

## Hazardous Energy Control

### Short description

This section provides the guidance and process for the effective control and prevention of release of potentially hazardous energy.

### Contact person

Andrew Richardson

Name

770-613-2999

Phone number

HSEQ

Functional Department

arichardson@cce-inc.com

Email address

### Responsible

Brent LeVander

Name

HSEQ

Functional Department

### Approval

Geoff Preisman

Name

President and CEO

Title

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## 1 Objective and area of application

The objective of this section is to identify the requirements, individual roles and responsibilities for Centennial employees and subcontractors while supervising or performing Lock-out/Tag-out (LOTO) procedures. These procedures involve conducting risk assessments to identify activities that could lead to potential injury or property damage due to unexpected release of uncontrolled, hazardous energy.

The control of hazardous energy is intended to prevent an unexpected operation or release of the following types of energy:

- Electrical (**Additional information on electrical LOTO and ZVV can be found in Section 31**)
- Hydraulic
- Pneumatic
- Mechanical
- Thermal

Workers performing servicing or maintenance on machinery and equipment may be exposed to injuries from the unexpected energization, startup of the machinery or equipment, or release of stored energy in the equipment. This section outlines the roles and responsibilities for those who will perform LOTO in protecting affected personnel from potentially hazardous sources of energy. Proper LOTO practices and procedures safeguard workers from the release of hazardous energy. The LOTO Program combines the use of tags and locks, or other electrical or physical systems to lock out power from the source to the equipment while out of service or while construction activities are proceeding.

## 2 Superior and additional applicable documents

1000\_GP\_11\_01\_en\_6.0 Global Policy on Health, Safety, Environment/Sustainability and Quality (HSEQ)

NFPA 70 - National Electric Code

NFPA 70E - Standards for Electrical Safety in the Workplace

This section of the HSEQ Manual applies to all Centennial employees and subcontractors who are performing work in Centennial facilities and project sites. There may be more stringent requirements than this section as defined by specific State, local or contact specific hazardous energy control requirements. If there is a conflict between this section and other applicable regulations, the more stringent will apply.

### 3 Definitions

The following definitions of terms are important for an understanding of this section.

Term	Definition
Centennial	All Centennial employees, joint venture employees, subcontractors and business partners
LOTO	Lock-out/tag-out or the control of hazardous energy
HSEQ	Health, Safety, Environment and Quality
Qualified person (electrical)	One who has demonstrated skills and knowledge related to the construction and operation of electrical equipment and installations and has received safety training to identify the hazards and reduce the associated risk
Authorized worker	Worker who installs locks or tags on machines or equipment in order to perform servicing, maintenance, or construction
Affected person	Individual who is required to use machines or equipment on which servicing is performed or who performs other job responsibilities in an area where there is potential exposure to hazardous energy
Energized	Machines and equipment are energized when they are connected to an energy source or they contain residual or stored energy
Energy source	Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy
Lock-out	The placement of a lock-out device on an energy-isolating device, in accordance with an established procedure, ensuring that the energy-isolating device and the equipment being controlled cannot be operated until the lockout device is removed
Tag-out	The placement of a tag-out device on an energy-isolating device, in accordance with an established procedure, to indicate that the energy-isolating device and the equipment being controlled may not be operated until the tag-out device is removed in accordance with an established procedure
ZVV	Zero voltage verification. Verifying an electrically safe work condition by testing confirm the absence of electrical voltage after performing LOTO
Energized work	Working on energized electrical conductors or circuit parts. Intentionally coming in contact with energized electrical conductors or circuit parts with the hands, feet, or other body parts, with tools, probes, or with test equipment, regardless of the personal protective equipment a person is wearing. There are two categories of “working on” <ul style="list-style-type: none"> <li>- Diagnostic testing is taking readings or measurements of electrical equipment with approved test equipment that does not require making any physical change to the equipment</li> </ul>

- Repair is any physical alteration of electrical equipment (such as making or tightening connections, removing, or replacing components, etc.)
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SSR Senior Site Representative

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HSEQ Director Leads the HSEQ Team

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## 4 Energy isolation procedures

Workers authorized to perform LOTO procedures will be certain as to which switch, valve or other energy isolating devices apply to the equipment or tools being locked out / tagged out. Implementation of lock-out / tag-out procedure shall be performed only by authorized workers.

Energy control procedures detail and document the specific information in which an authorized worker must have received training and the worker must know to accomplish LOTO and include:

- Scope of LOTO
- Purpose of LOTO
- Authorization authority
- Specific rules and techniques to be utilized

Affected persons shall be notified of the application and removal of lock-out / tag-out devices. Notification shall be given before the controls are applied, and after they are removed from the machine or equipment. Each lock-out / tag-out device shall be removed from the individual energy isolating device by the employee who applied the device or by written direction from a competent person after proper consultation with the person who applied the device.

