UC RIVERSIDE | Environmental Health & Safety

Hazardous Energies Control and Lockout/Tag Out Program

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1. Program Description

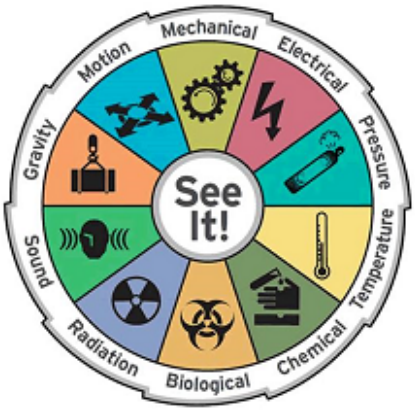
It is the goal of the University of California, Riverside (UC Riverside OR UCR) to control hazardous energies in the workplace to the fullest extent. UC Riverside Environmental Health & Safety has developed a Hazardous Energies Control and Lockout/Tagout Program to ensure that its employees' health is protected from hazardous energies in the work environment. In compliance with Cal/OSHA regulations, UC Riverside maintains a written Hazardous Energies Control and Lockout/Tagout (LOTO) program document for guidance in all operations where employees, volunteers, students, or contractors may be potentially exposed. This written program is available, upon request, to any UC Riverside-affiliated person or by visiting the UCR EH&S website.

This program provides a structured process for servicing and maintaining equipment to ensure personnel and contractor safety while maintaining regulatory compliance. This approach involves: creating and following approved and written equipment-specific procedures to shut down and lock out equipment and machinery, dissipating all hazardous energy, blocking parts where necessary, and verifying that all energy has been controlled before work is initiated.

This program also establishes procedures for removing abandoned locks and long-term lockouts. EH&S must review and approve each request for these procedures.

2. Scope

This program applies to all employees, students, volunteers, and contractors performing work, including the installation, service, maintenance, or removal of any type of machinery, equipment, or components, in which the unexpected start-up or release of stored energy could cause injury. All forms of energy must be controlled, including but not limited to electrical, mechanical, pressure, gravity, and motion.



The purpose of this program is to prevent injuries and accidents from occurring while:

- Servicing or maintaining machinery or equipment that is capable of sudden energy releases; and
- Working with machinery or equipment that is capable of storing hazardous energy.
- While working on energy delivery systems like electrical, steam, compressed air, or gas.
- Working in the vicinity of hazards that, if not properly controlled, could cause harm.

The types of energy needing to be isolated may be part of a particular machine or utility system, including but not limited to:

- **Electrical System Maintenance, Repair, Installation, and Replacement**
  - Disconnects
  - Breakers
  - Switches and outlets
  - Lighting fixtures and ballasts
  - Capacitors
  - Battery storage banks
  - High voltage transformers
- **Building mechanical systems**
  - HVAC components
  - Axial fans
  - Exhaust fans
  - Air storage tanks
- **Larger experimental equipment**
  - Scanning electron microscope
  - Centrifuges
  - Autoclaves
  - Gas delivery systems
  - Magnetrons

- **Large equipment with internal combustion engines or battery systems**
  - Tractors
  - Motorized carts
  - Forklifts
  - Floor scrubbers
  - Mowers
- **Shop equipment**
  - CNC equipment
  - Mills and lathes
  - Saws
  - Powered hoists and other lifting equipment
  - Mobile elevated work platforms
  - Welding equipment
  - A printing press
- **Mechanical Equipment that may have stored energy or be dangerous if not in good working condition (SPRINGS, FANS, COUNTERWEIGHT, CAPACITORS, PRESSURE, ETC.)**
  - Steam lines
  - Compressed air and gas lines
  - Vacuum systems
  - Water lines
  - Hydraulic systems
  - Door springs
  - Hatches with gas spring supports
- **Theaters, Recital Halls, Lecture Halls, Dance Studios, Conference Halls, etc.**
  - Counterweight rigging
  - Motorized hoist systems
  - Fire safety curtain system
  - Lighting dimmer systems
  - Stage lifts

3. Responsibilities

All UCR Employees

All UCR employees are considered affected employees and must:

- Complete Safety Orientation Training
- Never attempt to remove a lockout lock placed by another person
- Never attempt to operate equipment that has been locked and/or tagged in the off position by someone else
- Never disturb a mechanical block that has been placed by someone else
- Contact their supervisor or EH&S to investigate if the reasons for the lockout/tagout are unknown

Any affected individuals may join a lockout that has been completed by a lockout/Tagout authorized user (acting as the responsible individual or RI) if they are exposed while work is occurring. The RI will verify that the lock is of the appropriate type and that the affected individual has the only key before the lock is allowed.

Authorized Lockout/Tagout User

- Complete lockout/tagout authorized user required training and remain current as outlined in the training section of this document.
- Be authorized by your supervisor to enact lockouts.
- Never give your lockout key to anyone else.
- Never remove someone else's lock. If the lock has been abandoned, report it to your supervisor. Abandoned locks can only be removed once the supervisor has completed the removal form and EH&S has reviewed it. If the lockout is a long-term lockout, please refer to the process outlined in this program.
- Conduct energy hazard assessments and create lockout/tag out procedures for equipment and energy sources that need maintenance and repair when one is not already available. Contact your supervisor or EH&S for assistance.
- Follow all written lockout procedures, and if there is a need to change or alter the procedure, discuss it with your supervisor or EH&S.

- Always place your personal lock on any equipment you will be working on or near. Use a group hasp or box to allow all persons exposed to the lockout hazards to place their personal lock.
- Alert all affected persons in the lockout area before starting work.
- Log lockouts in equipment-specific log books or online logs, if used by your department.
- Function as a Responsible Individual or LOTO Lead for a lockout where non-authorized individuals and contractors will need to join the lockout because they are exposed in the area or are performing work covered under the LOTO.
- Only UCR maintenance service groups are authorized to de-energize circuit breakers in electrical panels. Submit a work order for your maintenance service group's electricians for assistance.
- Employees may be authorized to perform certain electrical LOTO procedures based on review and approval by the maintenance electrical supervisor and/or EH&S. Contact EH&S for assistance.

Departments

- Departments are responsible for identifying equipment that has single or multiple sources of energy for operation that falls under this program's energy isolation requirements.
- Academic departments that own/operate research and other equipment in existing buildings not under the control of a maintenance services department must apply the LOTO program to their equipment. This includes equipment that requires accessing under covers or guards where there may be unprotected electrical connections, moving parts, blades, rollers, capacitors, etc., for cleaning, maintenance, adjustment, and/or repair. The only exceptions require approval from EH&S and completion of training to ensure that there are safe procedures used to access dangerous areas of the equipment while energized.
- Departments must authorize individuals to conduct energy isolation who have completed the required authorized user and qualified electrical worker training. Alternatively, departments may have their respective maintenance services group conduct lockouts of energy sources and equipment.

- Departments may designate a Lockout/Tagout Coordinator to assist with managing Lockouts. A Lockout/Tagout Coordinator must complete authorized user training, have experience working with the department equipment, and if they will lockout anything beyond cord & plug, they will need to be a Qualified Electrical Worker and approved by EH&S for specific electrical lockout procedures. They will act as the responsible individual for lockouts of department equipment needed by unauthorized personnel and create and manage the needed procedures.

- Every department must survey and inventory equipment requiring an equipment-specific LOTO procedure using the form in Appendix C.

- Departments must track Cal/OSHA-required annual audits of their owned equipment procedures using either the attached template, RSS ***Procedures****, or other template or software as approved by EH&S*.

- Departments must provide written LOTO procedures for individual location-specific pieces of equipment developed for employee and contractor use. All employees and students must be informed of the need for lockout/tagout, who is authorized to perform these lockouts, and where to locate the written procedures.

- Procedures should be kept in the area with the equipment and/or in a central location like a lab safety binder, Shop Safety binder, or be available online and accessible for all employees.

