

## Environmental Health & Safety

<b>Title: Lock Out/Tag Out for Energy Isolation</b>	
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- B BSC LO/TO Form For Coordination With Outside Contractors**
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## I. PURPOSE

The purpose of this policy is to provide establish required measures to protect BSC employees and non-BSC personnel from inherent dangers and hazards associated with unexpected energization, start-up, or restart of equipment or machinery or release of stored energy that could cause injury, illness, contamination, or property damage. This program was created to conform with the Occupational Safety and Health Administration's (OSHA) regulations 29 CFR Part 1910.147, *Control of Hazardous Energy (Lock Out Tag Out)*.

## II. SCOPE

This policy identifies the minimum protocols that shall be followed for Lock Out/Tag Out (LO/TO) of energized equipment or systems during maintenance or servicing operations at BSC in a manner that ensures the machine or equipment is stopped, isolated from all potentially hazardous energy sources and locked out before maintenance/servicing work is performed. For the purpose of this procedure *energy is defined as any power including electrical, mechanical, hydraulic, pneumatic, chemical, thermal and any other.*

The Environmental Health and Safety (EH&S) Office will be responsible for ensuring BSC and non-BSC personnel comply with the requirements of this program.

## III. APPLICABILITY, RESPONSIBILITIES AND AUTHORIZATIONS

### 3.1 Applicability

Adherence to this policy and procedure is mandatory for all BSC employees and non-BSC personnel including, but not limited to contractors and subcontractors, unless the contractor or subcontractor has a more restrictive and protective procedure.

This procedure is applicable to any and all servicing or maintenance activities where unexpected energization or start-up of the machine or equipment or release of stored energy could cause injury. Such equipment includes but is not limited to motors, fans, compressors, pumps, electrical circuits, boilers, elevators, steam, steam and hot water lines. The BSC energy systems requiring implementation of this LO/TO procedure are identified in Appendix A.

Only an "authorized" employee may initiate and implement LO/TO on the BSC campus. An "authorized" employee shall be a "competent person" and designated by management/supervisors to perform LO/TO. A "competent person" is defined by this policy as an individual by training and/or experience, of identifying existing and predictable hazards or working conditions in the work place. This person is authorized to take prompt corrective measures to eliminate the unsafe conditions.

All BSC employees and non BSC personnel, upon observing a machine or piece of equipment, which is locked out to perform servicing or maintenance, shall not attempt to start, energize, or use that machine or equipment. BSC employees failing to follow this program are subject to disciplinary actions and/or dismissal.

## 3.2 Exceptions

This LO/TO procedure does not apply to the following instances:

- A) Work on cord- or plug-connected electrical equipment where the equipment is able to be disconnected from the energy source by unplugging the equipment AND where the plug or cord is under the sole control of the individual performing the maintenance/servicing activity;
- B) "Hot Tap" operations that involve transmission and distribution systems for gas, steam, water, or petroleum products on pressurized pipelines **if** continuity of service is essential, shutdown of the system is impractical, documented and **proven** procedures are followed, employees are effectively protected by special equipment, supervisor approval is obtained;
- C) Normal repetitive, routine minor adjustments and maintenance as long as workers are adequately protected. This may include lubricating, draining sumps, servicing filters, inspection for leaks, changing light bulbs and malfunctions **unless** one or more of the following is required:
  - i) An employee is required to remove or bypass a guard or other safety device;
  - ii) An employee is required to place any part of their body into an area on a machine or piece of equipment where work is actually performed, such as the point of operation or where a danger zone exists.

If changing light bulbs, refer to Section X.

## 3.3 Authorization and Competency

Only an "authorized employee" may initiate and implement LO/TO on the BSC campus. An "authorized employee" shall be a "competent person" and designated by management/supervisors to perform LO/TO. A "competent person" is defined by this policy as an individual by training and/or experience, of identifying existing and predictable hazards or working conditions in the work place. This person is authorized to take prompt corrective measures to eliminate the unsafe conditions.

