

# LOTO and Zero Energy

## 1 PURPOSE

This procedure ensures that all safeguards are used to protect personnel and property from the unexpected release or transmission of equipment and/or process energy during the performance of work, in compliance with the Saskatchewan OH&S Act and Regulations and client-specific site standards and requirements.

## 2 SCOPE

This procedure applies to all employees and contractors performing work on site. Appropriate job specific procedures may exist to supplement this procedure. Inquiries concerning the interpretation and requirements of this procedure should be directed to the Supervisor or the Health & Safety Department.

This procedure applies to activities such as erection, installation, construction, commissioning, repair, adjustment, inspection, cleaning, modification, maintenance or decommissioning of equipment or process systems. Energy sources may include electrical, mechanical, hydraulic, pneumatic, chemical, radiation, thermal, compressed air, stored energy and potential energy from suspended equipment, etc.

Unauthorized removal or violation of personal protection locks and tags is subject to investigation and disciplinary action up to and including dismissal. All unauthorized removals of personal protection locks and tags will be investigated by the Supervisor or the Health & Safety Department.

## 3 DEFINITIONS

### 3.1 Terms

<b>Authorized Person</b>	An employee who is qualified to engage in hazardous energy control because of knowledge, training, and experience and has been authorized by DMC to engage in such control.
<b>Competent Person</b>	A person who is qualified, because of knowledge, training and experience, to organise the work and its performance, is familiar with the Act and Regulations for the jurisdiction and the regulations that apply to the work being performed, and has knowledge of any potential or actual danger to health or safety in the workplace.
<b>Group Lockout</b>	Lockout achieved through the use of a lock box.
<b>Hasp</b>	A device which allows several workers to attach locks to an energy isolating device.
<b>Lock Box</b>	A device used for group lockouts in which unique keys of the locks used in equipment isolations are placed.
<b>Personal Protection</b>	Individually, uniquely keyed locks used by workers for their own

**Locks** protection while working on equipment/systems.

**Personal Protection Tags** Tags used by workers in conjunction with personal protection locks while working on equipment/systems in regards to who, when and why the equipment has been locked out