- If any electrical equipment that is to be shut down will affect other building occupants, or is hardwired to a breaker panel, a maintenance services electrician is required to coordinate with occupants, de-energize the equipment, lock it, and act as the responsible person for the lockout.

- Departments may arrange with EH&S for personnel to receive documented training or may use another vendor for qualifying personnel with EH&S approval.

Principal Investigator (PI)/Project Supervisor/Supervisor

- Inform all affected persons working in the area of the existence of this program and its impact on their work. Inform them to never disturb a LOTO lockout placed by another person, never attempt to start equipment that has been locked out, and never disturb a block placed by another person.
- Ensure that employees have had documented training concerning LOTO, access to written procedures at a level appropriate to the anticipated

level of exposure to hazardous energy sources in their research/workplace.

- Ensure that proper labeling is applied to all disconnect locations on specific equipment controlled by the department. Labeling activities may be conducted by the PI, supervisor, or qualified person, another department member under the leadership of this person, or by an outside contractor.
- Determine safe equipment-specific energy isolation procedures to be worked on and record them using the document templates in Appendix A or B.
- Conduct an annual audit of equipment-specific energy isolation procedures to ensure they are still accurate and appropriate to the needed safe work practices.
- Determine who is a qualified person who may work on the equipment.
- Inform all qualified person(s) and/or the contractor of any:
  - Known energy sources on the equipment
  - Any energy isolation procedure previously developed for the equipment
  - Any other known hazards associated with the equipment.
- Authorize employees to perform lockout/tagout based on completion of required training, relevant experience, and ability to perform safe work.
- Do not allow unauthorized affected personnel to enact a lockout. Non-authorized affected personnel may only work on equipment when it is locked out by an authorized person.
- Train those who perform maintenance, cleaning, and repair on cord & plug equipment to never walk away from the equipment while it is open and being worked on, to request a lockout if assistance is needed or they need to leave, and to always put all covers and guards back on before plugging the equipment back in.
- Supervisors are responsible for ensuring all authorized lockout/tagout employees are provided with the proper tools and personal protective equipment (PPE) to perform the job safely.
- For departments with multiple work shifts, the supervisor of each shift must meet to exchange information about the lockout status. The LOTO responsible individual (RI) or lead from the arriving shift must place their locks on as the departing shift lead removes theirs. Then all affected employees will do the same. At no time will the equipment be fully unlocked

in this transfer. Before leaving the LOTO, RIs will verify that the LOTO transfer is complete.

- For departments hiring contractors to conduct work at UC Riverside, the project supervisor must be familiar with the contractor or joint project roles and responsibilities.
- Employees may be authorized to perform certain electrical LOTO procedures based on review and approval by the maintenance electrical supervisor and/or EH&S.
- Supervisors are responsible for ensuring that only Qualified High Voltage Electrical Workers work on high voltage systems (>600 volts), and only Qualified Electrical Workers (QEW) work on systems that contain hazardous voltages equal to or below 600 volts.
- Contact EH&S for assistance in developing energy isolation procedures and providing training to subordinates and authorized/qualified personnel as needed.

Lockout/Tagout Coordinator Responsibilities

- Writing equipment-specific lockout/tagout procedures;
- Ensuring that only authorized lockout/tagout employees perform lockout/tagout operations on necessary equipment;
- Maintaining an inventory of all equipment in their department that requires equipment-specific lockout/tagout procedures;
- Receiving the appropriate training to become an authorized lockout/tagout employee and perform lockout/tagout procedures on equipment

Maintenance Services Groups' Responsibilities

Maintenance Service Groups include Facilities Services, Auxiliary Facilities, SRC Facilities, and other EH&S-recognized maintenance personnel. Contact EH&S if you are unsure if you are considered a maintenance service group.

Maintenance service groups are responsible for creating and maintaining LOTO procedures for all building infrastructure equipment under their purview. These procedures need to be available to all employees and EH&S upon request. It is recommended that the equipment have a hard copy and/or have a label with a QR code link to the electronic version of the procedure.

Ensure all panels and disconnects are labeled to match the procedures and/or the downstream equipment they service.

Ensure all electrical lockouts are only performed by authorized, qualified electrical workers who have the experience, understand the hazards, have completed required training, and have the ability to perform safe electrical work.

Do not allow unauthorized affected personnel to enact a lockout. Non-authorized affected personnel may only work on equipment when it is locked out by an authorized person.

Employees may be authorized to perform certain electrical LOTO procedures based on review and approval by the maintenance electrical supervisor and/or EH&S.

Maintenance service groups are responsible for ensuring all authorized lockout/tagout employees are provided with the proper tools, lockout devices, locks, and personal protective equipment (PPE) to perform the job safely.

Include reviews of energy isolation procedures during relevant safety meetings.

Regularly audit employees conducting LOTO to ensure they understand and follow this program. Correct any concerns and, if necessary, provide additional training.

Comply with the abandoned lock procedure to ensure all employees are safe and accounted for, and resources are not wasted.

Comply with the long-term lockout procedures to ensure equipment is managed, labeled, and documented appropriately.

For maintenance service groups with multiple work shifts, the supervisor of each shift must meet to exchange information about the lockout status. The LOTO responsible individual (RI) or lead from the arriving shift must place their locks on as the departing shift lead removes theirs. Then all affected employees will do the same. At no time will the equipment be fully unlocked in this transfer. Before leaving the LOTO, RIs will verify that the LOTO transfer is complete.

Contact EH&S for assistance in developing energy isolation procedures and providing training to subordinates and authorized/qualified personnel as needed.

R 'Projects and Planning Design & Construction Project Managers

For new construction, building retrofits, and equipment installed by R 'Projects and Planning Design & Construction, the Project Manager:

- Ensures the requirements of this program are integrated into project documentation

Hazardous energy surveys of all affected building systems are completed and provided to the host department upon completion.

- Signage and labels are installed on energy disconnects in compliance with this program.
- All equipment installed must be able to be locked out in compliance with this program.

Contractors

- Contractors must have and follow their own LOTO program when working on university property or equipment in conjunction with this program.
- Contractors must provide their own energy isolation equipment, including locks, devices, tags, and hasps, and follow joint project requirements.

  If the owner department has previously developed equipment-specific LOTO procedures for equipment, the contractor must review the department's procedure and determine if it is appropriate for their use.

  For equipment that has not previously had a LOTO procedure developed, the contractor shall develop and document a written LOTO procedure for it. A copy of the contractor's equipment-specific LOTO procedure is provided to the project supervisor and EH&S as part of completed-project documentation.

  Contractors shall inform the project supervisor immediately of any newly discovered energy sources or potential hazards associated with the equipment.

Joint Project Requirements

- For Joint Projects where employees of UCR and Contractor(s) are working on the same equipment at the same time or where university employees are at risk, the Project Supervisor, whether employed by the contractor or UCR, must hold joint meetings with all personnel who will be working on the equipment to create a plan, ensure safe work practices, and maintain open lines of communication between work crews.

Environmental Health and Safety (EH&S) Responsibilities

EH&S is responsible for:

- Assisting maintenance service groups and other departments on campus who perform work, to interpret the standards and regulations as they apply to the work being performed.

- Assisting Facilities Management and other departments in writing equipment-specific lockout/tagout procedures
- Assisting in the coordination of appropriate training for Authorized Lockout/Tagout Employees.
- Overseeing and managing the implementation of the intent of this program and resolving any situations not directly addressed by this program.
- Assisting departments and equipment owners with annual review of all electrical work, including lockout/tagout procedures for specific equipment and high voltage switching procedures written by UC Riverside Facilities Management and other departments.

4. Program Components

Hazardous energy control surveys and procedures

All Departments are responsible for identifying any department-owned equipment that uses hazardous energy and for developing procedures detailing who to notify, the steps for lockout, types of devices required, a verification test to ensure the equipment has been fully de-energized, steps to re-energize, and notifications for when the work is complete. Research departments must also ensure Principal Investigators follow this program and develop procedures necessary for lockout of their specific lab and experimental equipment as needed.

