

P-5

Lockout/Tagout

I. Overview

A. Policy Statement

An effective program shall be established to protect employees from the unexpected start-up, release of stored energy, or release of hazardous energies during maintenance and servicing on machines and equipment. The purpose of the program is to protect employees, contractors and the public from injuries that could be caused by the release of hazardous energy or the unexpected start-up of a piece of equipment. The program shall include training for authorized personnel, procedures for locking out equipment, provision of necessary equipment, and procedures to coordinate with contractors. This program applies to maintenance operations when an employee must remove a guard from a machine to perform maintenance or service, and/or when an employee must place any part of his body in a hazardous area or point of operation while performing an operation on that piece of equipment.

The program does not apply to equipment powered by a plug and cord, when the maintenance person can unplug the equipment and remain in control of the plug during the operation. The program does not apply to mobile construction or agriculture equipment, but such equipment shall be turned off, equipment lowered to the ground, and pressure released from mechanical and hydraulic systems before servicing.

NOTE: For non DGS managed buildings and/or leased spaces this program is not to override any existing lock out-tag out procedures developed by the building owner(s). If necessary this program can be used if there is no existing program or can be used to augment an existing program from the building owner/management. Contact your safety coordinator if you have any questions.

B. Applicability

All equipment that is capable of being locked out shall be locked out before maintenance or servicing operations. Equipment that cannot be locked out shall be tagged out of service. The program specifically applies to:

- HVAC fans and motors
- Other motor-driven equipment
- Heat pumps
- Shop equipment that is hard-wired to a circuit breaker or knife switch
- Building main electrical systems
- Water chillers and associated systems
- Any other equipment that has guards removed during servicing

Note that de-energizing high voltage electrical systems requires specific procedures and personal protective equipment to protect from arc flash and other hazards. High energy systems are outside the scope of this program. Refer to the High Energy Lockout Program.

II. Inspection of the Program

The Building Managers responsible for equipment covered by this program shall periodically and at least annually review operations to ensure all equipment and operations are considered in this program and all employees understand the requirements of the program. The Division Chief, Building Manager, or Supervisor shall complete the **Lockout and Tagout Log** (Attachment 1) specific to that buildings. These records shall be maintained in the Building Manager's office for at least one (1) year. Contact the Safety Coordinator if a new piece of equipment or operation is introduced into the workplace that requires a specific energy control procedure. Develop the energy control procedure using the **Equipment-Specific Lockout/Tagout Procedure** form (Attachment 2), post the procedure on the machine, and forward a copy to the Safety Coordinator.

III. Training

Training shall be provided to all employees who may work in systems that may have hazardous or stored energies. These employees are referred to as Affected Employees. Training shall also be provided to people who are authorized to lock out equipment. These employees are referred to as Authorized Employees.

Training shall include:

- The purpose of the lockout and tagout program.
- Recognition of energy sources that must be locked out.
- Procedures for locking and tagging equipment out of service.
- Requirements that equipment that is locked and or tagged must not be reenergized by anyone other than the Authorized Employee who locked out the system, or by his Supervisor.
- Understanding that equipment that is tagged out has the same requirements as equipment that is locked out.

Training shall be provided when an employee is assigned to a position requiring the use of this program, and when new equipment is introduced that presents new or additional hazards. The Supervisor shall document the training in the employee-training file.

IV. Contractors Coordination

Contractor activities on equipment that may expose DGS employees to hazardous conditions must be controlled with an effective lockout program. The Contractor may use the DGS program or may use an equally effective program. If DGS employees are placed at risk, or if there is a potential for equipment damage following an unauthorized start-up of equipment, the Division Chiefs, Building Managers, or Supervisors must control the situation with the DGS program, and the Contractor must protect his employees by joining in the lock-out process. The procedures for a multiple lockout are shown in Section V(C).

V. Energy Control Procedures

A. Equipment-Specific Lockout and Tagout Procedures

1. Minimum Requirements

For any equipment that is capable of being locked out, an equipment-specific lockout procedure must be developed and documented **unless all of the following are true:**

- The machine or equipment has no potential for stored or residual energy or re-accumulation of stored energy after shut down which could endanger employees.
- The machine or equipment has a single energy source that can be readily identified and isolated (i.e. unplugged).
- The isolation and locking out of that energy source (such as a circuit breaker) will completely deenergize and deactivate the machine or equipment.
- The machine or equipment is isolated from the energy source and locked out during servicing or maintenance.
- A single lockout device will achieve a locked-out condition.
- The lockout device is under the exclusive control of the Authorized Employee performing the servicing or maintenance.
- The servicing or maintenance does not create hazards for other employees.
- There have been no accidents involving the unexpected activation or reenergization of the machine or equipment during servicing.

