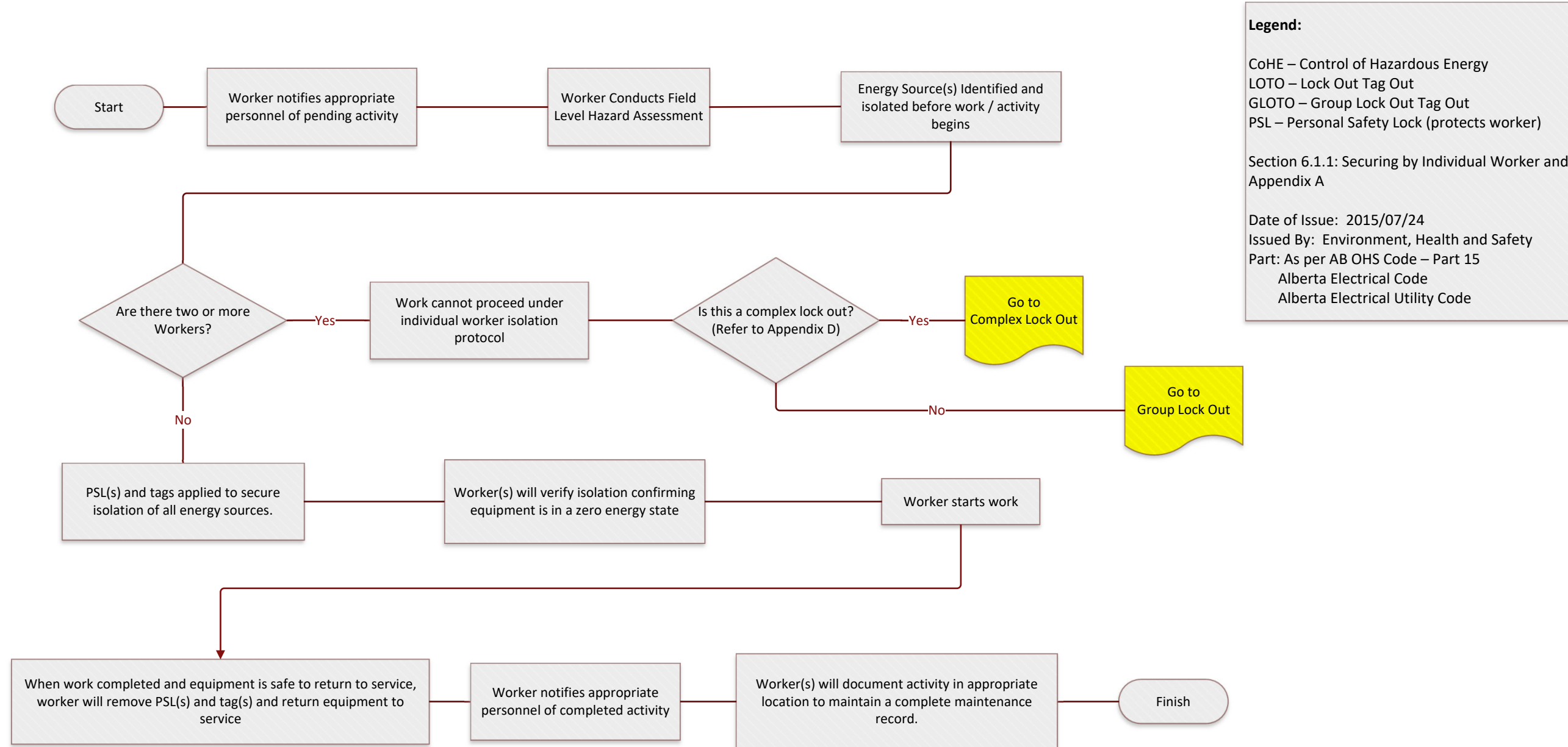
REMOVING EQUIPMENT FROM SERVICE OR EXTENDED LOCKOUT:

When the servicing or maintenance has NOT been completed on shift and the machine or equipment is NOT ready to return to normal operating condition, the following steps will be used:

1. **INSPECT EQUIPMENT:** Check the equipment and the immediate area around the equipment to ensure that non-essential items have been removed.
2. **NEUTRAL:** Verify that the controls are neutral.
3. **LOCKOUT AGAIN:** Remove the personal lockout device(s) and apply an equipment lock. Equipment removed from service permanently must be locked out with an equipment lock(s) and be rendered inoperative. All locked-out equipment must be tagged.
4. **NOTIFICATION:** Notify affected worker(s) that the servicing or maintenance has NOT been completed and the machine or equipment is unavailable.