Conduct a hazard assessment survey for each piece of identified equipment or asset using the form in Appendix C. Departments and PIs/Supervisors are responsible for surveying owned equipment, and maintenance services groups are responsible for building infrastructure equipment.

Equipment that is hard-wired to UCR electrical infrastructure will require a UCR maintenance service Electrician to shut down the power supply at the breaker or disconnect unless the department has a trained and authorized qualified electrical worker and a maintenance service electrical department, and an EH&S Safety Engineer-approved procedure.

For non-electrical energy sources, including compressed gas, water, hydraulics, steam lines, and pneumatic equipment, it is important to de-pressurize the system and have the correct devices to lock out the energy source. If uncertain about how to de-energize non-electrical sources, contact EH&S for assistance.

Maintenance services are required to inventory all campus utility and mechanical infrastructure equipment and develop lockout procedures to ensure

safe maintenance and repair for UCR employees and contractors. If a procedure does not exist when work is to begin, the procedure should be developed before beginning the work. The procedure should be documented using one of the templates provided in Appendix A or B. Newly created procedures should be reviewed by the trade supervisors and then added to the Lockout Procedure Library and linked to the equipment and/or location in the respective work order system. Employees must have access to the procedures at all times.

Departments wishing to use the UC developed Risk & Safety Solutions application Procedures to manage their LOTO procedures can access the application using the link below. For assistance setting up the application and/or training contact EH&S.

https://ehs.ucop.edu/procedures

Lockout/Tagout (LOTO) is not required for each of the following situations

Normal operations, also known as normal production operations or normal energized operations, where the machine or equipment is utilized to perform its intended function. Follow the parameters below.

- Servicing or maintenance that takes place during normal operations requires LOTO only if:
    - A person is required to remove or bypass a guard, cover, or other safety device, or
    - A person is required to place any part of his or her body into an area of a machine or piece of equipment where work is actually performed upon the material being processed (point of operation) or where an associated danger zone exists during a machine's operating cycle
- Minor tool changes, adjustments, and other minor servicing activities that take place during normal operations do not require LOTO, provided that:
    - Such activities are routine, repetitive, and integral to the use of the equipment and
    - The work is performed using alternative measures that provide effective personnel protection
- Hot tap operations involving transmission and distribution systems for substances such as gas, steam, or water when they are performed on pressurized pipelines, provided that it has been demonstrated that:
    - Continuity of service is essential,
    - Shutdown of the system is impractical, and

- Documented procedures are followed, and special equipment is used, which will provide proven effective protection for employees.

- Energized testing and troubleshooting (e.g., alignment, measuring, calibration, fault finding) does not require LOTO, where the equipment must be energized to perform the tests, and they are done by a qualified electrical worker with an approved energized electrical permit.

- Work on cord-and-plug-connected electrical equipment does not require LOTO controls when the Cord & Plug Procedure is followed.

Cord & Plug Equipment Exemption Procedure

Cord and plug equipment refers to any electrical equipment that uses a flexible cord and attachment plug to connect to a source of electricity as its sole energy source. If there are additional sources of energy, of any type, this exemption cannot be used.

The cord & plug exemption can be used only when:

All Hazardous energy is controlled by unplugging the equipment, and

The plugs remain under the exclusive continuous control of the worker performing the work. Exclusive control means the plug is within sight of the worker at all times, and they are the only person working on the equipment. If they leave the area, the equipment must be locked out. A second person assisting with the work requires the equipment to be fully locked out.

When cord & plug equipment does not meet the above requirements, it must be locked out. Using a plug cover, as shown below, is the simplest method for lockout on cord and plug equipment. If more than one person will be working on the equipment, they also need to place a lock on the device. A hasp can be purchased to allow multiple locks.

Persons working under the cord & plug exemption are not required to be LOTO Authorized Persons but must complete the Awareness level training and may need to be Qualified Electrical Workers depending on the voltage of the equipment. If the equipment needs to be locked out, Authorized user training is required. Departments may choose to have a designated Lockout Authorized Person enact all lockouts, with the people performing work on the equipment adding their lock once the equipment is safely de-energized.

A cord & plug LOTO procedure is available in Appendix F. This procedure can be printed and used for equipment where all energy is dissipated by unplugging one electrical cord.

Sequence of Hazardous Energies Control

These are the general steps for controlling energy sources. Use them as a guide to develop procedures to lock out specific equipment and systems.

1. The authorized lockout/tagout employees performing the work, as well as their supervisor, must create the work plan, written lockout procedures, and physically locate and identify all isolating devices to be sure which switches, valves, or other energy isolating devices apply to the equipment to be locked out.
2. Employees authorized to lockout/tagout equipment must be certain which switches or other energy isolating devices apply to the equipment to be locked out.
3. All energy isolating devices must have labels identifying the equipment supplied and the type and magnitude of energy isolated.
4. CAUTION: Any questionable identification of electrical energy sources or when designated as needing approval must be cleared by the employees with their supervisor before proceeding.
5. Notify all affected and other employees as necessary that a lockout is to be performed. These persons must be informed that they are not to disturb the lockout device or attempt to restart the equipment until they are informed that the lockout has been cleared and it is safe to resume normal operations.
6. Log the lockout in the equipment logbook (logbooks available from EH&S) and/or online log designated for use by your department.
7. If the equipment is in operation, shut it down using the normal shutdown procedure. Turn the equipment off if there is an off/on switch.
8. Open the circuit breaker, turn off the disconnect switch, and close the valves or other energy-isolating device (i.e., turn it to the “OFF” position).

Toggle switches, push buttons, and other types of control switches are not energy-isolating devices. You must go back as far as you can to ensure there is no energy in the work location.

9. Lock out all energy-isolating devices. Lock out the circuit breaker, disconnect switch, or other isolating device in the open ("OFF") position with an assigned individual lock, and attach an identifying tag to the lock. If it is impossible to use a lock, refer to the "procedure when physical locking is impossible" section.
10. For electrical equipment that has capacitors that must be manually discharged to assure safe work, open access panels and discharge these capacitors with an appropriate discharge tool, and follow directions in the equipment manual or maintenance procedures. This must only be accomplished by an authorized lockout/tagout employee or a qualified high voltage electrical worker who is authorized to perform such work.
11. All forms of stored energy must then be dissipated (except for batteries, which can be disconnected). This may include relaxing any springs, relieving any pressure or vacuum, allowing flywheels to come to rest, blocking fans, or neutralizing or adequately removing any chemicals.
12. Any parts that could inadvertently move during the procedure must be blocked in place to prevent this movement. Blocking must be secured in place so that it cannot be inadvertently removed or fall out.
13. At this point, it must be verified that all forms of hazardous energy have been reduced to zero potential. If the work to be performed involves de-energized electrical equipment, this equipment must be tested with some form of test equipment to verify that there is no electrical energy present. Other forms of energy also require verification of zero potential. Examples of such means of verification include: observing a pressure gauge for zero pressure (gauge) or vacuum, observing a multi-meter showing zero volts, observing a spring in a relaxed state, observing that a flywheel is not spinning, or using litmus paper or a measuring device to verify that a chemical is no longer present or hazardous.
14. The final step is to attempt to restart or re-energize the equipment or machinery to verify an isolated condition. If the equipment does not restart, then work can proceed. If the equipment restarts or it appears that energy has been allowed to flow into the system, there could be a serious flaw in the procedure, and no work should proceed until the problem is identified and appropriate steps are included in the procedure to control this energy.
15. The equipment is now locked out. Work may now begin.

