UCSF Energy Safety and Energy Isolation
Lockout Tagout (EI-LOTO)

Drafted in Conjunction with UCOP Facilities Safety Center of Excellence
1.0 Introduction / Roles & Responsibilities

1.1 Purpose:
“Energy Safety” and Energy Isolation - Lockout/Tag-out (EI-LOTO) is required by CalOSHA and Federal OSHA and must be conducted on every campus and research field station by UCSF personnel and contractors. Because of the potential for injury from energy sources that operate equipment and utility systems, knowledge of energy safety and how to apply it to EI-LOTO guides safe design, selection, installation, set-up, adjustment and maintenance work on equipment by isolating energy sources from the equipment prior to commencing work. It is required by law to implement safe procedures when working on equipment or utility systems with one or more energy sources.

UCSF policy only allows for work on “energized systems” under very specific circumstances, subject to review and approval by UCSF safety personnel.

1.2 Scope:
Only personnel who have attended training and have received authorization from their Supervisor can conduct EI-LOTO procedures at UCSF. Training must include how to identify energy sources on equipment and safely conduct EI-LOTO on those energy sources specific to that equipment.

All Facilities Services staff are made aware through the EH&S website and safety awareness training that “No person ever touches or tries to actuate an energy source that has been ‘locked’ and/or ‘tagged’ in the ‘off’ position by someone else. And further, never disturb a mechanical block that has been placed to prevent equipment movement by someone else.”

1.3 Supervisors:
Functional Area Supervisors (“Supervisors”) manage staff that may:
- Engage in EI-LOTO processes (“Qualified Persons”) or
- Work near EI-LOTO processes (“Affected Individuals”)

Supervisors are responsible for:
1) Implement appropriate EI-LOTO procedures within their area of operation.
2) Identify “Qualified Persons” within their staff. Staff members’ qualifications are based upon the Supervisor’s knowledge of the qualified
person’s skills, and the energy sources on the equipment to be isolated / locked out.
3) Assure that their direct-report personnel / research associates / students are trained on EI-LOTO processes, and
4) Provide all said personnel with the proper EI-LOTO equipment, and
5) Develop and provide general procedures to conduct EI-LOTO safely and effectively under their areas of responsibility, and
6) Identify all equipment under their supervision that requires EI-LOTO procedures, and
7) Develop written EI-LOTO procedures specific to that equipment, and
8) “Qualify” personnel in a documented process to conduct EI-LOTO activities (sample form available in Appendix D ), and
9) Communicate with other operational groups during EI-LOTO procedures when necessary

1.4 Qualified Persons:
Only persons who are “Qualified” by their Supervisor may conduct EI-LOTO processes. A person must be “Qualified” by their Supervisor when their duties include performing cleaning, repairing, servicing, setting-up and adjusting operations on equipment requiring Energy Isolation for safe work activities.

A “Qualified Person” is an individual formally recognized and documented as:
1. Having completed required classroom, trades or other training on EI-LOTO, and
2. Having sufficient understanding of EI-LOTO safe-work practices and equipment to be able to recognize and positively control any hazards that may be present on specific equipment they are trained on, and
3. Possessing the work experience and formal training necessary to execute work according to recognized and accepted EI-LOTO safe-work practices, and
4. Having completed orientation to a specific equipment’s EI-LOTO procedure, or having developed and reviewed an EI-LOTO procedure for specific equipment that is subsequently reviewed and approved by another “Qualified Person” or their Supervisor.

Qualified Person(s) may conduct EI-LOTO to the degree of their documented qualification, develop energy isolation procedures and conduct annual audits on existing procedures as detailed below.
A person may be considered “Qualified” with respect to certain equipment, certain types of energy sources, and certain safe-work methods on specific equipment, but not ‘Qualified’ for other equipment/locations within the same Department or Research Project.

It is the responsibility of the “Qualified Person’s” Supervisor to determine limitations of “Qualification” for every person working under their direction. This “Qualification” is a documented process. A sample “Qualification” form is available in Appendix D.