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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 6.1.1: Securing by Individual Worker and Appendix A

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 Part: As per AB OHS Code – Part 15
 Alberta Electrical Code
 Alberta Electrical Utility Code

Group Control of Hazardous Energy Procedure -

Standard Procedure for Group Control of Hazardous Energy

The following lock-out 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.

1. **IDENTIFY GROUP PRIMARY AND GROUP ALTERNATE.** 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.
2. **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.
3. **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.
4. **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.
5. **LOCKOUT:** 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, the 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 Group Primary will verify the energy isolation by attempting to operate the machinery, equipment, or powered mobile equipment or by another testing to make certain it will not operate.
CAUTION: *Return operating control(s) to neutral or the "OFF" position after verifying isolation.*
8. **POSTING the WORKSITE:** The Group Primary will post a notice (Group Lock Out Form) identifying all equipment that has been locked out and that the hazardous energy is isolated.
9. **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 personal locks from the group lockout device.
10. **VERIFICATION:** The Group Primary will ensure no other worker is endangered when the equipment is returned to service.
11. **FINAL CHECK:** The Group Primary will operate the machinery, equipment, or powered mobile equipment to confirm the repair or service has been 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 completed.)
12. **NOTIFICATION:** The Group Primary notifies the appropriate personnel when service or maintenance has been completed and the equipment is returned to service.

**Appendix B: Group Control of Hazardous Energy
Group Lock Out Form**
Part # 1: Declaration of Energy Isolation

I have isolated the supply of energy to the equipment listed on this form. I have tested for potential, dissipated any residual energy, applied locks and tags and tested the locking method.

If any individual has to leave the work site, they must contact their Supervisor and sign part 2 "Approval for Return of Energy and Start up of Equipment" prior to leaving.

Group Primary (Employee in Charge) Signed _____ Date _____ Time _____
Group Alternate Signed _____ Date _____ Time _____

Isolation Device
Identification _____ **Building/rm#** _____
Isolation Device
Identification _____ **Building/rm#** _____
Isolation Device
Identification _____ **Building/rm#** _____
Isolation Device
Identification _____ **Building/rm#** _____

I issue clearance to these following crafts persons to work on ONLY the equipment listed below;

Equipment designation: _____
 _____ *Building/rm#* _____

Tested for Potential:

Equipment designation: _____
 _____ *Building/rm#* _____

Tested for Potential:

Name: _____ **Signature:** _____ **Date/Time:** _____
Name: _____ **Signature:** _____ **Date/Time:** _____
Name: _____ **Signature:** _____ **Date/Time:** _____
Name: _____ **Signature:** _____ **Date/Time:** _____
Name: _____ **Signature:** _____ **Date/Time:** _____

Please see Part 2: Approval for the return of energy and startup of equipment

Part # 2: Approval For The Return of Energy And Startup Of Equipment.

I have completed all maintenance on the equipment noted in part 1 "Declaration of Energy Isolation" form.
All tools, testers, cleaning supplies and personal safety locks have been removed and accounted for.
I issue clearance for the removal of protective locks, and the return of energy to this equipment.

Note: All signatures from part 1 must be re-signed on part 2 before return of energy will be authorized.