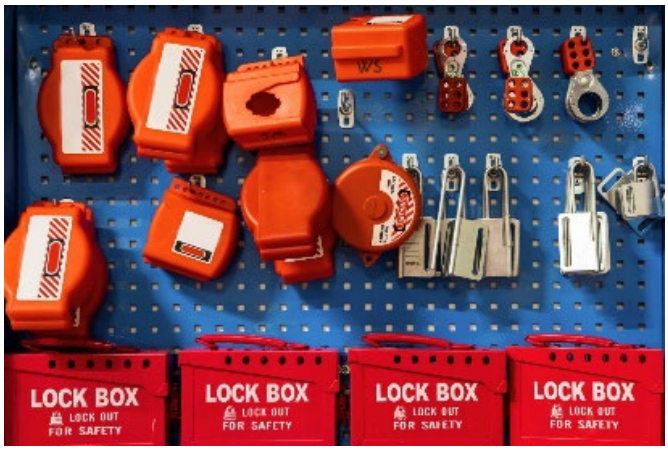
Restoring Equipment to Service

The restoration procedure is specified in the written lockout procedure below, and must be performed in the exact sequence as stated.

1. Remove all blocking and replace any critical parts removed during the lockout procedure.
2. Ensure that all tools or equipment have been removed from the hazard zone.
3. Close and secure all cover panels and doors. If all panels or doors cannot be closed, which may occur when testing, place barricades or rope off a safety zone with non-conductive material and post prominent warning signs around the area.
4. Advise all affected and other employees that the system is to be re-energized.
5. Ensure all persons are clear of the equipment/hazard zone.
6. Remove locks and tags. NOTE: Ordinarily, only the person who placed the locks and tags may remove them. If the person who placed the locks and tags is not available, only his/her supervisor may cut off the locks and tags, after personally ascertaining it is safe to do so.
7. Energize the equipment and restore the equipment to its normal condition.
8. Notify all affected and other employees that the lockout condition has been cleared.
9. Note the removal date and time of the lockout in the equipment logbook or online log as specified by your department.

Lockout Devices & Locks

When it is impossible to use a lock, a tagout may be used instead. All other steps of the process are the same as those listed above for lockout. The tag must be clear that the equipment is out of service and not safe for use. All persons in the area need to be notified not to attempt to use or approach the equipment.



Procedure When Physical Locking Is Impossible

When it is impossible to use a lock, a tagout may be used instead. All other steps of the process are the same as those listed above for lockout. The tag must be clear that the equipment is out of service and not safe for use. All persons in the area need to be notified not to attempt to use or approach the equipment.

Situations Involving More Than One Person Locking Out

Employees and/or contractors must engage in a group lockout situation. If more than one employee and/or external contractors work on the equipment, a lockout adaptor suitable for the installation of several locks must be used, enabling all workers to lock out the machine with their individual locks. For high voltage electrical equipment, a UCR high voltage electrician must control the lockout and ensure all persons and contractors working on the equipment have placed their locks as required.

Procedure When Machine Testing Is Required During A Lockout

On some machines, it may be necessary to energize or start up machinery or equipment during a lockout procedure to tune, adjust, or make measurements before the machine is fully restored to service. In those instances, all persons must clear the hazard zone of all tools and equipment, leave the hazard zone, verify that all persons are clear of any hazards,

remove the necessary locks, and then the equipment can be energized. A qualified person must then make the necessary measurements or adjustments, and the equipment must be shut down. The locked-out condition must then be re-established by repeating the same work steps specified in the written procedure for fully locking out the equipment.

Procedure Involving Personnel Changes During the Job

Persons being replaced or exchanged on a job during a shift or at the end of a shift must ensure that the lock(s) and tag(s) of his/her replacement are substituted for his/her own before leaving the job.

If a lockout procedure is to continue through the following work shift, the oncoming work crews must place their locks and tags on the energy isolating devices before the departing crew removes their locks and tags. Before work begins on the subsequent work shift, the oncoming crew must re-verify that all safety devices, such as blocking, are in place, that there is still zero energy in the system, and they should attempt to restart or re-energize the system before anyone enters the hazard zone.

Procedure When Work Is Left Unfinished

Locks, tags, and all other safety warning devices must be left in place during all short absences such as breaks or trips to pick up parts.

When work is incomplete and temporarily suspended overnight or over a weekend, all locks, tags, and other safety warning devices must be left in place.

When work is suspended for more than 3 days while waiting for parts or other information, the equipment or machinery must be tagged as out of service, disconnected from all energy sources, and must have the covers and access panels reinstalled. Never leave exposed machine parts or electrical contacts unattended.

Procedure: When Employee Leaves without Removing their Lock

When an employee leaves the facility site and does not remove his/her lock(s) from the energy isolating device(s) (for example, if the employee became sick and left the site), then the responsible supervisor must attempt to contact that employee to determine if he/she will be able to return to remove the lock. If it is verified that the equipment is ready to be returned to service, and the employee is unavailable or cannot return, the supervisor must complete the Abandoned Lock Removal Authorization Form (Appendix D), have EH&S review and approve, take it to the Facilities Services Lock Shop, and check out a spare key to remove the lock.

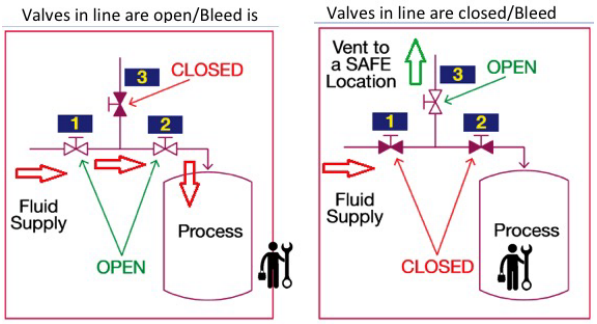
Once the employee returns to the work site, that person must be informed that their lock was removed and the status of the equipment that was locked out (e.g., returned to service, still under lockout, etc.).

Lockout Requirements for Specific Situations

Work on pressure or vacuum systems:

For pneumatic systems (e.g., generally where compressed air is used to perform some mechanical function).

Pneumatic systems are generally used to provide some force for mechanical movement. For isolating such a system, it may be more logical and convenient to isolate (block) and lock out the mechanical portion of the energy path. If servicing or maintenance is to be performed on the pneumatic system itself, the compressor pump must be turned off and locked out, and the air receiver or system depressurized before work can begin. Sections of the system can be isolated and depressurized in that section, allowing in-line repairs by installing a block and bleed system of valves to depressurize a segment of the system.



Double block and bleed valve unit

Steam, chemical, and water distribution systems

Large piping systems that carry hazardous pressure or contents should shut off at the valve upstream and then be blinded and secured using a blind flange lockout device.

Blind Flange lockout on a pipe

Work on Electrical Power Systems or Equipment

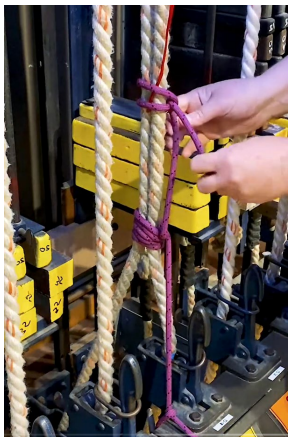
Work on de-energized electrical equipment or systems must be accomplished by person(s) who are Authorized Lockout/Tagout Employees. Electrical energy must be locked out at a disconnect switch that positively interrupts the circuit supplying the electricity, or the equipment is physically disconnected from the source of electricity. Interlocks, software controls, relays, or other control circuit devices are prohibited for use to control hazardous electrical energy for servicing or maintenance. The equipment or circuits must be verified to be de-energized with a test meter or other type of testing device before work begins.

Work on University Theater & Studio Theater Hoist & Counterweight Systems:

When a manual line set requires maintenance, repair, or should not be moved for any reason, it should be locked out. The line should first be snubbed with a safety rope and then a lock placed on the rope lock. The tag should inform why the line set is locked out. This includes when a line set will hit objects and scenery unless a knuckle-buster style stop or similar is used to prevent the line from going in too far. A tape spike mark is not enough.

As an exception, a lockout is not required during regular loading and unloading of battens and arbor weight. However, a snub line, uncle buddy style securing bar, or other proven method to secure the line set when unbalanced is still required.

Knuckle Buster No. 85



Snub line shown on the line set.