1.5 Affected Persons:
Personnel who uses equipment/systems that is currently under El-LOTO or who work in an area where El-LOTO is being used are defined as “Affected Persons”. When El-LOTO procedures are implemented, all Affected Persons must be informed that El-LOTO is being used in their work area and instructed to never tamper with or remove locks / tags that have been placed pursuant to this program.

1.6 Contractors:
If contractors are working on University equipment, then the Project Manager representing the department who owns the equipment is responsible for assuring the Contractor has an El-LOTO program equivalent to the University’s and follows it. The Project Manager is not responsible to evaluate the Contractor's program, only to verify that the Contractor has one and intends to follow it.

The Project Manager must inform the contractor of:
- any known energy sources on the equipment
- any energy isolation procedure previously developed for the equipment should be provided to the contractor, and
- any other known hazards associated with the equipment made known.

As work progresses, the contractor must inform the project supervisor of any newly discovered energy sources or hazards associated with the equipment.

The contractor must provide their own locks and hasps.

If University personnel and contractors are working on the same piece of
equipment, then the University must provide the hasps that the University personnel install their locks on, and contractor must provide the hasps that their personnel installs their locks on. Each work team installs their own hasp and personnel locks on each energy source.

The Project Manager must hold *joint tailgate meetings* with all personnel who will be working on the equipment to promote understanding of safe work practices, energy isolation procedures specific to the equipment, and any hazard controls needed to complete work in a safe manner.

2.0 Defining EI-LOTO:
Every piece of powered equipment or utility system uses or transports one or more types of hazardous energy. When equipment is being installed, maintenance work is being performed on it, or when it is being modified to perform specific functions, the energy sources must be isolated from the equipment to assure a safe working environment.

In commercially purchased equipment, the design of the equipment safely controls the energy flowing to, though, or stored in the equipment when properly maintained and operating normally. However, when equipment is being maintained, adjusted or malfunctions, the equipment must be rendered free of hazardous energy. This is a specific, documented process called “Energy Isolation – Lockout/Tagout”, or “EI-LOTO”. Cal/OSHA and Federal OSHA law require EI-LOTO to be followed whenever equipment that has potentially hazardous energy associated with it is being worked on.

2.1 Energy types for EI-LOTO: EI-LOTO is applied to ALL forms of potentially hazardous energy, and is applied to every individual piece of equipment that has potentially hazardous energy. The types of energy to be isolated include:

- **Potential / stored energy** (E.g. mechanical springs in tension or compression, pressurized compressed gas cylinders, suspended counter weights, flywheels, hydraulic or gaseous reservoirs / tanks containing stored materials, liquid or gaseous fuels, vehicles parked on a slope, etc.)

- **Kinetic energy** (E.g. rotating flywheel, moving parts, rolling components,
water or other liquids / gases flowing through pipes, rotating fan blades, moving vehicles, etc.) and,

- **Utility energy** (electricity, compressed air, steam, domestic water, etc.) that may be part of a particular machine or utility system.

2.2 Equipment EI-LOTO applies to:
EI-LOTO may be applied to:
- Building mechanical systems including, but not limited to:
  - electrical distribution equipment
  - pumps
  - distributed air & gas systems
  - HVAC and air handlers
  - some larger experimental equipment that is hard-wired and/or hard-plumbed to building utility systems
  - air compressors
  - printing presses
  - some shop equipment such as a programmable milling machine, CNC equipment, wood-working equipment, powered cranes and other lift equipment, etc.
- A piece of equipment’s, or a building’s, plumbing or wiring systems and controls.
- “Parked” vehicles.
- Equipment that can be ‘unplugged’ but may have energy potentially stored in the ‘unplugged’ equipment.

2.3 How EI-LOTO is applied:
**Lock out** is a physical process used to stop / isolate the energy of a piece of equipment at its source. A typical scenario is that an electrical power switch, circuit breaker, or valve is turned off, and a locking device is attached to prevent the energy from being turned back on until the lock is removed by the person who placed it.