Name: _____ Signature: _____ Date/Time: _____

Name: _____ Signature: _____ Date/Time: _____

Name: _____ Signature: _____ Date/Time: _____

Name: _____ Signature: _____ Date/Time: _____

Name: _____ Signature: _____ Date/Time: _____

Name: _____ Signature: _____ Date/Time: _____

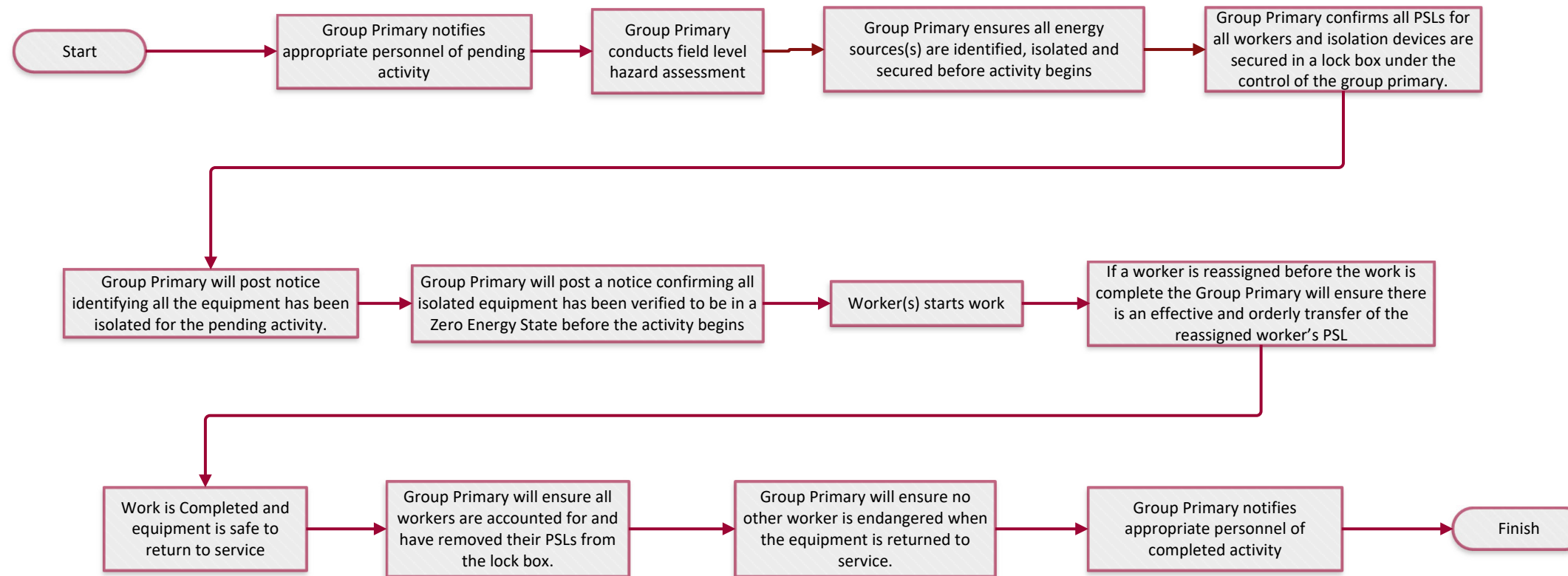
Clearance issued to:

Group Primary (Employee in Charge): Signed _____ Date _____ Time _____

Group Alternate Signed _____ Date _____ Time _____

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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 controlling 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.



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: 6.1.2 Securing by Group Control and Appendix B

Date of Issue: 2024-03-15
 Issued By: Environment, Health and Safety
 Part: As per AB OHS Code – Part 15

Complex Group Lockout Procedure and Permit -

The following lock-out and permit 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. Procedures must be certified by a professional engineer.