If a motorized hoist powered line set requires maintenance, repair, or should not be used for any reason, the hoist should be de-energized and locked out. Do not rely on notes on the control panel to ensure the hoist will not be used. Facilities Services will need a work order request submitted to identify the main power source for the hoist motor and shut it off. Only Facilities Services can de-energize hard-wired electrical equipment. A Facilities Services electrician will perform the lockout out and then anyone in the theater or contractors working on the equipment must add their lock.

Elevated areas, confined spaces, or other restricted access locations

Restricted areas that pose a danger may require access locks to ensure unsuspecting or unauthorized individuals do not attempt to access them. These may include ladders that go to rooftops, vaults, pump pits, tunnel entrances, buildings that are condemned, and so on. In cases where an area must be locked out, a long-term lock must be issued. Do not leave personal lockout locks on areas for extended periods. If you determine an area needs to be secured, use the Long-Term Lockout form to request a campus LT lock from the Facilities Services Lock Shop.

Long-Term Lockout

If equipment, areas, or power sources need to be locked out for a period exceeding 90 days, a long-term lockout should be enacted. A long-term lockout lock should be obtained from the Facilities Services Lock Shop along with the long-term Tag. These locks are on a restricted master to minimize access. A log of long-term lockouts will be maintained and include the reason for the lockout, who enacted it, the date it was enacted, and any safety concerns associated if applicable. To request a long-term lockout, use the form in Appendix E

Sample long-term lockout tag

Enforcement

Supervisors and managers of Authorized Lockout/Tagout Employees shall periodically audit their employees on the job to ensure compliance with lockout procedures. Any observed deviations from the written lockout procedure or inadequacies in the employee's required knowledge or understanding of their responsibility under the procedure will be noted in a report. Refresher training must be conducted to correct these deficiencies.

No employee shall install, service, remove, or perform electrical or mechanical maintenance on any electrical equipment or machinery unless they are trained and “Authorized” for the specific tasks to be performed, which shall include the specific lockout procedures necessary for that task. Employees who disregard lockout/tagout procedures or perform unauthorized work on energized equipment are subject to disciplinary action.

Authorization

Employees must be authorized by their supervisor to enact lockout/tagout when they have the requisite experience, training, and procedures in place to do the work. Only authorized persons may join or work on equipment that has been locked out. Supervisors must define the scope of employees who will be authorized to do referencing a specific procedure, a series of tasks, or by job description. If supervisors need assistance determining whether an employee has the requisite training or experience to be authorized for LOTO work, contact the EH&S for assistance.

Program Review

Cal/OSHA requires that each LOTO procedure be reviewed at least annually to verify the procedure is still correct and that it effectively isolates all

energy. The owner department, supervisor, maintenance service group supervisors, and or EH&S Safety Engineer may review the procedures to determine if they are adequate, appropriate, and current. Dates of review should be noted on the LOTO Procedure Annual Audit form maintained by the owner department.

5. Training Requirements

All Affected and Other Employees must attend Core IIPP training. For UC Riverside employees to be considered Authorized Lockout/Tagout Employees, they must attend the same classes as Affected Employees and additionally attend the Advanced Electrical Safety/Lockout/Tagout Training class. After taking the Advanced Electrical Safety Training class, the Authorized Lockout/Tagout Employees will be certified to work on equipment that requires lockout/tagout procedures. Authorized Lockout/Tagout Employees may then take the Hazardous Electrical Voltage Training to become a Qualified High Voltage Electrical Worker (in addition to other requirements) and work on high voltage equipment and systems.

Training Requirements	**Courses**	**Target Audience**
IIPP Training	UCR Safety Orientation RI-ESECO0100	All UCR Employees
Lockout/Tagout Awareness	Lockout/ Tagout RI-UCSKSS0102-ECO Or Lockout/ Tagout in-person awareness training using EH&S materials	All Affected Employees
Authorized Person Lockout/Tagout Training	Lockout/Tagout for Authorized Persons RI-ESTOP0031 Qualified Electrical Worker (QEW) I & II RI-UCSKSS0496-ECO and RI-UCSKSS0529-ECO	Authorized Lockout/Tag Out Employees (QEW only required for enacting an electrical lockout beyond cord & plug)

Employees must participate in refresher training every three years. All LOTO procedures must be inspected on an annual basis and as the need arises due to new job assignments, changes in procedures, or changes in equipment that present new hazards. Refresher training will also be conducted when deficiencies are found during the annual program review, when there have been significant procedural, program, or regulatory

changes, or if the employee's knowledge of the energy control procedures appears to be inadequate.

LOTO training records shall be maintained at UC Riverside for the duration of employment and 3 years after.

6. Definitions

Affected and Other Employee – Any employee in an office or industrial setting who works around outlets, electrical panels, or electrical switches, and whose job requires them to be near or around the hazard zone (but not within the hazard zone) when equipment is being serviced or maintained under a locked-out or tagged-out condition. For example, a machine operator who must stay near the machine during a lockout is classified as an Affected Employee. Office staff working on computers and electrical equipment when nearby equipment is being serviced or maintained during a lockout are also classified as Affected Employees. The Affected Employee must be instructed never to attempt to restart or re-activate equipment that is locked out or tagged out.

Authorized Lockout/Tagout Employee - A person who has completed the required hazardous energy control training, has the requisite experience for the task, and may be authorized by their authorized to lockout or tagout a specific machine or equipment to perform service or maintenance by their supervisor. A person must be an Authorized Lockout/Tagout Employee to apply a lock or tag to control hazardous energy, join a lockout managed by another authorized person, or work on locked-out equipment.

"Capable of Being Locked Out" - An energy isolating device will be considered capable of being locked out if it is designed with a hasp or other means of attachment to which a lock can be affixed, or if it has a locking mechanism built into it. Other energy isolating devices are capable of being locked out, if a lockout can be achieved without the need to dismantle, rebuild, or replace the energy-isolating device or permanently alter its energy control capability. An appropriate lockout attachment, designed for such an application, is available through a supplier.

Energy Forms:

- Electrical – Low voltage is when the potential is greater than 30 volts RMS or direct current, but less than 600 volts; high voltage is when the potential is greater than 600 volts; high current is when 25 amperes or greater exists at any voltage.
- Chemical – Explosion, pressure, extreme heat, fire, corrosive, reactive, oxidizer, toxic

- Pressure – greater than one atmosphere, can be in the form of pneumatic pressure, hydraulic pressure, or liquid pressure.
- Vacuum – less than one atmosphere
- Ionizing Radiation – greater than 2 millirem per hour
- Non-Ionizing Radiation – Ultraviolet greater than the ACGIH TLV, Infrared, RF/Microwave, Laser, Magnetic Fields
- Potential – Flywheels, springs, differences in elevation, elevated parts that could drop, capacitors, batteries.

Energy Isolating Device - A mechanical device located at an energy control point that positively blocks the flow of energy and can be locked in the "safe" position. Push buttons, selector switches, software controls, interlocks, and other control circuit devices are not considered energy-isolating devices.

Hazardous Energy - Energy, if not controlled, of such a magnitude that it is capable of causing harm to a person, death, or loss of resources.

Hazardous Energy Control - The process of systematically implementing mechanical means to prevent hazardous energy from flowing to a person. This includes using mechanical means to achieve the following conditions:

- ***Isolated*** - A condition where all sources of hazardous energy have been controlled by breaking the energy path so that the energy cannot flow to workers. The term "isolated" is commonly used with electrical circuits and fluid lines.
- ***Dissipated*** - A condition where all stored energy has been reduced to a non-hazardous level. Most commonly used with energy-storing devices such as capacitors, pressure receivers, or springs.