2. Development of a Lockout Procedure

Following are general procedures for developing a specific lockout procedure for a piece of equipment or machine. The **Equipment Specific Lockout/Tagout Procedure** form (Attachment 2) shall be used to document the lockout procedure. An example lockout procedure is shown in Attachment 3. A copy of the completed form shall be maintained in the Bureau or Building office and a copy shall be posted on or near the machine or equipment.

- a. Identify all energy sources for the piece of equipment, including, electrical, mechanical, pressurized systems, and stored energies.
- b. Identify the locations where the energy sources must be locked out.
- c. Identify the specific order that the machine or piece of equipment must be locked out.
- d. Notify building management that the equipment will be locked out.
- e. Apply the lockout to **control all energies**. This may include blocking mechanical equipment, discharging capacitors, blocking steam or pressurized lines, as well as opening circuit breakers.
- f. Verify equipment is deenergized at all energy sources.
- g. Document the start-up procedure.

3. Multiple Lockout Systems

If multiple locks are required to control all of the energies in a system, the Bureau Director shall establish a program to ensure all aspects of the system remain safe until the system is ready to be returned to service. All locks must stay in place until guards are replaced, system parts are replaced, blocks are removed, and all personnel are out of the system. All keys from a multiple lockout system shall be placed in a lock box, and all Authorized Employees shall place their locks on the lockbox. The Division Chief, Building Manager, or Supervisor shall also place his lock on the box. The Division Chief, Building Manager, or Supervisor shall remove his lock only after all other personnel have removed their locks. The system can be then returned to service using normal procedures.

B. General Lockout and Tagout Procedures

Following are the general procedures to be followed to conduct a lockout when all eight conditions in V (A)(1) are met.

1. Procedures to Initiate a Lockout

- a. The Authorized Employee obtains a lock and/or tag from: during normal working hours the building manager, after normal working hours from the control center.
- b. A building specific lockout-tag out log of all equipment locked-tagged out will be maintained in the specific building manager's office as well as an emergency log to be kept in the Control Center.
- c. Each log will have 5 locks uniquely identified to that building and lock out-tag log. There will be no limitations for the tags.
- d. The log shall be completed to indicate the equipment that is to be locked out, the reason for the lockout, and the name of the Authorized Employee.
- e. The Authorized Employee turns off the equipment at the switch or control panel.
- f. The Authorized Employee opens the knife switch or circuit breaker and applies the lock and tag. The tag shall be noted with the name of the Authorized Employee, the equipment to be locked out, and the reason for the lockout. The Authorized Employee retains the key to the lock so only that person can reenergize the system.
- g. Before beginning maintenance, the Authorized Employee shall cycle the main operating control on and then off to ensure the system is de-energized. Ensure the operating control is in the off position. The equipment is now locked out.

2. Transferring a Lockout

If an operation or piece of equipment must remain locked out for more than one shift, the lockout shall be transferred to a new Authorized Employee or the control center. The key is transferred to the new employee or the control center and the log updated to indicate the change in responsibility. Note the equipment must remain locked out

as long as guards are removed or the equipment is disassembled or unsafe. If a lockout must be removed and the Authorized Employee has left the area, only his Supervisor is authorized to remove a lock, and only after the area is inspected and the safety of the systems is ensured.

3. Procedures to Remove a Lockout

- a. After the maintenance is complete, the Authorized Employee shall ensure the guards are replaced, tools and equipment are removed from the area, and people in the area are clear of the machine or operation.
- b. Notify building management that the machine or equipment will be reenergized.
- c. The operating switch must be turned off.
- d. The Authorized Employee removes the lock and tag and re-energizes the system.
- e. The system is restarted following normal procedures.
- f. Verify normal operating conditions.
- g. The lock is returned to the building manager or Control center and the log(s) is updated to indicate the date and time the lockout was released.

4. Equipment for the Lockout and Tagout Program

Equipment used for the lockout program shall be durable, substantial enough to prevent removal without the use of excessive force, and standardized with respect to shape or color. Tags should be standardized with respect to color and format, durable, and indicate the identity of the Authorized Employee and the reason for the lockout.

