

2.5 Academic & Research Operations General LOTO Procedures

All machinery and equipment that undergo Lockout/Tagout must have a written procedure in place prior to any work being performed. See **Appendix F** for an outline of the minimal written LOTO procedure requirements.

Energy Isolation

Physical application of lockout or tagout on machinery or equipment shall be performed only by properly trained authorized individuals. Authorized individuals are personnel identified by a supervising department as having the appropriate knowledge and skillset required to effectively execute LOTO procedures on a particular piece of machinery or equipment. No other student, staff, or faculty member may perform LOTO if they have not been identified by the supervising department as an authorized individual. All locks and lockout devices used in academic and research laboratories must be red in color and meet the requirements described in **Appendix G**.

Tagout

Physical lockout has been determined to be the most effective means of energy isolation, and provides the highest degree of safety. Lockout therefore is the preferred method and must be utilized any time it is possible to implement. There are instances where machinery/equipment cannot physically accept a lock. Only in these instances are tagout procedures permissible. When tagout systems are used, individuals must also be trained in the following:

1. Tags are warning devices affixed to energy-isolating devices. They do not physically prevent the operation of equipment they way a lock does.
2. When a tag is attached to an energy-isolation point, it must only be removed by the authorized person who is responsible for it. A tag is never to be bypassed, ignored, or otherwise defeated.
3. Tags must be legible and understandable by all authorized individuals, affected individuals, and all other individuals whose work operations are or may be in the area.
4. Tags and their means of attachment must be made of materials, which will withstand the environmental conditions encountered in the workplace.
5. Tags can provide a false sense of security, and their meaning needs to be understood as part of the overall energy control program.
6. Tags must be securely attached to energy-isolation points so that they cannot be inadvertently or accidentally detached during use.

See **Appendix G** for additional information on physical tag requirements as well as the accepted tag format.

LOTO Preparation

Survey the machine/equipment to locate and identify all energy isolation points. Consult all manufacturer documentation on energy isolation whenever possible. Be certain which switch(s), valve(s), or other energy-isolating devices apply to the equipment to be locked or tagged out. More than one energy source (electrical, mechanical, or others) may be involved.

Sequence of Lockout Tagout System Procedures

1. Notify all affected individuals that a lockout or tagout system is going to be implemented. The authorized individual must know the type and nature of energy that the machine or equipment utilizes and must fully understand the hazards.
2. If the machine or equipment is operating, shut it down by the normal stopping procedure (depress stop button, open toggle switch, etc.) as outlined in the SOP or operator manual.
3. Operate the switch, valve, or other energy-isolating device(s) so that the equipment is isolated from its energy source(s). Stored energy (such as that in electrical capacitors, springs, elevated machine components, flywheels, hydraulic systems, air, gas, steam, water pressure, etc.) must be dissipated or restrained by methods such as repositioning, blocking, bleeding down, etc.
4. Lockout and/or tagout the energy-isolation device(s) with assigned individual lock(s) and/or tag(s). Verify LOTO efficacy through the following steps:
 - a) Ensure that the machine or equipment is in a safe state and no personnel are exposed to any potential hazard.
 - b) Initiate a machine or equipment start to verify that the LOTO procedure successfully rendered the equipment inoperable.
 - c) If the equipment is capable of being operated from a remote station or computer control system, the authorized individual MUST verify that the equipment cannot start remotely.
 - d) Return ALL operating control(s) to the “neutral” or “off” position after the test has been completed.
5. The equipment is now locked out and/or tagged out.

Restoring Machines or Equipment to Normal Production Operations

1. After the servicing and/or maintenance is complete and equipment is ready for normal operations:
 - a) Check and verify that all tools and materials used in the procedure have been removed and are accounted for.
 - b) Verify that all guarding devices have been properly reinstalled.
2. Notify the affected individual(s) and check the area around the machines or equipment to ensure that no personnel are exposed to any potential hazards.
3. All authorized individuals involved in the LOTO procedure must remove their own personal lockout and tagout devices.
4. After all LOTO devices have been removed, return the energy isolation devices to the normal position for machine or equipment operation.

Procedures Involving More Than One Person

In the preceding steps, if more than one individual is required to lockout or tagout equipment, each shall place his/her own personal lockout device or tagout device on the energy-isolating device(s). When an energy-isolating device cannot accept multiple locks or tags, a multiple lockout or tagout device (hasp) may be used. If lockout is used a single lock may be used to lockout the machine or equipment with the key being placed in a lockout box or cabinet which allows the use of multiple locks to secure it. Each employee will then use his/her own lock to secure the box or cabinet. As each person no longer needs to maintain his or her lockout protection, that person will remove his/her lock from the box or cabinet (see “Group Lockout/Tagout” Section).

Periodic Inspection of LOTO Procedures

All LOTO procedures for machinery or equipment must be inspected at least annually per [29 CFR 1910.147\(c\)\(6\)](#). PIs, Technicians, and Staff are responsible for conducting periodic LOTO procedure inspections for the machinery and equipment they are responsible for. See **Appendix D** for the Lockout/Tagout Procedure Inspection Form.