1. **IDENTIFY OPERATOR IN CHARGE (OIC) AND QUALIFIED UTILITY EMPLOYEE IN CHARGE (QUEIC).** Where the OIC has been identified as responsible to carry out an action the QUEICs will be responsible to confirm the action has been completed and is effective for the work required.
2. **NOTIFICATION:** The OIC 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.
3. **HAZARD ASSESSMENT:** The OIC 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.
4. **ISOLATE ENERGY SOURCE:** The OIC 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.
5. **LOCKOUT:** The OIC 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, the 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 OIC will verify the energy isolation by attempting to operate the machinery, equipment, or powered mobile equipment or by another testing to make certain it will not operate.
CAUTION: *Return operating control(s) to neutral or the "OFF" position after verifying isolation.*
8. **PERMIT:** The OIC will complete a lockout permit listing all equipment that has been locked out.
9. **ISOLATION VERIFICATION:** The QUEICs leading each working crew will review the lockout permit and isolation methods used to control hazardous energy with the OIC. The QUEIC must verify the effectiveness of the isolation via the methods listed in steps 6 & 7 as needed.
10. **UNDERSTAND:** All workers signing onto the lockout permit clearly understand the isolations/controls and the equipment that can be worked on. Workers can sign onto the lockout permit and lock onto lockable device using their PSL.
11. **RE-EVALUATE:** All workers involved shall continue to monitor and re-evaluate over the course of work if any hazards have been introduced over the duration of the job. Permit to be reissued when new hazardous energy sources are introduced. (i.e. new generator feed, new cable tie-in, etc.)
12. **COMPLETION OF WORK:** The QUEIC will ensure all crew workers have been accounted for and that the work has been finished. The QUEIC will report to the OIC that work is complete.
13. **RESTORING EQUIPMENT TO SERVICE:** The OIC 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 OIC ensures all workers are accounted for (signed off permit) and have removed their personal locks from the group lockout device.

Complex Group Lockout Procedure and Permit -

14. **ENSURE ALL-CLEAR:** The OIC will ensure no other worker is endangered when the equipment is returned to service.
15. **FINAL CHECK:** The OIC will operate the machinery, equipment, or powered mobile equipment to confirm the repair or service has been 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 completed.)
16. **NOTIFICATION:** The OIC notifies the appropriate personnel when service or maintenance has been completed and the equipment is returned to service.

THIS SECTION IS LEFT INTENTIONALLY BLANK

DRAFT

Complex Group Lockout Permit - Guarantee of Isolation

Permit# _____

Part - 1a
Guarantor(s)

Description of work to be done: _____

Energy Isolating Devices

#	Field Name / Description / Location	#	Field Name / Description / Location
1		5	
2		6	
3		7	
4		8	

Isolated Equipment that is Approved for De-energized Work Tasks

#	Field Name / Description / Location	#	Field Name / Description / Location
1		3	
2		4	

Guarantor's Declaration

- I have isolated the supply of energy to the equipment listed on this form. I have tested for potential, dissipated any residual energy, installed temporary protective grounding if required, applied locks and tags & tested the locking method.

- Permit to be returned by: _____
Date (DD/MM/YY)
Time

Title:	Name (Please Print)	Signature:	Date: (DD/MM/YY)	Time:
OIC:				

- I have verified the effectiveness of the isolation and tested the locking method

Title:	Name (Please Print)	Signature:	Date: (DD/MM/YY)	Time:
QUEIC:				

Part - 1b
Guarantee Recipient(s)

- If any individual has to leave the work site, they must remove their personal safety lock & tag and sign part – 2a “Approval for Termination of Guarantee and Return of Energy” prior to leaving.
- Please ensure that your lock and tags have been installed prior to signing.

#	Name (Please Print)	Signature:	Date: (DD/MM/YY)	Time:
1				
2				
3				
4				
5				
6				
7				

- Please see part 2a on page 2 for details on Termination of Guarantee and return of energy requirements.

Termination of Guarantee

Part - 2a

Recipient approval for Termination of Guarantee and Return of Energy

Recipient's Declaration

- I have completed all modifications or maintenance on the equipment listed in part – 1a of the Guarantee of Isolation.
- Required Electrical Permits and Inspections have been approved. CSA field re-certifications have been acquired if equipment has been modified.
- All tools, testers, cleaning supplies and personal safety locks have been removed and accounted for.
- I have completed an overview of all work tasks with the “Qualified Utility Employee(s)” and have provided details of connections, replacements, modifications and final test results.
- I issue clearance for the termination of the guarantee of isolation and the return of energy to the equipment listed in part – 1a.