## 3.4 BSC Employee Responsibilities

- A) BSC Department Heads shall:
  - i) Maintain an adequate supply of LO/TO out devices. All locks used by BSC employees on campus as lock out devices shall be supplied by Campus Services.
  - ii) Designate or arrange for the necessary training of employees:
    - \* whenever there is a change of job assignment;
    - \* whenever a new hazard is introduced due to a change in machines, equipment, or process;
    - \* whenever there is a change in energy control procedures; or

\* whenever a periodic inspection reveals deficiencies in procedure implementation.

- B) BSC EH&S Director shall:
  - i) Monitoring applicable LO/TO safety regulations;
  - ii) Maintaining and promptly updating this procedure accordingly to assure compliance with applicable regulations;
  - ii) Providing consultative advice to Department Heads and other affected personnel as necessary on correct implementation of the LO/TO procedure; and
  - iv) Auditing & inspecting worker implementation of this LO/TO procedure.
  
- C) BSC Supervisory personnel shall:
  - i) Assure that only “authorized employees” initiate or implement a LO/TO device;
  - ii) Assure that a LO/TO is performed when necessary;
  - iii) Maintain related records (e.g. inspection records, what LO/TO are issued to whom); and
  - iv) Re-combine or remove an employee’s lock from use when the key is reported lost.
  
- D) BSC Employees shall:
  - i) Complete required LO/TO training;
  - ii) Implement the LO/TO procedure when required;
  - iii) Remove locks/tags promptly when the assignment is completed and the LO/TO procedure is no longer applicable;
  - iv) Immediately notify their supervisor that LO/TO is needed, when it is not originally identified or anticipated in the job assignment;
  - v) Report the loss of a LO/TO lock, lock key, or tag immediately to their supervisor.

### **3.5 Outside Contractor Work**

If outside contractors perform servicing or maintenance that requires lockout, the BSC representative controlling the work/project shall take the following steps.

1. Inform the outside contractor of BSCs LO/TO procedures and supply them with a copy.
2. Obtain and review a copy of the outside contractor's lockout procedures.
3. Ensure that BSC employees understand and comply with the responsibilities and prohibitions of the outside contractor's LO/TO procedure, if the procedure is accepted by the EH&S Office Director (or their designee) and it is used. If not accepted, the contracting company will utilize the procedures as set by BSC. Note that in order to use the contracting company's procedure, it must at least be as stringent as the BSC procedure in order to protect the employees of both respective parties and the property of BSC.

## IV. LO/TO Hardware Requirements

### 4.1 Hierarchy of LO/TO Devices

Where a machine or piece of equipment cannot be Locked out, a Tag Out device shall be used as a second alternative.

### 4.2 Lock Out Devices

- A) Lockout devices shall include locks, chains, wedges, key blocks, adaptor pins etc. or any combination of the above and shall ONLY be used for isolating equipment from their energy source.
- B) Lockout devices shall be standardized throughout the college and recognizable as a Lock Out device. Each Lock out device shall indicate the identity of the individual applying the device.
- C) Their construction shall be sturdy enough to withstand unauthorized removal.
- D) There are four (4) potential types of Locks to be used by BSC personnel which are defined as follows:
  - 1) Shop Lock - Series of locks all keyed alike with multiple keys in the possession of the owner/operator group. This lock is used for clearing purposes by the equipment owner/operator on individual lockouts. The shop lock is the first lock on and the last lock off. No work can be performed under a shop lock by itself.
  - 2) Personal Lock - A single lock or series of locks that has one key which the employee keeps in his possession. There are no master keys or duplicate keys for a personal lock. This represents the employee's individual safety protection for the job. Contractor personal safety locks shall be of an equivalent strength and durability to the BSC supplied locks.