**Tag out** is a written warning on a tag usually attached to the lock. The tag displays the name of the service person (or work lead), the reason for the LOTO, date / time the tag was placed, and a contact phone number for the person who placed the lock and tag. When a lock cannot be placed on a machine, a tag may be used without the lock to convey the same safety-information.
Locks and tags must be easy to read and durable enough to withstand a pull of 50 lbs. without failure, as well as the environmental conditions of the work area.

Cal/OSHA compliance mandates the EI-LOTO Program require each department to create a written energy isolation procedure for each piece of single / multi-energy source equipment hard wired, plumbed, or that has the potential of stored or kinetic energy at a state of rest. This procedure must be shared with all persons who work on the equipment as part of tailgate training/equipment orientation prior to start of work.

Every person working on a piece of equipment must have their own set of keyed padlocks and other lock-out attachments for each specific energy source that powers the equipment. Each person must place their keyed padlock on a hasp that accepts multiple padlocks at each energy-isolation location. The hasps are installed on energy isolation devices such as electrical disconnect switches, piping valves, bleed valves (open position), blocking bars or rolling stops (kinetic energy), etc. so that once installed, energy cannot flow to the equipment, and moving parts cannot move. Every person must have their own locks installed on each energy source. Every energy source must be isolated from the equipment prior to work commencing.

In addition to locking out energy sources, a written tag must be installed on the ‘shut off’ device that details:
- The name of the person who placed the lock/tag
- The date the lock/tag was placed
- The reason for energy isolation
- Contact phone number of the person who placed the lock/tag

3.0 Basic Procedures

3.1 EI-LOTO Safety Procedures: Several basic safety rules are applied during every EI-LOTO situation. These are:
   1. Only “Qualified Persons” may work on or “practice” EI-LOTO.
   2. All equipment must be blocked and locked out to protect against accidental or inadvertent operation when such operation could
cause injury to personnel.
3. Never attempt to operate any switch, valve, or other energy isolating device bearing a lock placed by someone else.
4. Never remove a blocking device until all personnel, tools and obstructions have been cleared from the area, and all equipment guards have been properly reinstalled.
5. Once EI-LOTO is in place, ALWAYS VERIFY electricity and other energy sources are dead-off in conductors using a volt meter, or piping using pressure gages, or verify bleed valves are open, prior to commencing work.
6. If the equipment or system must remain energized during work, contact the UCSF Electrical Safety Engineer to assist in developing adequate alternative hazard control measures, such as the use of suitable temporary barriers, special tools and personal protective equipment, prior to commencing work.
7. Develop and/or verify an EI-LOTO procedure and confirm it applies to the equipment you’re working on prior to start.
8. Follow the EI-LOTO procedure as it is written, unless you discover needed updates to the procedure as you implement it.
9. Use the flow chart in Appendix A for guidance.

3.2 Standard EI-LOTO Procedure:
1. Maintenance personnel check out a suitable lock or locks from the LOTO equipment station and signs his/ her name in the logbook. 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, especially the machine operator and project supervisor, are informed before the energy sources are turned off. Unexpected loss of power may lead to 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, Work Lead or “Qualified Person” places a tag on each lock-out location. Attach 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.

8. All energy sources which could activate the machine must be locked or blocked out following an equipment-specific EI-LOTO Procedure developed for that equipment.

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 with grounding straps installed.

CAUTION: Return disconnects and operating controls to the “off” position after each test.

### 3.3 Testing and Adjusting Equipment During EI-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 equipment.
3. Remove the minimum number of blocks and lockout devices to conduct the test.
4. Re-energize systems, following the established safe procedure.
5. Proceed with tryout or test.
6. Shut off all energy sources reinstalling lockouts on energy sources, reinstall blocks, bleed all pressure systems and verify all energy sources 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 in order 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.

3.4 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 that applied it, or under his/her direct supervision. If the qualified person is absent from the work place 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.

3.5 When EL-LOTO is not necessary:
When ALL of the following criterion are met:

1. When the work to be done is completed within a single 8-hour shift, and
2. When the work to be done is done by only one person, and
3. When all energy isolation points are within eye-site of that person, and
4. When that person is present for the entire time the work is being done.
If any of the above criterion cannot be met during the work (for example, the person must leave to eat lunch or use the rest-room), then written tags must be installed at each energy isolation point prior to leaving the workspace and/or continuing the work.

