Energy sources including electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other sources in machines and equipment can be hazardous to workers. During the servicing and maintenance of machines and equipment, the unexpected startup or release of stored energy can result in serious injury or death to workers.

Workers servicing or maintaining machines or equipment may be seriously injured or killed if hazardous energy is not properly controlled. Injuries resulting from the failure to control hazardous energy during maintenance activities can be serious or fatal! Injuries may include electrocution, burns, crushing, cutting, lacerating, amputating, or fracturing body parts, and others.

Examples of equipment/machines that may be encountered at UCCS that are subject to LO/TO include but are not limited to: gas, water and steam lines; HVAC equipment including air handlers and boilers; kitchen equipment such as slicers, mixers, dishwashers, trash compactors, and garbage disposals; woodworking and metalworking machines; printing presses; laboratory equipment such as centrifuges, autoclaves and high powered lasers; conveyors; motor vehicles; hydraulic lifts; elevators, etc.

In general, LO/TO must be observed during service and maintenance activities including: constructing, installing, setting up, adjusting, inspecting, modifying, lubricating, cleaning or un-jamming, and adjusting or changing tools.

This SOP and the cited OSHA standard do NOT apply to work on electric systems operating at 50 volts or more. Rather, these activities are subject to specific energy isolation requirements and work practice controls covered by other OSHA standards.

Failure to control hazardous energy accounts for nearly 10 percent of the serious accidents in many industries. Proper lockout/tagout (LOTO) practices and procedures safeguard workers from hazardous energy releases. OSHA's Lockout/Tagout Fact Sheet (PDF*) describes the practices and procedures necessary to disable machinery or equipment to prevent hazardous energy release. The OSHA standard for The Control of Hazardous Energy (Lockout/Tagout) (29 CFR 1910.147) for general industry outlines specific action and procedures for addressing and controlling hazardous energy during servicing and maintenance of machines and equipment. Employers are also required to train each worker to ensure that they know, understand, and are able to follow the applicable provisions of the hazardous energy control procedures.

- Proper lockout/tagout (LOTO) practices and procedures safeguard workers from the release of hazardous energy. The OSHA standard for The Control of Hazardous Energy (Lockout/Tagout) (29 CFR 1910.147) for general industry, outlines specific action and procedures for addressing and controlling hazardous energy during servicing and maintenance of machines and equipment. Employers are also required to train each worker to ensure that they know, understand, and are able to follow the applicable provisions of the hazardous energy control procedures. Workers must be trained in the purpose and function of the energy control program and have the knowledge and skills required for the safe application, usage and removal of the energy control devices.
• All employees who work in an area where energy control procedure(s) are utilized need to be instructed in the purpose and use of the energy control procedure(s), especially prohibition against attempting to restart or reenergize machines or other equipment that are locked or tagged out.

• All employees who are authorized to lockout machines or equipment and perform the service and maintenance operations need to be trained in recognition of applicable hazardous energy sources in the workplace, the type and magnitude of energy found in the workplace, and the means and methods of isolating and/or controlling the energy.

• Specific procedures and limitations relating to tagout systems where they are allowed.

• Retraining of all employees to maintain proficiency or introduce new or changed control methods.

OSHA's Lockout/Tagout Fact Sheet (PDF*) describes the practices and procedures necessary to disable machinery or equipment to prevent the release of hazardous energy.

**Employee Training**

All “authorized” and “affected” employees must complete LO/TO training, consisting of both general training provided by EHS and supplemental specific training provided by the supervisor or delegate. Specific training by the supervisor must include site-specific equipment/machines and related LO/TO procedures.

- An “Affected Employee” is an employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under LO/TO, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed.

- An “Authorized Employee” is a person who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment.

OSHA provides an on-line interactive LO/TO training program.

**Written LO/TO Procedures**

As a general rule, specific procedures must be documented for each piece of equipment subject to LO/TO. These procedures must contain the following information:

- A specific statement of the intended use of the procedure;

- Specific procedural steps for shutting down, isolating, blocking, and securing machines/equipment to control all sources of hazardous energy;

- Specific procedural steps for the placement, removal, and transfer of LO/TO devices and responsibility for the devices;

- Specific requirements for testing a machine or equipment to determine and verify the effectiveness of LO/TO device and other energy control measures.

**Periodic Review**

Supervisors must periodically (at least annually) review written procedures & observe employees performing tasks to verify continued efficacy and employee adherence to LO/TO procedures. The review must include discussion with “Authorized” and “Affected Employees” to reinforce each employee’s responsibilities relative to the procedure.

**Minor Servicing**

Minor tool changes and adjustments and other minor servicing activities which take place during normal production operations are not subject to LO/TO standards provided ALL of the following criteria are met.
The activity is routine. It is performed as part of a regular and prescribed course of action/procedure and is performed in accordance with established practices/industry standards.

The activity is repetitive. It is repeated regularly as part of the production process or cycle.

The activity is integral to the use of the equipment for production (the activity must be essential to the production process).

The activity is conducted with effective production-mode safeguards in place.

The activity does not require extensive disassembly of the machinery/equipment.

The activity is performed using alternative measures (tools or guarding) which provide effective employee protection.

Cord & Plug

The LO/TO procedural requirements do NOT apply if the machinery/equipment is completely de-energized simply by unplugging it and the cord/plug remains under the control of the person conducting the service/repair. If the equipment/machine is not unplugged; if the cord/plug does not remain under the exclusive and immediate control of the person conducting the repair/service, or; if the equipment has multiple energy sources, then the LO/TO standard applies and all procedural steps must be followed. Pneumatic tools may also fall into this category provided that they can be completely isolated from their energy source and bled of stored energy.

LO/TO Procedural Steps

Steps to effectively accomplish a LO/TO state are listed below and depicted in the flow charts at the end of this SOP (reprinted from OSHA). Each step must be accomplished in the stated order, and captured/described in a written LO/TO procedure. All affected and authorized employees must receive LO/TO training, including procedures specific to their work. See EHS SOP, Lockout/Tagout for Machines & Equipment: Training & Inspections.

Step 1: Identify Hazardous Energy
Step 2: Communicate
Step 3: Shut-down
Step 4: Isolate
Step 5: Apply LO/TO device(s)
Step 6: Relieve Stored Energy
Step 7: Verify
Step 8: Service
Step 9: Inspect
Step 10: Remove LO/TO
Step 11: Communicate
Step 12: Restart

Last reviewed by Cynthia Norton on December 16, 2015