Note: All signatures from part - 1b must be re-signed before return of energy will be authorized.

#	Name (Please Print)	Signature:	Date: (DD/MM/YY)	Time:
1				
2				
3				
4				
5				
6				
7				

Part - 2b

Termination of Guarantee Completion

Return of Energy and Startup of Equipment listed in part 1a.

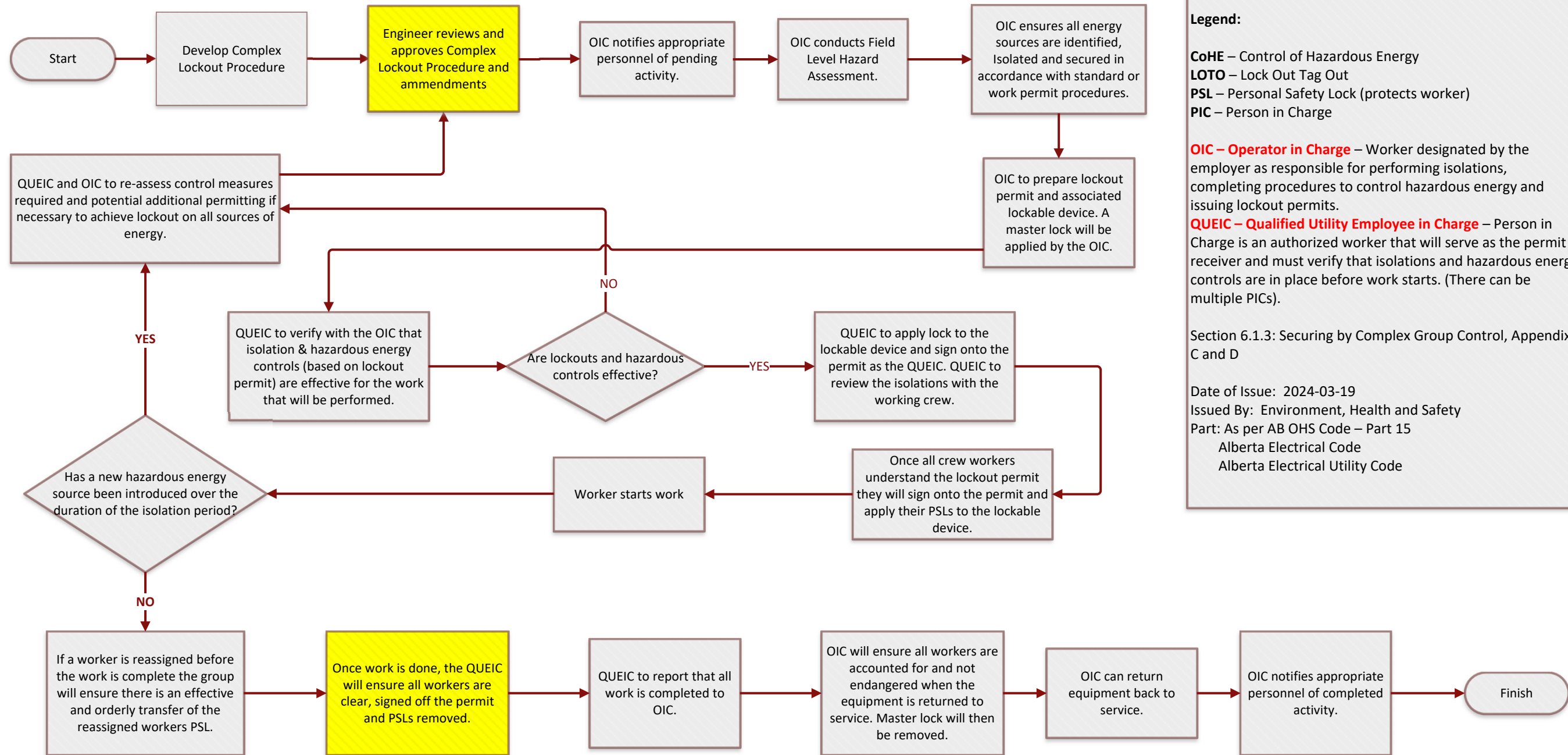
Energy Isolating Devices returned to normal configuration