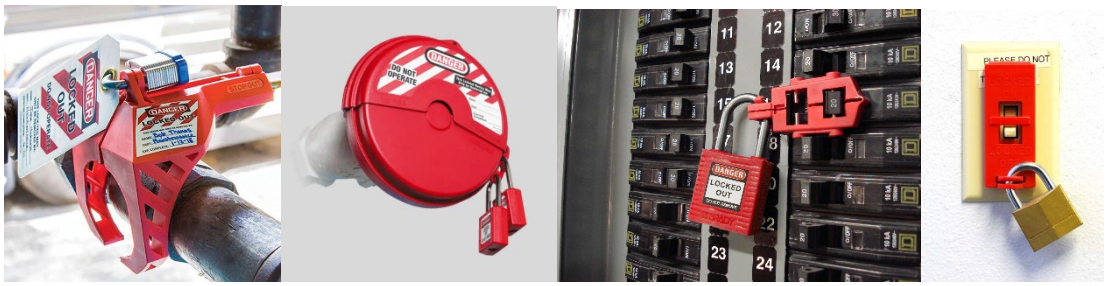
Blocked - A condition where a mechanical device is inserted into the energy path to physically prevent movement. Most commonly used with mechanical machinery or fluid-filled lines.

Hazard Zone - The space around a source of hazardous energy where a person could be harmed if the hazardous energy were suddenly or unexpectedly released, such as the unexpected release of stored pressure, the unexpected movement of a machine, or the spray from a hazardous chemical that was unexpectedly released.

High Voltage System - Associated electrical conductors and equipment operating at or intended to operate at a sustained voltage of more than 600 volts.

Lockout - The method of applying a mechanical lockout device and a tag on an energy-isolating device by an authorized employee in accordance with established written procedures, to control hazardous energies.

Lockout Device – Item used to cover, block, or prevent an energy source like a breaker, valve, or plug from being turned on or connected. These are applied to the item, and then the lockout lock is connected to it.



Lockout Lock – A padlock that has restricted access to keys. The person applying the lock is the only one with access to the key. The locks are used to physically secure energy-isolating devices (such as circuit breakers, valves, or switches) in a safe, de-energized position. The lock prevents unauthorized individuals from turning on the equipment, ensuring that it remains shut down until the work is completed and it is safe to restart.

Lockout/Tagout Coordinator – A department may designate a Lockout coordinator for their equipment. This person must complete authorized user training and will be responsible for coordinating lockouts for their department. They can act as a responsible individual for lockouts requested by others in the department without training. IF they will be doing electrical lockouts beyond cord & plug, they will need to complete the Qualified Electrical Worker training and be approved by EH&S to enact specific LOTO procedures.

Maintenance service group- Depending on the building you are working in or the location (Main Campus, Palm Desert, UCR Health, etc.), the maintenance service group might be different. Maintenance service is a generic reference for the group responsible for your building, which may include: Facilities Services, Auxiliary Services, department facility teams, or contracted services. Make sure to identify the correct maintenance service for your building.

Qualified Electrical Worker (QEW) - is an individual possessing the skills, knowledge, and training necessary to safely perform work on or near energized electrical equipment and installations. This definition is not simply based on holding an electrical license or certification; rather, it hinges on demonstrable abilities and training specifically focused on electrical safety in the workplace. Qualified Electrical Workers will be approved for work that is within their capabilities, not all electrical work.

Tagout - The placement of a tagout device on an energy-isolating device in accordance with established written procedures to control hazardous energy. Using tagout as a form of hazardous energy control is not a positive means of controlling hazardous energy and shall not be used whenever lockout is possible.

Tagout Device - A prominent warning tag capable of being securely attached that provides a warning not to use the equipment. The tag should include: reason for the tag, name of person placing the tag and how that person may be contacted, and date the tag was placed. Tags must be durable and able to withstand the environment to which they are exposed for the maximum time exposure is expected. These tags shall not be used for other purposes.

Stored Energy Source - Any device that is capable of holding energy after equipment shutdown. This includes, but is not limited to, capacitors, tanks, pipes, springs, and flywheels.

7. Information and External References

California Code of Regulations, Title 8 CCR §2320.3 Tests

California Code of Regulations, Title 8 CCR §2320.4. De-Energized Equipment or Systems

California Code of Regulations, Title 8 CCR §2320.5. Energizing (or Re-Energizing) Equipment or Systems

California Code of Regulations, Title 8 CCR §2320.6. Accident Prevention Tags

California Code of Regulations, Title 8 CCR §2320.7 Safety Precautions

California Code of Regulations, Title 8 CCR § 2530.86. Motor Not in Sight from Controller

California Code of Regulations, Title 8 CCR § 2940. General Provisions

California Code of Regulations, Title 8 CCR 3314, “Cleaning, Repairing, Servicing, and Adjusting Prime Movers, Machinery, and Equipment”

California Code of Regulations, Title 8 CCR

Cal/OSHA Workplace Health & Safety Guide – Controls for Hazardous Energies

Cal/OSHA Lockout/Tag Out for Employees' Safety & Health Fact Sheet, May 2022

Federal OSHA 29 CFR 1910.147 - The Control of Hazardous Energy (Lockout/Tagout)

Federal OSHA Safety & Health Topics – Control of Hazardous Energy (Lockout/Tag Out)

8. Appendices

- A – LOTO Procedures Template
- B – LOTO RSS ***Procedures*** Template
- C – Hazardous Energy Assessment Template
- D - Abandoned Lock Removal Authorization Form
- E – Long-Term Lockout Request form
- F – Campus-Wide Cord & Plug LOTO Procedure UCRPLUG-001
- G – LOTO Procedures Annual Audit form

LOTO Procedures Template

Equipment /System:	**ID#:**	**Date:**
Building:	**Verified by:**	**Date:**
Specific Location:		**Next Audit Due:**

Scope/Use: This procedure is required whenever machine guards or other safety devices are removed or bypassed, or any hazardous exposure to a point of operation or an associated danger takes place.

Purpose: This lockout will bring this equipment (or section) to a fully de-energized condition for inspections, cleaning, and repairs.

Special Precautions

Lockout devices needed (list all)	Number of Lock points: Devices required:
PPE Required	• Safety Glasses •

Lockout Application Steps

Step 1 – Review the procedure and verify you have all of the needed lockout devices and locks required

Step 2 – Notify all affected persons and occupants that the equipment is being shut down

Step 3 – Shut down the equipment from the operator controls

STEP 4 – Isolate energy and lock out each point in order

Order	Energy Source	Magnitude/type	Device	Method	Visual
1					
2					
3					
4					
5					

STEP 5 – Verify lockout is complete by testing the operation and/or verifying there is no energy at the work location. Dissipate any energy from the system that may be released into the work area. Use the steps outlined below.					
1					
2					
3					
4					
5					
Step 6 – Begin Work					

Lockout Release Steps

Step 1 – Inspect equipment and ensure all tools, spare parts, and waste are clear of the equipment
Step 2 – Review the procedure and make sure all authorized persons are present with their keys
Step 3 – Notify all affected persons and occupants that the equipment will be re-energized and tested
Step 4: Check the area to make sure all affected persons and occupants are clear of the equipment, and it is safe to begin.
Step 5 – Remove locks and re-energize

Order	Energy	Point	Device	Method
1				
2				
3				
4				

5				
Step 6 – Notify affected employees and occupants that the system is energized and ready for testing.				
Step 7 – Startup equipment and verify proper operation				
Step 8 - Lockout complete. Notify all affected persons.				

**If additional steps are needed, note them below or on the back.

UCR Environmental Health & Safety

LOTO *Procedures* Template

This Procedure can be found in ***Procedures*** using the name: _____

Follow these steps to create a written sequence for de-energizing, lockout, testing, and startup of equipment requiring energy isolation.