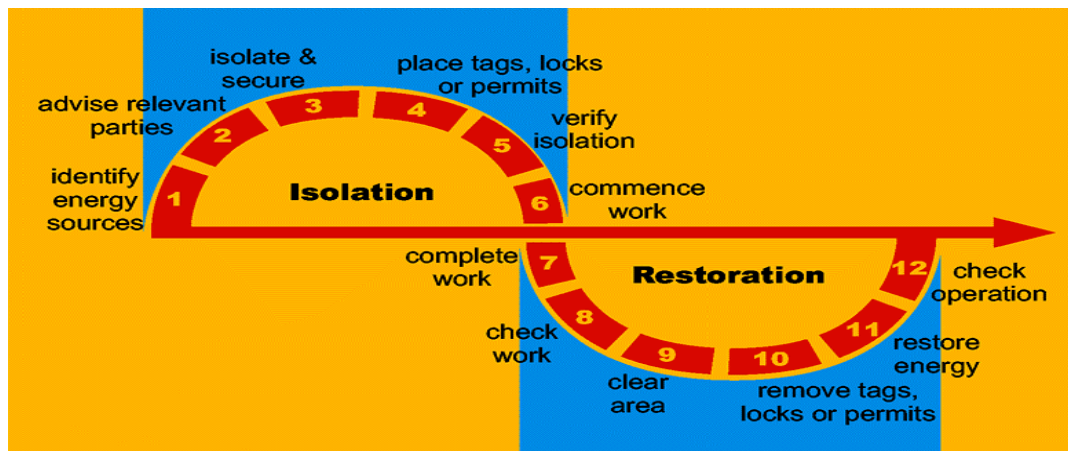
### 3.2 Acronyms

**LOTO** Lock Out Tag Out

## 4 Types of Energy

1. **Mechanical Energy:** Energy that is stored mechanically, such as rolling equipment that has the potential to move or release.
2. **Electrical Energy:** An invisible form of energy where a generator converts the mechanical energy of a conductor moving in a magnetic field to electrical energy. This energy is transmitted through conductors and wires to electrical equipment, motors, devices or tools.
3. **Chemical Energy:** Energy stored in the form of a chemical. This may include fuel and/or other chemicals that have significant energy if brought to a specific condition.
4. **Gravitational Energy/Potential:** Energy that is stored by a mass, such as large rocks up above a work area.
5. **Radioactive Energy:** Energy that is emitted from a radioactive source. This resultant energy has the ability to pass through matter and must be handled with extreme care and diligence.
6. **Thermal Energy:** Energy in the form of heat or cold such as a glycol system, various parts of a freeze plant, slurry pumps if operated while blocked, and malfunctioning electric motors.
7. **Stored Pressure Energy:** Energy that is stored under pressure such as airlines, air actuated valves, and water pipes or hoses.

All harmful energy sources shall be isolated and stored with all energy dissipated before Carrying out cleaning maintenance and adjustments on industrial plant and equipment.



## REQUIREMENTS

### 4.1 General

General requirements for all lock out and tag out applications include the following:

1. Work that requires the application of the LOTO and Zero Energy procedure shall always be conducted under the control of a completed Isolation Permit.
2. Installation and removal of locks and tags shall be carried out in compliance with this procedure.
3. No equipment shall be isolated, locked and tagged without the knowledge of the Equipment Owner/Operator.
4. Prior the start of work, all affected equipment that could potentially create a hazard if operated shall be:
  - de-energized and isolated;
  - locked out and tagged out; and
  - Tested to ensure effectiveness of the isolation.
5. All personal protection locks shall have corresponding personal protection tags securely attached (e.g. attached via tag grommet and lock).
6. Where equipment is required to be isolated for the protection of personnel assigned to work on the equipment, personal protection tags in conjunction with personal protection locks shall be applied.
7. On completion of their portion of the work, or at the end of the work shift, whichever occurs first, workers shall remove their personal protection locks and tags. A Supervisor's lock must be in place if equipment is not ready to operate.
8. Personal protection locks and tags must be uniquely identified and shall not be used for any purposes other than those specified in this document.
9. Locks and/or tags left in place after the completion of the work, or beyond the period requiring their application, are considered outdated for the purposes of this procedure. However, being outdated does not invalidate the LOTO device. Outdated tags are to be brought to the attention of the person who signed the tag. Where this is not possible, the situation shall be brought to the attention of management, so that the status of the equipment/process/work involved, and the tag's validity, can be reassessed. (See Section 6.2 - Lock and Tag Removal Process).
10. In cases where work cannot be completed if the equipment is isolated and locked and tagged out, work shall be completed in accordance with an approved JHA, which specifies the protective measures to be taken to protect the workers and equipment (e.g., protective clothing and equipment, guards/shields, administrative controls, etc.).
11. All violations of the LOTO and Zero Energy procedure shall be investigated jointly by line management and the Safety Department.
12. All isolations over 600 volts shall be performed by a qualified electrician.

### 4.2 Personal Protection

Where equipment is required to be isolated for the protection of personnel assigned to work on the equipment, personal protection locks and tags must be applied.

Personal protection locks shall only be used by, and for the protection of, the individual to whom they have been assigned. Personal protection lock(s) shall never be applied or removed by anyone else other than in those special circumstances specified in Section 6.2 of this procedure.

In those cases where equipment cannot be left in a safe state, an authorized person shall ensure Supervisor's locks and tags are applied prior to removing personal locks and tags.

#### 4.2.1 Personal Protection Locks

All personal protection locks used on site shall be uniquely numbered and coloured red.

Personal protection locks assigned to workers shall be uniquely and individually keyed.

A process must be in place, for those employees who have not been assigned personal protection locks, to record signed out temporary personal protection locks. (i.e. log books)

Personal protection locks shall be used in conjunction with personal protection tags to ensure workers own protection while working on equipment/systems.



#### 4.2.2 Personal Protection Tags

Personal protection tags are to be used in conjunction with personal protection locks to identify who, when and why the equipment has been locked out. Personal protection tags shall not be used for equipment protection or status reporting purposes.