- 3) System Lock – Series of locks with a single key such that a system can be locked out with multiple locks having just one key. There are no master or duplicate keys for system locks. NOTE: Unused system locks shall be controlled by the owner/operator.
- 4) Equipment Safety Lock – These locks are assigned to equipment that requires routine lockout for minor servicing and adjustments to operating equipment. These locks must be attached to the equipment and will have one key. The operator must lock the equipment and keep the key in his/her possession during work. This lock must be accompanied by a properly signed Danger Tag and may not be used for Mechanical work. Only the person placing the Equipment Safety Lock may work under the lock. (Lockout checklists are not required for equipment safety lockouts.)

### 4.3 Tag Out Devices

Tag Out devices shall consist of two (2) parts: the tag and the attachment mechanism, which shall meet the following:

- A) The tag shall be printed with the warning **“DO NOT OPERATE”** that shall be weatherproof. The color, shape, size, print, and format are to be standardized throughout the college;
- B) The attachment mechanism shall be sturdy enough to prevent accidental removal. The mechanism shall be non-reusable, self-locking, and attachable by hand; and
- C) Each Tag Out device shall indicate the identity of the individual applying the device.

There are four (4) basic types of Tags used:

Danger Tag – A properly identified Danger Tag must always accompany a lock. The tag will explain the purpose of the lockout and must be dated and signed by the employee placing the tag. Only the person who placed the tag may remove it, unless otherwise directed by Supervision (NOTE: This does not apply to the tag accompanying a Shop Lock). On piping systems, properly completed Danger Tags and locks are used on all valves associated with the job task. Danger Tags left on equipment for more than 60 days must be updated and signed before the end of the 60 day period. (See Out of Service Tag).

Work Incomplete Tag – This tag is placed with the shop lock(s) upon start of work by each work group. The purpose of the tag is to communicate that a particular group's work is incomplete even though the personal locks may have been pulled at shift change. The tag is hung at each shop lock(s) by a designated person from each group that has work in progress. The tag can be removed by any member of that work group that knows that his/her group's total job is complete.

Restricted Tag – When equipment requires operation by personnel other than the owner/operator group for check-out/testing/troubleshooting, a Restricted Tag shall be placed specifying the group to operate the equipment. While the Restricted Tag is in place, the designated group will be responsible for all LO/TO procedures (and becomes the owner/operator until the Restricted Tag is removed).

Out-of-Service Tag – When equipment is taken out of service but remains in place, an Out of Service Tag must be attached, properly signed, and dated, with the reason the equipment is no longer serviceable. **NOTE: An Out-of-Service Tag cannot be used on equipment which is still electrically or mechanically connected to a power or process source.**

#### 4.4 Multiple Users of a LO/TO Device

- A) When the LO/TO devices are intended for use by more than one worker (e.g., electrical and lock shops), the LO/TO devices shall be identified as multiple user device and assigned an identification marking to distinguish that device from others.
- B) When it is necessary to use a multiple user LO/TO device, the person taking custody (using) of the device shall sign out the device on a form specified by the supervisor. The form shall require, at a minimum, the following information be entered printed name, signature, LO/TO device i.d., date and time, and the precise location of intended use.

## V. ESTABLISHING LO/TO ENERGY ISOLATION

A zero energy state must be achieved prior to performing work on equipment. This is the state where all sources of energy are identified, isolated, and stored energy relieved. A general description of Lock Out Methods is provided in Section 5.1. Procedural steps to reach a safe, Locked Out state are provided in Section 5.2 and in Appendices A and B, which contains system and contractor specific guidelines.

### 5.1 Lock Out Methods

There are two accepted methods for lockout. One is called Simple Lock Out and the second is called System Lockout. A method of documenting lockout points will be used for any system lockout. A lockout description in the Operating Directions (ODs) or Lockout Checklist, are acceptable methods of documentation. The Lockout Checklist (or ODs) shall be readily accessible. The Lockout Checklist Form to be completed is provided in Appendix C.