1. Survey and check off all energysources
2. Note the magnitude and type of each energy source
3. Note the device and location of each energy disconnecting/isolation source/method.
4. List the sequence of energy isolation (number from 1 up to 12)
5. Check off all PPE to be used for energy isolation
6. Check off all safety equipment to be used for energy isolation

Equipment Name:	**Building:**	**CAAN:**	**Room #**
Exact Location Description:			
Describe Scope of Work:			

4.	1. Energy Source	2. Magnitude/Type				3. Isolation Device/Location/Method
	☐ ELECTRICITY– Main power	Amps:	Volts:	# Phase	AC or DC	
	☐ ELECTRICITY– Control circuit(s)	Amps:	Volts:	# Phase	AC or DC	
	☐ BATTERY / SOLAR / ALT POWER	Amps:	Volts:	# Phase	AC or DC	
	☐ COMPRESSED AIR / GASES	PSI:	Gas Type:			
	☐ STEAM / CONDENSATE	PSI:	Source:			
	☐ FLUID UNDER PRESSURE	PSI:	Source:			
	☐ HEAT / COLD ± C° or ±F°	Temp:	Source:			
	☐ VACUUM CHAMBER / PIPING	Hg:	Source:			
	☐ FUEL(S) - SOLID / LIQUID / GAS	Volume:	Fuel:			
	☐ ROTATING WHEEL / FAN / DRIVE	Details:				
	☐ SUSPENDED WEIGHT	Details:				
	☐ MECHANICAL OTHER	Details:				

STEP 5: Mark and check off all PPE and safety equipment to be used for Energy Isolation.

PROCEDURE PREPARED BY:

[x]	PPE TO BE WORN DURING WORK								[x]	SAFETY EQUIPMENT TO BE USED DURING WORK							
	Eye Protection		Goggles		Face Shield		Weld Gear			Fire Extinguisher		Fire Watcher					
	Boots		Steel Toe		Rubber		Other			Lines Blinded & Tagged							
	Gloves		Leather		Rubber		Insulated			Valves / Switches – Locked & Tagged							
	Respirator		Dust		Chemical					Remove Flammables / Combustibles							
	Thermal		Heat		Cold Protection					Bleeders Locked Open & Tagged							
	Apron		Wet Gear		Other					Shields		Arc Curtain		Heat Blanket			
	Safety harness				FR Lab Coat					Blocks		Barricades		Bars		Chains	
	Other:									Tools		Insulated		Long Handle			

(PRINT NAME)

SIGNATURE / DATE:

ANNUAL REVIEW COMPLETED BY:

(PRINT NAME)

SIGNATURE / DATE:

Return this form to EH&S for review.

Standard Energy Isolation – Lockout / Tagout (LOTO) Procedure	1. All maintenance personnel are issued a suitable lock (or locks for multiple energy sources). Each lock has the individual worker's name or other identification on it. Each worker has the only key to the lock/lock set. 2. The Qualified Person checks to be sure that no one is operating the machinery BEFORE turning off energy sources. All persons in the area, and especially the machine operator and project supervisor, are informed before the energy sources are turned off because an unexpected sudden loss of power could cause an accident. 3. Steam, air, and hydraulic piping or tanks must be bled, drained, and/or brought to atmospheric pressure and locked "open" to assure no pressure or vacuum in piping or in reservoir tanks. 4. Gas cylinders must be locked 'closed' and, if possible, disconnected from distribution piping. 5. Any mechanical component that could roll, shift, or otherwise move, such as springs, counterweights, wheels, fan blades, etc., must be chained, barred, or blocked. 6. Each person who will be working on the machinery must put a lock on each of the machine's lockout device(s). Each lock must remain on the machine until the work is completed. Only the worker who placed the lock may remove their lock. 7. The Supervisor or "Qualified Person" places a tag on each lock-out location. 8. All energy sources that could activate the machine must be locked or blocked out following an equipment-specific EI-LOTO Procedure developed for that equipment. (Other side) 9. All disconnects must be tested to ensure that all energy sources to the machine are off. 10. Electrical circuits must be checked by qualified persons with proper and calibrated electrical testing equipment. Stored energy in electrical capacitors must be safely discharged. 11. CAUTION: Return disconnects and operating controls to the "off" position after each test. 12. Attach accident prevention tags which give the reason for placing the lock/tag, the name of the person placing the lock/tag, how they may be contacted, and the date and time the lock/tag was placed.
Testing / Adjusting Equipment During LOTO	In many maintenance and repair operations, machinery must be tested and therefore energized before additional maintenance work can be performed. For such situations, this procedure must be followed: 1. Clear all personnel to safety. 2. Clear away tools and materials from the equipment. 3. Remove blocks and lockout devices and re-energize systems, following the established safe procedure. 4. Proceed with the tryout or test. 5. Shut off all energy sources, reinstall lockouts on energy sources, reinstall blocks, bleed all pressure systems, and verify all energy sources are de-energized prior to continuing work. Equipment design and performance limitations may dictate that effective alternative worker protection be provided when the established lockout procedure is not feasible. If machinery must be capable of movement to perform a maintenance task, workers must use extension tools, personal protective equipment, and other means to protect themselves from moving parts and potential injury.
Restoring Equipment to Service	After the work is completed and the equipment is ready to be returned to normal operation, this procedure must be followed: 1. Remove all non-essential items. 2. See that all equipment components are operationally intact, including reinstalling guards and safety devices. 3. Repair or replace defective guards before removing locks. 4. Remove each lockout device using the correct removal sequence. 5. Make a visual check before restoring energy to ensure that everyone is physically clear of the equipment. Each lock is removed by the qualified person who applied it, or under his/her direct supervision. If the qualified person is absent from the workplace, then the lock or tag can be removed by a qualified person designated to perform this task, provided that the immediate supervisor: 1. Verifies that the qualified person is not present and therefore unable to remove the lock; 2. Makes all reasonable efforts to inform the qualified person that the lockout/tagout device has been removed; and 3. Ensures that the qualified person knows their lockout/tagout device has been removed before their work resumes. Finally, notify any "Affected Person(s)" that equipment has been restored to its operational state.
Joint Projects	If University personnel and contractor personnel are working on the same piece of equipment, each work team installs its own hasp and locks on each energy source. The University provides the hasps that University personnel install their locks on, and the Contractor provides their hasps and locks that their personnel install/use.

UCR Environmental Health & Safety

Hazardous Energy Assessment Form

Equipment Description:		**Completed by:**	**Date:**

Evaluate the equipment for all existing and potential hazardous energy sources and indicate present by checking the left-hand column. For each, describe the energy type and magnitude, danger zone (the part(s) of the equipment where the energy is found), and the isolation point(s)/method of control.

Check If Present	Types of Energy	Type / Magnitude	Danger Zone	Isolation Point(s) and Control Method
	Electrical - low voltage (<50 V) - list amperage			
	Electrical- low voltage (50-600 V) - list amperage			
	Electrical - high voltage (>600 V) - list amperage			
	Emergency power- does the equipment maintain an emergency power/uninterruptible power supply or have capacitors?			
	Chemical - flammable, pressure, extreme heat, fire, corrosive, reactive, oxidizer, toxic, etc. **Required: Consult an EH&S subject matter expert.**			
	Pressure - hydraulic, pneumatic > 150 psi in rigid pipe or >50 psi in flexible, unsecured lines			
	Vacuum			
	Mechanical - capable of crushing, pinching, cutting, snagging, striking			
	Thermal- high temperature-surface temperature, ,hot liquids, steam Liquids or gases > 125°F (52°C) Surfaces ≥ 140° F (60°C)			
	Thermal, cryogenic - super cold surface or cryogenic liquid < 27°F (-3°C)			
	Radiation, ionizing			
	Radiation, non-ionizing – ultraviolet, infra-red, RF/Microwave, laser, magnetic			
	Stored energy - flywheel, springs, differences in elevation, capacitors, batteries, counterweights, etc.			
	Other- describe			

Hazardous Energy Assessment Form

Hazardous Energy Thresholds

Energy Form	**Evaluate Hazard and Consider Lockout/Tagout**	**Lockout/Tagout Required (see note 1)**
Electrical (AC or DC)	< 50V and < 5mA, and ≤ 10J	≥ 50V, or > 5 mA or > 10J
Thermal (hot)	Liquids or gases ≤ 125°F (52°C) Surfaces ≤ 140° F (60°C)	Liquids or gases > 125°F Surfaces ≥ 140° F
Thermal (cold)	Liquids and surfaces ≥ 27°F (-3ºC)	Liquids and surfaces < 27°F
Mechanical - kinetic	No threshold; each situation must be evaluated	
Mechanical - potential	No threshold; each situation must be evaluated	
Pneumatic	≤ 150 psi in rigid pipe ≤ 50 psi in flexible, unsecured lines	> 150 psi in rigid pipe (see note 2) > 50 psi in flexible, unsecured lines
Hydraulic	≤ 150 psi in rigid pipe ≤ 50 psi in flexible, unsecured lines	> 150 psi in rigid pipe (see note 2) > 50 psi in flexible, unsecured lines
Chemical	No threshold; each situation must be evaluated based on the chemical's hazardous properties	

1 Unless de-energizing the source by lockout/tagout introduces additional or increased hazards or is infeasible due to equipment design or operational limitations.