##### Personal Protection Tags Must:

1. Bear the “**DANGER**” header to indicate that operation of the tagged component could result in serious injury or death to personnel working on the related equipment/system, and a statement to the effect that the tagged component is not to be operated;
2. Have designated locations for the **printed name, signature** of the person applying it, and the **date** of application;
3. Include, in the remarks section, equipment being worked on, company name and details of the isolation; and
4. Be durable enough to stand up to the work environment. (e.g. all information on it must remain legible for the period of its application) For the sake of legibility and durability, tags **shall not** be re-used.



### 4.3 Group Lock Out



1. Group lockout should be considered when multiple lockouts are involved.
2. Keys associated with Project locks and tags placed on equipment to ensure equipment/systems are isolated, verified and secured in a safe state shall be placed into a lockbox.
3. The integrity of the lockbox shall be maintained by the authorized person by applying a Project lock and tag to the lockbox. (lockboxes in progress must not be left unsecured and unattended).
4. Lockbox must clearly identify the job which it applies to and must be listed on the Isolation Permit.
5. Each worker exposed to the equipment/system shall secure their own personal protection lock and tag to the identified lockbox.
6. The Project lock and tag used to protect the integrity of the lockbox shall not be removed until such time that all personal protection locks and tags have been removed and it is safe to do so.

### 4.4 Verification

Before starting work on machines, equipment, or processes that have been locked out, the authorized person responsible shall verify that isolation and de-energization have been

accomplished by the appropriate testing. Such testing will be conducted using methods appropriate to the situation, after ensuring that no personnel are in a position of risk.

Verification can be accomplished by one or more of the following:

1. testing for the absence of energy;
2. performing load verification cycling;
3. visually inspecting the position;
4. manually trying the machinery controls, actuating devices, or locked-out mechanisms;
5. monitoring movement or discharge; or
6. Observing bleeds, gauges, indicators, etc.

#### **4.5 Training**

All employees who apply the LOTO and Zero Energy procedure shall receive approved lock out / tag out training. All delivered LOTO training should be validated through testing of participants knowledge.

### **5 RESPONSIBILITIES**

#### **5.1 Supervisor**

Supervisors are responsible for:

1. Ensuring employees assigned tasks involving the use of LOTO are trained and qualified to perform the work
2. Ensuring LOTO procedures are appropriately applied;
3. Ensure Isolation Permit has been developed, approved for use and communicated to all personnel involved.
4. Making appropriate locks and tags available to employees.
5. Maintaining an administration system that issues controls and keeps a record of distributed personal protection locks.
6. Ensuring when work is not completed at the end of shift that Supervisor's locks and tags are applied and this is communicated to the oncoming shift.
7. Investigations are conducted for non-conformance.

#### **5.2 Electrician**

A qualified electrician is responsible for:

1. Performing isolations on all equipment over 600 volts
2. Verifying zero energy state as required

#### **5.3 Workers**

Workers who perform work requiring the application of the LOTO procedure are responsible for:

1. Complying with the requirements of this procedure;
2. Reporting to supervision any deficiencies or concerns related to LOTO prior to the commencement of the work;

3. Before work is started, verifying, if required, that the authorized person has taken the appropriate steps to prepare the equipment for work;
4. Becoming familiar with all energy isolating and control devices that apply to the equipment/system being locked and tagged
5. Ensuring all questions concerning the identification of energy sources shall be resolved with their supervisors and/or authorized person;
6. Verifying that the equipment/system is in a safe state;
7. Placing their personal protection locks and tags on all identified energy isolating and control devices or on identified lock boxes controlling these devices;
8. Immediately reporting any LOTO violations to their supervisor;
9. When safe to do so, removing their personal protection locks and tags upon completion of their portion of the work or at the end of the work day or work shift, whichever comes first; and
10. Ensuring a Project lock and tag are in place on equipment at the end of a shift if the work is not completed and advise the supervisor of such so that it may be communicated to the oncoming shift.

#### **5.4 Supervisor or the Health & Safety Department**

The Supervisor or the Health & Safety Department is responsible for:

1. Developing and maintaining a comprehensive LOTO and Zero Energy procedure;
2. Providing assistance to line management in the selection and acquisition of appropriate lock out/tag out devices and adapters;
3. On request, providing job-specific guidance on the requirements and application of LOTO procedures;
4. Providing LOTO training to employees and contractors; and
5. Participating in investigations of LOTO violations.