C Procedures for Coordination with Contractors

If Contractors are working on a piece of equipment and DGS employees are at risk, the Division Chief or trade Supervisor shall ensure the equipment is fully locked out before work begins. The Contractor and Division Chief, trade Supervisor shall jointly conduct the lockout procedure. A multiple lock hasp shall be placed on the lockout, and the Contractor and Division Chief, or Trade Supervisor shall both place locks on the hasp.

At the completion of the activity, the Contractor shall verify all Contractor equipment and personnel are out of the area, and the machine is safe to restart. The Contractor then removes his lock or locks. Then the Division Chief, or trade Supervisor conducts the start-up procedure and removes the DGS lock only after he confirms the system is safe to reenergize.

VI. Documentation

The trade Supervisor shall ensure that the **Lockout and Tagout Log** (Attachment 1) is completed for each lockout operation. The log shall be retained for a year in the building manager's office for the work that was completed. The Division Chief or Supervisor shall ensure all training records are maintained according to agency procedures.

Appendix B
Equipment-Specific Lockout/Tag-out Procedure

Procedure #:	Page #:
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Equipment Information		
Equipment:		Location:
Inventory #:	Model #:	Serial #:
Energy Information		
Energy Type	Lock Location	Special Equipment Required
Shutdown Procedure		
1. 2. 3. 4. 5. 6.		
Verification Procedure		
1. 2.		
Startup Procedure		
1. 2. 3. 4. 5. 6.		
Prepared by:		Date:
Reviewed by:		Date:
Reviewed by:		Date:

See the back of this form for a diagram of the lockout/tagout needs of this equipment, if available.

Appendix C

Example Equipment-Specific Lockout/Tag-out for Boiler

Equipment Information		
Equipment: Boiler/vaporizer system (2units- large and small)		Location: Outside of the Facility (N ₂ tank farm)
Inventory #:	Model #:	Filename: Outside boilers
Energy Information		
Energy Type	Lock Location	Special Equipment Required
Electric – disconnect switch (main controls)	At unit	Lock and tag
Electric – disconnect switch (recirculation pump)	At unit	Lock and tag
Natural gas (small vaporizer) – large ball valve	At base of small vaporizer unit	Large ball valve lockout device, lock, and tag
Natural gas (small vaporizer) – large ball valve	At base of large vaporizer unit	Large ball valve lockout device, lock, and tag
Liquid nitrogen (LN ₂ Tank 1) – large ball valve	At base of LN ₂ Tank 1, labeled V.51.1	Large ball valve lockout device, lock, and tag
Liquid nitrogen (LN ₂ Tank 2) – large ball valve	At base of LN ₂ Tank 2, labeled V.51.2	Large ball valve lockout device, lock, and tag
Shutdown Procedure		
<ol style="list-style-type: none"> 1. Notify all affected employees and department of impending shutdown and lockout 2. Move unit control disconnect switch to the off position, attach lock and tag 3. Move unit recirculation pump disconnect switch to the off position, attach lock and tag 4. Close natural gas ball valve for the small vaporizer, located at the base of the unit, attach large ball valve lockout device, lock, and tag 5. Close natural gas ball valve for the large vaporizer, located at the base of the unit, attach large ball valve lockout device, lock, and tag 6. Close liquid nitrogen ball valve for LN₂ tank 1, attach large ball valve lockout device, lock, and tag 7. Close liquid nitrogen ball valve for LN₂ tank 2, attach large ball valve lockout device, lock, and tag 8. Apply multiple locks on hasp for each person performing work on system 		
Verification Procedure		
<ol style="list-style-type: none"> 1. Retest unit for power 		
Startup Procedure		
<ol style="list-style-type: none"> 1. Verify all employees are clear of the equipment 2. Remove locks and tags 3. Move unit controls disconnect switch to the on position 4. Move unit recirculating pump disconnect switch to the on position 5. Open natural gas ball valves for both system vaporizers 6. Open liquid nitrogen ball valve for LN₂ tank 1 7. Open liquid nitrogen ball valve for LN₂ tank 2 8. Start equipment 9. Verify proper operation 		
Prepared by: Peter Power pack		Date:

Reviewed by:	Date:
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This procedure must be used when performing maintenance and service on this equipment. All energy sources must be locked out. This procedure must be performed by Authorized Personnel only.