2 Double valve isolation is required when the operating temperature exceeds 200°F or the operating pressure exceeds 500 psi.

UCR Environmental Health & Safety

ABANDONED LOCK REMOVAL AUTHORIZATION REQUEST

Only supervisors can remove abandoned locks

General Information			
Person(s) and/or Department Requesting Lock Removal: Click to enter text			
Building or work area where Lock is applied: Click to enter text			
Lockout Procedure #: Click to enter text			
Lock Owner: Click to enter text			
Date of Lockout: Click to enter date			
Reason Lock needs to be removed: Click or tap here to enter text.			
Hazard Identification Questions (check all that apply)			
YES	NO		**Describe Safeguards and Actions Required**
☐	☐	**Employee absence verified**	Attempt to contact the employee by any means possible
☐	☐	**Employee contact attempts before removal**	List different methods attempted:
☐	☐	**Is it safe to remove the lock(s) now?**	
☐	☐	**Is it critical to remove the lock(s) now?**	

As the supervisor, I acknowledge that we have made a satisfactory attempt to contact the lock owner.

_____I certify that the situation is safe for all involved to remove the lock and restore energy to the system.

or

_____A new lock for a present employee has been placed on the equipment before removal of the abandoned lock to ensure safe transfer and maintain the system lockout.

Supervisor Name:_____ Signature:_____ Date:_____

Received by EH&S: _____Date: _____

UCR Environmental Health & Safety

LONG-TERM LOCKOUT AUTHORIZATION REQUEST

Only UCR Facilities LT Locks may be used over 90 days

General Information
Person(s) and/or Department Requesting LT Lockout: Click to enter text
Building or work area where Lock will be applied: Click to enter text
Lockout Procedure #: Click to enter text
Asset # & Equipment Name: Click to enter text
Number of locks required: Click to enter text
Estimated length of lockout: Click to enter text
Reason Lock needs to be placed: Click or tap here to enter text.

Hazard Identification Questions (check all that apply)			
YES	NO		**Describe Safeguards and Actions Required**
☐	☐	**Owner/occupant has been notified?**	Ensure people are aware of the lockout and why this has taken place.
☐	☐	**Have you verified that energy has been fully removed beyond the lockout?**	Ensure there is no residual energy beyond the lockout point using the same process noted on the LOTO procedure.
☐	☐	**Are all covers and guards replaced and secured?**	Never leave equipment open.
☐	☐	**Tags with contact information and reason for lockout are in place?**	Employees must know who to contact if they have questions regarding the lockout.

As the supervisor,

_____I certify that the long-term lockout plan has been reviewed and determined as necessary.

or

_____The request is denied, and other steps will be taken to provide a safe situation, including disabling the equipment further upstream or removing it altogether to eliminate the need for a long-term lockout.

Supervisor Name:_____ Signature:_____ Date:_____

Received by EH&S: _____Date: _____

If approved, take a copy of this form to the UCR Facilities Lock Shop to be issued a LT lock(s).

Lockout/Tag Out Equipment Procedure

Equipment: Simple Plug-in Tools & Equipment

ID#: UCRPLUG-001

Description: Simple Plug Lockout	**ID#:** UCRPLUG-001	**Date:** 09/04/2025
Building: Campus-wide	**Verified by:** T.Stark	**Date:** 09/04/2025
Specific Location: Can be used at any UCR-owned or leased facility		**Next Audit Due:**

Scope/Use: This procedure is required whenever a tool or equipment that has a plug on the power supply and no other forms of energy that can pose a hazard is serviced, cleaned, or maintained with removed or opened covers that expose moving parts, electrical contacts, or other hazards. ***If the cord will remain in your exclusive control (within visual sight and under close attention) and no one else is exposed or near the hazards, this procedure is not required. Refer to the cord and plug exemption on page 2.***

Purpose: This lockout will bring this equipment (or section) to a fully de-energized condition for inspections, cleaning, and repairs.

1 Lockout Point(s)

Lockout devices needed	1 lockout hasps (if others are exposed) 1 Tag 1 lock per employee 1 Cord Cover LOTO Device
PPE Required	• Appropriate for maintenance being conducted • Safety glasses

Lockout Application Steps

Step 1 – Review the procedure and verify you have all of the needed lockout devices and locks required

Step 2 – Notify all affected persons and occupants that the equipment is being shut down

Step 3 – Shut down the equipment from the operator controls and ensure it has completely stopped.

STEP 4 – Dissipate and isolate all energy sources and lock out each point in order

Order	Energy Source	Point	LOTO Device	Method	Visual
1	ELECTRICAL	Power cord	Cord cover	Unplug the power connector and place the cord cover over the plug. Place the lock with the tag.	

STEP 5 – Verify lockout is complete by testing the operation and/or verifying there is no energy at the work location. Dissipate any energy from the system that may be released into the work area.

Step 6 – Begin Work

Lockout/Tag Out Equipment Procedure

Equipment: Simple Plug-in Tools & Equipment

ID#: UCRPLUG-001

Lockout Release Steps

Step 1 – Inspect equipment and ensure all tools, spare parts, and waste are clear of the equipment and all covers and doors are closed and secured.

Step 2 – Review the procedure and make sure all authorized persons are present with their keys

Step 3 – Notify all affected persons and occupants that the equipment will be re-energized and tested

Step 4 – Check the area to make sure all affected persons and occupants are clear of the equipment, and it is safe to begin.

Step 5 – Remove locks and re-energize

Order	Energy	Point	Device	Method
1	ELECTRICAL	Power cord	Cord cover	Remove the lock and cord cover. Plug in equipment when safe to do so.

Step 6 – Notify affected employees and occupants that the system is energized and ready for testing.

Step 7 – Startup equipment and verify proper operation

UCR Cord & Plug Equipment Exemption Procedure

Cord and plug equipment refers to any electrical equipment that uses a flexible cord and attachment plug to connect to a source of electricity as its sole energy source. If there are additional sources of energy, of any type, this exemption cannot be used.

The cord & plug exemption can be used only when:

All Hazardous energy is controlled by unplugging the equipment, and

The plugs remain under the exclusive continuous control of the worker performing the work. Exclusive control means the plug is within sight of the worker at all times, and they are the only person working on the equipment. If they leave the area, the equipment must be locked out. A second person assisting with the work also requires the equipment to be fully locked out.

When cord & plug equipment does not meet the above requirements, it must be locked out. Using a plug cover, as shown below, is the simplest method for lockout on cord and plug equipment. If more than one person will be working on the equipment, they also need to place a lock on the device. A hasp can be purchased to allow multiple locks.

Persons working under the cord & plug exemption are not required to be LOTO Authorized Persons but must complete the Awareness level training and may need to be Qualified Electrical Workers depending on the voltage of the equipment. If the equipment needs to be locked out, Authorized user training is required. Departments may choose to have a designated Lockout Authorized Person enact all lockouts, with the people performing work on the equipment adding their lock once the equipment is safely de-energized.

Lockout/Tag Out Procedure Annual Audit

Department:	Year:
Department Chair/Manager:	LOTO Coordinator:

Procedure #	Title/Equipment	Date Rev'd	Reviewed by	PASS	FAIL	Notes