## **6 PROCESS**

### **6.1 Lockout Process**

Isolation and LOTO of equipment shall only be performed by employees who are trained, qualified and authorized to do so.

#### **Step 1 - Preparation for Shutdown**

- Identify all hazards (including stored energy)
- Identify the types and magnitude of energy to be controlled
- Identify the method or means of controlling the energy
- Identify the location of switches, energy sources, controls, interlocks or other such devices necessary to isolate the system
- Assess the consequences of shutdown
- Develop an Isolation Permit
- Notify all affected persons that the equipment will be shutdown and locked and tagged out

## **Step 2 - Machine, Equipment, or Process Shutdown**

- Shut down all machines, equipment, or processes using established shutdown procedures

## **Step 3 - Machine, Equipment, or Process Isolation**

- Isolate, neutralize, drain, vent, blank off and clean (if necessary) every machine, equipment, or process that could affect the health and safety of personnel.
- Ensure that all machines, equipment or processes are isolated

## **Step 4 - Application of Lock Devices**

- Apply and ensure lockout devices are properly adjusted
- Apply personal protection locks and completed personal protection tags on all identified machines, equipment and processes.

## **Step 5 - Stored Energy (de-energization)**

- Ensure all potentially hazardous stored or residual energy is relieved, blocked, bled, restrained and rendered safe.

## **Step 6 - Verification of Isolation**

- Visually confirm isolations and LOTO.
- Test all start buttons and other activating controls and/or the potential check of all electrical supplies to ensure that the equipment has been de-energized.
- Where required, ensure that all controls are returned to the “off” or neutral position after trying to start.

## **Step 7 – Completion of Work**

- Check that all temporary de-energization measures or devices have been terminated or removed
- Ensure the equipment/system is operationally intact, that all necessary guards have been reinstalled, and that all tools used during servicing or maintenance have been removed
- Ensure that all other employees, affected employees, and authorized persons are clear and have been told that the energy to the machine, equipment, or process will be restored.
- Prior to removing personal protection locks and tags, the worker must ensure the equipment is in a safe state. If the equipment cannot be placed in a safe state, Project locks and tags must be applied to the isolation point(s) by an authorized person prior to removing personal protection locks and tags.
- Remove personal protection locks and personal protection tags used to isolate the machine, equipment, or process.

## **6.2 Emergency Lock and Tag Removal Process**

In those very exceptional cases where worker’s personal protection lock and/or tag must be removed **for pressing safety or operational reasons**, and the worker who applied the personal protection lock and/or signed the personal protection tag is **off site and un-reachable**, removal of the personal protection lock and/or tag must be approved by the Supervisor or Manager .

If an employee leaves work and forgets to remove a personal protection lock and/or tag, the

following steps shall be followed:

- The supervisor will attempt to contact the employee to determine their whereabouts.
- If the employee is contacted and they can return to the project site in a reasonable period, they will do so and remove the lock.
- If the employee is contacted and cannot return to work in a reasonable period, they will give the supervisor adequate information to establish their identity and authorization to remove the lock.
- The supervisor will record this information as an incident.

If an employee leaves work and forgets to remove a personal protection lock and/or tag **and cannot be contacted** the following steps shall be followed:

- When the supervisor cannot contact the employee, he/she will perform a thorough search of the work area to ensure that the employee is not in the vicinity of the area where the work was being carried out.
- The supervisor will establish if the worker has left work.
- The supervisor will then contact the Manager and provide them with all of the information available. The Manager will consider the information provided and make a decision to the request for authorization to remove the lock.
- If permission is granted, the supervisor will remove the lock in the presence of at least one other worker.
- The supervisor must complete the **Emergency Lock and Tag Removal Form** which will include the names of those who assisted in the search for the employee and those who witnessed the lock being removed.
- The supervisor will record this information as an incident.

## **7 REFERENCES**

- 1) Saskatchewan OH&S Act and Regulations
- 2) CSA Z460 - Control of Hazardous Energy
- 3) 1996-1.1 REG 1 PART X Machine Safety Saskatchewan Occupational Health and Safety