Work activity requiring LOTO must be reviewed and renewed at the end of and beginning of each shift of work or the beginning of each new day of work.

### 4.1 Sequence of LOTO procedures

The sequence for LOTO procedures are as follows:

- Notify all affected personnel of the impending lock-out / tag-out including the specific equipment or sources of energy being locked and tagged out and the estimated duration
- Equipment shutdown and isolation. Place all switches in the "off" or "safe" position. Disconnect sources of power, ensuring all sources of both primary and secondary power to the equipment are interrupted
- Dissipate residual energy. Check for trapped pressure or residual electricity in the system
- Work continuing over more than one shift or day shall require a residual energy dissipation check and confirmation at the beginning of each shift or workday
- Lock-out verification. Test the equipment to be certain that there is no potential hazardous energy present
- Perform the work scheduled. Ensure the new/repair work does not bypass the lock-out and reactivate the system
- Lock and tag removal. All locks and tags shall be left in place until work is finished. Locks and tags are never to be removed except by the person who placed it

## 4.2 LOTO procedures involving more than one person

If more than one individual is required to install lock-out / tag-out devices on equipment, each shall place his or her own personal lock-out / tag-out device on the energy-isolating device(s). When an energy-isolating device cannot accept multiple locks and tags, a multiple lock-out / tag-out device shall be used. When each person has completed his or her own work, he or she shall remove only his or her lock and tag, leaving all other locks and tags in place until the last worker has completed his or her own work.

## 4.3 LOTO devices

LOTO Devices must be:

- Durable – Lock-out / tag-out devices shall be capable of withstanding the environment to which they are exposed for the maximum period of time that exposure is expected
- Substantial
  - Lock-out devices shall be substantial enough to prevent removal without the use of excessive force or unusual techniques, such as with the use of bolt cutters
  - Tag-out devices, including their means of attachment, shall be substantial enough to prevent inadvertent or accidental removal. Tag-out device attachment means shall be of a non-reusable type, attachable by hand, self-locking, and non-releasable with a minimum unlocking strength of no less than 50 pounds
  - Tag-out devices shall also be able to withstand the weather or other degrading conditions to which they are exposed including, but not limited to:
    - UV light
    - Wet or damp locations
    - Corrosive locations
- Identifiable
  - Lock-out / tag-out devices shall indicate the date installed and the identity of those applying the device(s)
  - Tag-out devices shall warn against hazardous conditions if the machine or equipment is energized and shall include a legend such as the following:
    - “Do Not Start”
    - “Do Not Open”
    - “Do Not Energize”
    - “Do Not Operate”

## 4.4 General LOTO training

Authorized workers must receive training on the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in their work areas, and the methods and means necessary for energy isolation and control.

Affected persons must receive training on the purpose and use of the energy control procedures. Other affected persons (those whose work activities are or may be in an area where energy control procedures may be utilized) must be instructed about the procedure and about the prohibition relating to attempts to restart or re-energize machines or equipment that are locked out / tagged out as well as the prohibition of removing locks and tags placed by others.

Any worker who will be working on or near energized electrical circuits or equipment shall be trained in the most current version of the NFPA70E.

**Additional information on electrical LOTO and ZVV can be found in section 31.**

## 5 General Utility Shutdown

All utilities should be researched before a shut-down is performed. As part of this process, Centennial has developed a Utility Shut-down Request Form (Appendix 1) and a Hazardous Energy Control Plan (Appendix 2) for use with water, phone, communication, or any other utility. In many cases the client may have a process and a form already in place which we will utilize.

## 6 Amendment history

Date	Version	Revised content
12.03.2014	1.0	Initial Preparation
04.07.2015	1.1	Updated in accordance with NFPA 70E 2015 version
01.01.2018	2.0	Updates to Paragraph 2 Superior Documents to add the Group Policy and Global Standards, Paragraph 3 Definitions (Centennial, Qualified person, ZVV, Energized work and HSEQ Director), Paragraph 5 Electrical LOTO, ZVV and energized electrical work (appendices) Paragraph 5.2.1 Energized electrical work permit (NFPA 70E sections), Paragraph 5.2.2 Energized electrical work permit approval process (approval), Paragraph 6 General Utility Shut-down (new), Appendix 1 50-600V LOTO/ZVV Plan (procedure updates and logo), Appendix 2 Energized Electrical Work Permit Flow Chart (logo), Appendix 3 Energized Work Job Planning/Briefing Checklist (additional items and logo), Appendix 4 (procedures and logo) and Appendix 5 (new)
11.01.2018	2.1	Appendix 1: 50-600 Volt LOTO/ZVV Plan (updated with section to indicate location of the LOTO action)
10.01.2019	2.2	Removal of Paragraph 5 Electrical LOTO, ZVV and Energized Work, removal of Appendices 1-4 and addition of Appendix 2.1 Hazardous Energy Control Plan
04.01.2021	2.3	Updates to Paragraph 2 Superior Documents and Paragraph 4 Energy Isolation Procedures (lock-out or tag-out changed to lock-out / tag-out)