- A) Simple Lockout – This approach is used when a job is relatively straight forward, involving a small number of locks, few people and not expected to go on for more than one shift. (The use of an Equipment Safety Lock is a special case of Simple Lockout.) The steps for a Simple Lock out are as follows:



- 1) Each person who is to do work on the system shall put his/her own Personal Lock and completed danger tag on each energy source and ***keeps the key in their possession***. For jobs lasting longer than 1 shift or have more than one work group (e.g. electricians and HVAC), a Work Incomplete Tag shall be placed with the Shop Lock(s) upon the start of work by each work group.
  - 2) Upon completion of work, personal locks and tags shall be removed.
  - 3) Each work group removes their shop lock and tag.
- B) System Lockout – A system lockout is used when the Lockout is complex requiring multiple locks, numerous workers and/or the job is expected to go on for several shifts. The owner/operator will decide whether a system lockout should be used based on his/her understanding of the work to be performed. The steps for a System Lockout are as follows:
- 1) The equipment is to be cleared by the owner/operator using a Lockout Checklist or OD's, System Locks and properly completed Danger Tags. Those working on the job may want to accompany the owner/operator during the clearing process to insure adequate set up had occurred.
  - 2) The key to the System(s) Locks will be placed in a System Lock box. The System Lock box will have a clear viewing window and the box must be capable of being locked shut. It will be the Department's responsibility to label and identify the multiple system lockboxes (numbers, labels, or colors). The department will then lock the box with their own shop lock and tag. The Lockout Checklist or OD's shall be kept readily accessible and cross-referenced to the proper system lockbox. Completed lockout checklist or checked off copy of OD's should be placed at the lockbox.
  - 3) Each work group will place a Shop Lock with properly filled out Work Incomplete Tag on the lock box.
  - 4) Each individual assures themselves that the equipment had been properly locked out, will place their personal lock and properly filled out Danger Tag on the lock box hasp.
  - 5) Upon completion of work, "work incomplete" tags and personal locks and tags shall be removed.
  - 6) The work group removes Shop Locks and Tags from lockbox.
  - 7) The department removes their Shop Locks and Tags.

## 5.2 PROCEDURE

The steps listed below **shall** be performed in the following sequence to ensure proper LO/TO of a machinery or piece of equipment. In addition, system and contractor specific guidelines provided in Appendix A are to be followed.

- A) The service personnel are to become familiar with the type, magnitude, and hazards of the energy powering the equipment and the method to control by eliminating the feed of energy to the unit.

- B) All individuals normally operating, using, or affected by the equipment to be shutdown are to be notified that the LO/TO procedure will be used and the rationale (reason) for its use.
- C) If the machine or equipment is operating, it should be shut down using the normal stopping procedure (e.g. depress the stop button, opening switches, etc.)
- D) Operate switches, circuit breakers, disconnects, valves, etc. so that the equipment to be serviced is isolated from **ALL** sources of energy. Stored energy, such as contained by springs, elevated machine parts, flywheels, hydraulic systems, compress air, gas, steam or water pressure must be released or restrained by repositioning, blocking, bleeding down, etc.
- E) The Lock Out or Tag Out device shall be secured to all energy isolating devices by the servicing individual in a manner that it will hold the isolating device in a "safe" or "off" position. If a Lock Out device cannot be used, a Tag Out device, indicating that the operation or repositioning of the energy isolating device is prohibited, shall be used and attached at the point where the lock would be attached.
- F) **Make certain the equipment does not operate and check that the energy has been disconnected by operating the normal operating controls. Other checks may be appropriate on different devices (e.g. ammeter or volt meter readings on electrical circuits). Return the operating controls to the "off" or "safe" position after the test.**
- G) The equipment, machine or device is now locked-out or tagged out.

## VI. RELEASING THE LO/TO AND RETURNING EQUIPMENT TO SERVICE

Once work is complete the following steps and sequence shall be followed for restoring the unit to an operable condition.