#	Field Name / Description / Location	#	Field Name / Description / Location
1		5	
2		6	
3		7	
4		8	

Title:	Name (Please Print)	Signature:	Date: (DD/MM/YY)	Time:
QUE:				
QUEIC:				

Document No. EHS-MS-1306	Document Custodian: Environment, Health and Safety	Version: 1	The controlled version of this document is available at www.ucalgary.ca/safety
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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 controlling hazardous energy is required.
 This process will apply when more than two workers must apply locks and tags to control hazardous energy while performing their duties.
Procedures for complex lockout must be approved by a professional engineer.



Legend:

CoHE – Control of Hazardous Energy
LOTO – Lock Out Tag Out
PSL – Personal Safety Lock (protects worker)
PIC – Person in Charge

OIC – Operator in Charge – Worker designated by the employer as responsible for performing isolations, completing procedures to control hazardous energy and issuing lockout permits.

QUEIC – Qualified Utility Employee in Charge – Person in Charge is an authorized worker that will serve as the permit receiver and must verify that isolations and hazardous energy controls are in place before work starts. (There can be multiple PICs).

Section 6.1.3: Securing by Complex Group Control, Appendix C and D

Date of Issue: 2024-03-19
 Issued By: Environment, Health and Safety
 Part: As per AB OHS Code – Part 15
 Alberta Electrical Code
 Alberta Electrical Utility Code

Determination of Complex vs Group Lockout Procedure

Group vs Complex Lockout Checklist		Order #: _____	Date (DD/MM/YY): _____		
1. Physical size and extent of machinery, equipment, piping, or process system					
Item	Description	YES	NO	N/A	
1a	Does the extent of the equipment make it impractical for all affected workers to apply their locks to all energy isolating devices? <i>No. of areas isolation devices span across: _____</i>	<input type="checkbox"/>	<input type="checkbox"/>	---	
1b	Will using a normal group lockout/lockbox be a practical solution to providing adequate protection from each hazardous source of energy?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2. Inaccessibility of energy isolating devices					
Item	Description	YES	NO	N/A	
2a	Are any of the energy isolating devices located in an inaccessible location? (e.g. confined space, noise levels, fall protection required, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	---	
2b	Is there an approved procedure for this work and would it be considered a routine task?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3. Number of workers involved requiring hazardous energy control					
Item	Description	YES	NO	N/A	
3a	Are there so many workers that using group lock boxes and associated accessories is not practical?	<input type="checkbox"/>	<input type="checkbox"/>	---	
4. Number of energy-isolating devices involved					
Item	Description	YES	NO	N/A	
4a	Are there so many energy-isolating devices that it is impractical for all workers to apply their locks to them? <i>No. of isolation devices: _____</i>	<input type="checkbox"/>	<input type="checkbox"/>	---	
4b	Will using a normal group lockout/lockbox be a practical solution to providing adequate protection from each hazardous source of energy?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5. Extended length of isolation period					
Item	Description	YES	NO	N/A	
5a	Will the isolation period extend beyond a single shift?	<input type="checkbox"/>	<input type="checkbox"/>	---	
5b	Will any additional hazardous energy conditions be created over the duration of the isolation period, which could cause workers to require additional Personal Safety Locks? <i>No. of overlapping lockouts required: _____</i>	<input type="checkbox"/>	<input type="checkbox"/>	---	
6. Interrelationship/interdependence of components or different systems					
Item	Description	YES	NO	N/A	
6a	Does the complexity of the interrelationships of components/systems require one OIC to overlook the isolation process?	<input type="checkbox"/>	<input type="checkbox"/>	---	
6b	Does the interrelationship/interdependence of components/systems or multiple trades/disciplines create new hazards where a complex lockout is more equipped to ensure best controls of hazardous energy?	<input type="checkbox"/>	<input type="checkbox"/>	---	