## 7 Appendix

Appendix 1: Utility Shut-down Request Form (0206500\_CP\_11\_13\_en\_A1.5)

Appendix 2: Hazardous Energy Control Plan (0206500\_CP\_11\_13\_en\_A2.1)

## Request for Utility and Service Shutdown

0206500\_CP\_11\_13\_en\_A1.5

It is requested that the noted building system(s) be “shutdown” by the Owner to allow for tie-in of services for the Project as enumerated below. We note that three (3) weeks advance notice is required as a minimum for medical and/or research facilities and that all such shutdowns may occur during other than regular working hours.

Project Title: \_\_\_\_\_ Date: \_\_\_\_\_

Requested Deactivation Date: \_\_\_\_\_ Time: From: \_\_\_\_\_ To: \_\_\_\_\_

Subcontractor Name: \_\_\_\_\_ Emerg. Phone No.: \_\_\_\_\_

Centennial Superintendent: \_\_\_\_\_ Phone No.: \_\_\_\_\_

Location of Activity:

Building: \_\_\_\_\_ Room(s) Name & No.: \_\_\_\_\_

Description of Work:

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Spec. Section Ref: \_\_\_\_\_ Detail/Drawing Number: \_\_\_\_\_

Not Approved – See comments below:

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Approved - The required information has been reviewed and confirmed to be correct. The deactivation may proceed during the requested date and time as listed above.

\_\_\_\_\_  
Owner Rep Name (Printed)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date



## Hazardous Energy Control Plan

0206500\_CP\_11\_13\_en\_A2.1

### LOCK OUT/TAG OUT AND VERIFICATION

#### Purpose:

This plan is intended to establish the minimum requirements for the Lockout/Tagout of energy-isolation devices whenever maintenance or servicing is performed. This plan shall be completed prior to starting any work on projects that involve stored or residual energy and/or where the unexpected energization or release of stored energy could cause injury, such as Hydraulic, Pneumatic, Mechanical, Thermal, Vacuum, Gravity, Springs or Battery.

#### Additional Documents:

Request for Utility and Service Shutdown 0206500\_CP\_11\_13\_en\_A5 may be required.

#### Instructions:

This plan shall be completed by a competent/qualified person operating in a safe manner. Fill in all blanks, attach all requested training documentation and return to the Project Superintendent or Project Safety Officer.

**General Site Information:**                      Outage Start Date: \_\_\_\_\_ Outage Finish Date: \_\_\_\_\_

Company Name: \_\_\_\_\_

Point of Contact: \_\_\_\_\_ Phone No.: \_\_\_\_\_

Lower Tier Company Name: \_\_\_\_\_

Company Project Name: \_\_\_\_\_

LOTO Description: \_\_\_\_\_

LOTO Personnel (Print Name): \_\_\_\_\_

Utilities Affected:     Gas     Water     Steam     Boiler     Other \_\_\_\_\_

#### Emergency Response Training:

**(1) Contact information:** \_\_\_\_\_

#### **(2) First Aid, Emergency Response and Resuscitation.**

- (a) Employees responsible for responding to medical emergencies shall be trained in first aid and emergency procedures.
- (b) Employees responsible for responding to medical emergencies shall be trained in cardiopulmonary resuscitation (CPR).
- (c) Employees responsible for responding to medical emergencies shall be trained.
- (d) Training shall occur at a frequency that satisfies the requirements of the certifying body.

#### **(3) Training Verification & Documentation**

*(Attach credentials to this plan)*

**Lock Out & Tag Out (LOTO):**

**Normal Operating Condition.** Normal operation of equipment shall be permitted where a normal operating condition exists. A normal operation condition exists when all the following conditions are satisfied:

- (1) The equipment is properly installed.
- (2) The equipment is properly maintained.
- (3) The equipment is used in accordance with instructions included in the listing and labeling and in accordance with the manufacturer's instructions.
- (4) All equipment covers/valves, etc. are in place and secured.
- (5) There is no evidence of impending failure.

Notice: The phrase *properly installed* means that the equipment is installed in accordance with applicable industry codes and standards and the manufacturer's recommendations. The phrase *properly maintained* means that the equipment has been maintained in accordance with the manufacturer's recommendations and applicable industry codes and standards. The phrase *evidence of impending failure* means that there is evidence such as loose and frozen valves, bound equipment parts, visible damage or deterioration, etc.