- A) Remove all tools used during the servicing, replace any guards that may have been removed for servicing, make certain the equipment is operationally intact;
- B) Notify affected personnel, including operators that the LO/TO removal is about to occur;
- C) Check to ensure all personnel are safely away from the equipment/machinery;
- D) Remove the LO/TO device and reenergize the unit;

**Only the person attaching the LO/TO Device is permitted to remove same and only when he/she has completed working on the locked out/tagged out equipment.**

Supervisory personnel are permitted to remove LO/TO devices but **ONLY** under the following conditions:

- A) It is verified that the individual applying the Lock or Tag is not available to remove the device;
- B) The steps for releasing the LO/TO listed above are followed and confirmed; **AND**
- C) The individual applying the Lock or Tag is notified of its release.

## VII. SITUATIONS INVOLVING MORE THAN ONE SERVICE PERSON

If more than one individual is required to work on the Locked Out or Tagged Out unit, **EACH** persons shall attach his/her personnel LO/TO device on the energy isolating device. A multiple Lock or Tag hasp may be necessary to accept the number of Locks or Tags needed to comply with this requirement.

## VIII. PERSONNEL OR SHIFT CHANGES

When work necessitating a LO/TO is not completed on a given shift and work continues into a succeeding shift, off-going personnel involve shall remove their LO/TO device and on-coming personnel shall install their LO/TO device(s). Supervisors shall monitor these situations and if necessary, install their own device so that at **NO** time will the equipment or machinery be without a LO/TO/ device.

## IX. LEAVING AN INCOMPLETE JOB ASSIGNMENT

### 9.1 BSC Personnel

BSC personnel who find it necessary to leave an incomplete job still requiring a LO/TO device shall install a Shop Lock then remove their Personal Lock or Tag. The work group (e.g. electrical) supervisor shall be notified when this happens. The intent is to ensure service personnel have their Personal Locks/Tags with them at all times either in use or on their possession.

### 9.2 Non-BSC Personnel

Non-BSC personnel who find it necessary to leave an incomplete job still requiring a LO/TO device shall NOT remove their personnel Lock or Tag devices, but shall obtain and use additional devices as necessary for the other job assignments.

## X. CHANGING LIGHT BULBS

Changing lamps or bulbs requires that the individual be qualified and experienced in recognizing electrical hazards. The bulbs may be replaced by such individuals with the power on or turned off at the wall switch, whichever provides the individual with adequate lighting. The minimum protective equipment required for lamp and bulb changing is goggles or safety glasses with side shields and if possible, leather gloves.

If a lamp or bulb is physically broken, the circuit shall be de-energized and locked out in accordance with this procedure to remove the fragments and electrical connectors. Fixture washdown and lamp cleaning using water will require light fixtures to be locked out. In addition, any lamp or bulb replacements in electrically classified areas will require Lock Out.

Low voltage (30 volts or less) bulbs in control panels and graphics can be changed by anyone trained to do so.

## **XI. EQUIPMENT RENOVATION OR MODIFICATION**

Whenever machines or equipment undergoes a major repair, replacement, or modification, or a new unit is installed, all energy isolating devices, such as valves, disconnects, etc., for these units will be designed and fabricated to accept a Lockout Device.

## **XII. BSC EMPLOYEE TRAINING REQUIREMENTS**

Each BSC employee that could reasonably be expected to be affected by this procedure shall be trained in: recognition of energy sources, the methods of energy isolation and control, the prohibition involving attempts to remove LO/TO devices and reenergize equipment, and the purpose and application of this procedure.

## **XIII. PERIODIC COMPLIANCE VERIFICATION AND PROCEDURE REVIEW**

The EH&S Office Director, or their designee(s) who is (are) knowledgeable and familiar with the requirements of this procedure and OSHA regulations will conduct an audit/inspection at least annually. This audit will consist of one or more lockouts being used in an area and an interview with one or more employees involved in those lockouts. The results of the audit will be documented and shared with area/shop supervision in order to correct inadequacies/deviations in a timely manner.

The EH&S Director (or their designee) shall maintain this procedure and ensure any necessary modifications are promptly incorporated.