Group vs Complex Lockout Checklist

Criteria for Complex Lockout

- All items require 1 box to be checked for each row.
- If 1 or more grey boxes are checked a complex lockout should be used.
- Each “YES” check box for items in 1a, 2a, 4a, 5a, 6a increases the overall complexity of the required lockout. Although white boxes are not as heavily weighed as grey boxes, determination of which lockout process to use should be considered wholistically and does not necessarily rule out the option of performing a complex lockout. If the pervasiveness of complexity posed by multiple “yes” answers to white boxes gives rise to reasonable doubt of effective controls of hazardous energy, a complex lockout may prove to be a more prudent choice. The guidance and/or professional judgement by a professional engineer with qualified experience and competency with regards to COHE may be required to assess the forementioned reasonable doubt in determining complex lock requirements.
- Individual lockout then, normal group lockout then, complex lockout is the preferred order of lockout processes when practicable and achievable.

Lockout Process Determination

Based on the criteria above and/or group discussions:

Group Lockout

Complex Lockout

Reasons for choosing group lockout or complex lockout process:

Title/Group	Name (Please Print)	Signature:	Date: (DD/MM/YY)	Time:
Manager				
OIC				
QUE				

APPENDIX E

Energized Testing Procedure

Control of Hazardous Energy Interruption (Energizing Test Procedure)

In situations where energy-isolating devices are locked out and it is necessary to test or position the equipment, the following procedure will be applied:

1. Ensure that the machine, equipment, or process components are operationally intact.
2. Clear the machine, equipment, or process of tools and materials.
3. Clear personnel away from the equipment and/or area.
4. Remove the lockout devices and tags from the energy isolating device(s).
5. Proceed with the test.
6. De-energize, re-lock, and re-tag energy isolating device(s).
7. Operate controls (etc.) to verify energy isolation.
8. Allow work to restart.

Procedure for Removal of Lock by Someone Other than the Worker Who Applied It




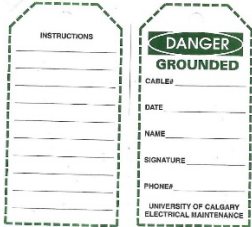
On occasion, it may be necessary for a lock to be removed by someone other than the worker who applied it. When the worker who applied the lock is absent, the following procedure will be applied before the lock is removed:

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.

The individual responsible for the lock removal will complete the Lock Removal Form 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.

APPENDIX G Lock Removal Form

Date:	Time:			
Location:				
Equipment:				
Lockout/ Tag out by:				
Reason for Lockout:				
Removal Requested By (name & Department):				
Reason for Removal:				
Was contact made with owner of the lock?	<input type="checkbox"/> Yes <input type="checkbox"/> No			
Have all involved workers been accounted for?	<input type="checkbox"/> Yes <input type="checkbox"/> No			
Person removing lock has verified no other worker is endangered.	<input type="checkbox"/> Yes <input type="checkbox"/> No			
Lock removal authorized by:				
Role	Name (Please Print)	Signature:	Date: (DD/MM/YY)	Time:
Responsible Supervisor				
Person removing lock				
Witness				

<p>Personal Tag</p> <p>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 and the date the tag was applied.</p>	
<p>Equipment Tag</p> <p>Equipment locks use yellow “Danger” tags to indicate that equipment or machinery is locked out for an extended period (longer than a worker’s shift). These yellow danger tags must state the worker’s name and tag applied date.</p>	
<p>Group Tag</p> <p>Orange “Danger” tags are used with group protocols in the control of hazardous energy to indicate multiple workers are working on the energy 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.</p>	
<p>Grounded Tag</p> <p>These white/green tags are used on operating devices with protective grounds installed. These tags must state the worker’s name and tag applied date.</p>	
<p>Long Term Equipment Tag</p> <p>These tags are the same as an equipment tag but are used for long term isolation of equipment and will note the rationale for long term isolation. These tags must state the worker’s name and the tag applied date.</p>	