**Protection of employees and public**

- 1) Warning signs and barriers shall be placed to keep out/away unauthorized personnel before starting the LOTO process.
- 2) Only authorized personnel will be permitted to access the area of the utilities to be locked out/tagged out. The authorized person's qualifications may vary due to the type of energy to be encountered.
- 3) Required PPE shall be worn at all times.
- 4) Be aware of hot and cold surfaces when handling valves/gates and other locking devices.

**LOTO Steps:**

- 1) Notify all affected personnel and/or employees where servicing/maintenance is required prior to disrupting any energy source.

**Affected Personnel:**

_____	_____
_____	_____

**Method/s of notification:**

_____	_____
_____	_____

- 2) Identify all sources of energy (stored or residual), the hazards involved and the method of control that are specific to the equipment being LOTO.

<u>Type of Energy</u>	<u>Hazard</u>	<u>Control</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____

- 3) After properly interrupting the load, pressure or flow, use approved valves/gates to shut down each energy source.

**Equipment Used for Testing:**

Test equipment/instruments must be selected based on the intended use and expected type of utility & conditions such as pressures and flows in the systems.

Make/Model: \_\_\_\_\_ Rating: \_\_\_\_\_

*Note: Verify the test instruments operation before and after zero energy verification*

- 4) **Verify all valves and gates of the devices are fully closed.**  
 5) **Engage energy isolating devices.** Verify that the device for LOTO cannot be removed or tampered with.

<u>Isolation Device</u>	<u>Location</u>
_____	_____
_____	_____

- 6) **Stored or residual energy must be dissipated or restrained by methods such as grounding, repositioning, blocking, bleeding down, etc.** Use adequately rated gauges or other rated devices to verify zero stored/residual energy.

<u>Type</u>	<u>Present</u>	<u>Method of Restraint</u>
Hydraulic	<input type="checkbox"/>	_____
Pressurized	<input type="checkbox"/>	_____
Vacuum	<input type="checkbox"/>	_____
Thermal	<input type="checkbox"/>	_____
Springs	<input type="checkbox"/>	_____
Gravity	<input type="checkbox"/>	_____
Capacitors	<input type="checkbox"/>	_____
Battery	<input type="checkbox"/>	_____
Others	<input type="checkbox"/>	_____

- 7) **Ensure the equipment is disconnected from the energy source(s)**, make sure no personnel are exposed, then verify the isolation of the equipment by attempting to start or operate the device or equipment through normal operating controls.

**CAUTION: Return operating control(s) to neutral or OFF position after verifying the isolation of the equipment.**

- 8) **LOTO/Zero Energy is verified complete.** Approved personnel may be allowed to enter the LOTO area and perform service/maintenance as required once this section is certified by the Authorized person.

\*I certify that all sources of energy were verified de-energized through testing on this date, utilizing LOTO procedures prior to service/maintenance work beginning.

\_\_\_\_\_  
 Authorized Person Signature

\_\_\_\_\_  
 Date

**Minimum PPE Requirements for LOTO & Verification of LOTO**

- (1) Safety vest
- (2) ANSI Z87.1 Safety glasses or goggles
- (3) Hearing Protection (ear canal inserts)
- (4) Gloves for protection against what is being in countered such as heat, chemical, etc.
- (5) Hard hat
- (6) Leather footwear
- (7) Additional PPE may be required by the testing equipment as per the manufacture.
- (8) Additional PPE may be required for releasing of a product, note: SDS is required for products encountered before exposing worker to additional hazards.

**Communication with Other Trades:**

Notify all workers on the project site of LOTO operations in advance. Once a safe work condition is achieved and verified with the contractor (Subcontractor) performing the LOTO, the project personnel shall be notified that it is safe to enter the work area.

**Additional Required Training:**

Employees will be trained to understand the specific hazards associated with stored energy and the relationship between hazards and possible injury. Employees must have received specific training on:

- What hazards are presented by the specific job
- How hazards affect body tissues
- How to avoid exposure to hazards
- How to minimize risk by body positioning
- What PPE is needed for the employee to perform his/her work assignment
- How to select and inspect PPE
- What employer-provided procedures, including specific work practices, the employee must implement
- How increased duration of exposure increases the opportunity of injury
- How to perform a hazard/risk analysis
- How to determine prohibited boundaries

**Pre-Job Requirements:**

- Review diagrams, work orders, manuals
- Conduct pre-job briefing
- AHA completed/reviewed
- Inspect PPE

**Utility Diagram Sketch Box**

**Initials:** \_\_\_\_\_

**Plan Approval:**

Plan Author (sign): \_\_\_\_\_ Date: \_\_\_\_\_

Authorized Person (sign): \_\_\_\_\_ Date: \_\_\_\_\_

**Plan Review:**

PSO/Superintendent (Sign): \_\_\_\_\_ Date: \_\_\_\_\_