## APPENDIX A

### MATRIX FOR SYSTEM AND CONTRACTOR SPECIFIC LO/TO GUIDELINES

BSC Energy System	LO/TO Guideline Number(s) *
A. Domestic and Circ. Hot Water	1, 6
B. Sanitary Systems	2, 9
C. Sprinkler Systems	1
D. Acid Waste	2, 9
E. Compressed Air	1
F. Natural Gas	1, 9
G. Petroleum (fuel oil, gasoline, diesel)	1, 9
H. Vacuum	1
I. Refrigeration Systems	1, 3, 6, 9
J. Chemical Feed Systems	1, 3, 9
K. Steam	1, 3, 4, 6
L. Condensate, Chilled Water, or Condensed water	1, 3
M. Fire Protection Systems (CO2 and kitchen hoods)	3, 5
N. Kitchen Equipment	3, 5, 6
O. Elevators	3, 7
P. Boilers	1, 3, 6
Q. Generators	3, 6, 8
R. Fire Alarms	3
S. Smoke Hatches	3, 5, 7
T. Air Handlers	3, 7
U. Fume Hoods	3, 9
V. Electrical	3
W. Outside Contractors	10

\* Guidelines start on next page.

## APPENDIX A (Cont'd)

### **LO/TO Guidelines**

- 1) Valves – Ensure all associated valves are fully closed, mechanically secured, and chained and locked or tagged. Stored energy (i.e., compressed air, water, etc) to be slowly released (bled) until all contained pressures are eliminated.
- 2) Sanitary and Acid Wastes – Prevent additional waste, water, sewage, etc. from being introduced into the affected drain.
  - a) Plug and tag drain openings in sinks and floors.
  - b) Tag associated valves, faucets, etc. to prevent their use to introduce wastes into the system.Flush first, then slowly release and clear stored energy (i.e., water pressure, wastes, etc).
- 3) De-Energizing Electrical –
  - a) If equipped, unplug all associated associated plugs and safely test.
  - b) Mechanically de-energize all associated disconnects, Tag and test.
  - c) Lock all lockable means of disconnecting, Tag and test.
  - d) Release or isolate stored forms of energy (i.e., batteries, capacitors).
  - e) Mechanically bond and ground circuits that exceed 208V (Volts) and 60 AMPs.
- 4) Cap and/or flange to isolate work areas where unable to ensure all stored energy is released.
- 5) Mechanically deactivate stored forms of energy (i.e., spring loaded mechanism).
- 6) Prior to working in high temperature areas, allow hot surfaces to cool either through natural or forced cooling.
- 7) Blocking and bracing to be utilized when working near or under equipment that could injury if allowed to move.
- 8) Remove and/or isolate stored forms of electrical energy (i.e., discharge capacitors and remove or isolate terminals on capacitors or storage batteries).
- 9) Neutralize and/or ventilate, prior to working on or in equipment when:
  - a) Fumes, gases or vapors could be present
  - b) Hazardous chemical solution is known or suspected present.
- 10) Outside Contractor Form (see next page) must be completed and signed.



## APPENDIX C

### BSC LOCKOUT CHECKLIST

Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Conducted By: \_\_\_\_\_

In order to determine all energy sources for *each piece of type* of machine or equipment, fill in the following table.

Building Name: \_\_\_\_\_ Room Number: \_\_\_\_\_

Equipment Name: \_\_\_\_\_

Model: _____ Serial Number: _____ _____		LOCATION OF ISOLATING DEVICE	METHOD OR MEANS OF ISOLATION
ENERGY SOURCE	MAGNITUDE* (see note)		
Electrical:			
Engine:			
Spring:			
Counterweight:			
Flywheel:			
Hydraulic:			
Pneumatic:			
Chemical:			
Thermal:			
Other (describe):			

**Caution:**

All sources of energy *must* be identified.

Follow the Lockout Procedure and *always remember* to test before touching the equipment.

**Note:**

\*Magnitude examples: 1) Electrical = 480v three phase 2) Pneumatic = 125 PSI