The only exception to bullet #4 above is when the person can ‘lock up’ the equipment and all its energy-isolation points in a room to which no one else has access, not even a janitor or a research associate. In such a situation, tags are not needed to be installed on lock-out points for the equipment.

3.6 EI-LOTO for Electricity: There are many different ways to lock out a piece of electrical equipment:
- In modern electrical equipment, the main electrical disconnect switch has one opening where a single lock can be placed.
- If more than one employee works on the equipment, a multiple-lock hasp suitable for the installation of several locks must be used, enabling all workers to lock out the machine with their individual locks.
- If the switches are in a metal box, the box itself must be locked out in the closed position.
- If a fuse was removed in order to de-energize the equipment, the empty-fuse-box must be locked.
- If the controls are in a metal-covered box, a common hasp can be welded or riveted to the door. Then the switch can be “opened” and the door closed and padlocked. Fuse boxes can also be locked in this way.
- In some equipment, an electric “control circuit” will actuate a main “power circuit”. In such situations, both the “primary power” and “control power” circuits must be ‘locked and tagged’ out before safe-work can proceed.
- Equipment that can be unplugged can have a “plug-lock” installed on the plug to prevent it from being “plugged in”.
- Capacitors must be safely discharged to ground with ground straps installed prior to working around, storing or transporting them.

Once electrical equipment is safely isolated with EI-LOTO, always verify that electricity is indeed “off” using a voltage meter prior to commencing work under EI-LOTO. Many people have lost their lives thinking that electrical conductors were “off” without verifying the electricity was off using their volt-meter. **DO NOT MAKE THIS FATAL MISTAKE.**
ALWAYS VERIFY THE ELECTRICITY IS OFF WITH PROPER EI-LOTO CONTROLS IN PLACE USING YOUR VOLTAGE METER PRIOR TO STARTING YOUR WORK!

Consult with your Supervisor, the UCSF Electrical Safety Engineer, or EH&S if you have questions about applying EI-LOTO to your equipment.

3.7 EI-LOTO for Compressed Air/ Gasses / Hydraulic fluids: Machines activated by compressed air, gasses or hydraulics will have valves that control movement and flow of gas / fluid in pipes. In addition, compressors and pumps may need to have electrical power shut-off and locked / tagged out so they cannot run and generate pressure inside the equipment's piping system.

Pressure vessels must be vented to atmosphere with vent-valves locked / tagged open to prevent any build-up of pressure in the system while it is being worked on. System control valves will need not only to be locked out, but also bleed valves locked and tagged open to release any residual pressure to atmosphere in the system's piping. Physically disconnect the equipment from the supply plumbing if possible, and install blinding-flanges or pipe caps and then install lock-out / tag out gear as required.

3.8 EI-LOTO for Steam/ Pressurized water: Machines that use domestic water, steam and / or condensate will have valves that control movement and flow of the steam and liquids in pipes. In addition, pressure vessels that accumulate / store steam or provide pressure diaphragms to regulate water-hammer and surge may be need to be vented to atmosphere with vent-valves locked / tagged open to prevent any build-up of pressure in the system while it's being worked on. System control valves will need not only to be locked out, but also bleed valves locked and tagged open to release any residual pressure to atmosphere in the system's piping.

3.9 EI-LOTO for Hot/ Cold Surfaces: Hot or cold surfaces present contact-hazards for heat-flow. To adequately protect surfaces from contact when conducting EI-LOTO, install insulation blankets and leave all installed insulation intact as much as possible. Below are some procedures on
conducting EI-LOTO on hot / cold surfaces:

Hot surfaces
1. Allow time to cool.
2. Install Insulation Blankets – Lock in place using a cable-lock.
3. Install a physical contact guard / barrier – Lock in place with cable-lock or custom-designed block that accepts personnel’s lock.

Cold surfaces / cryogenic fluids
1. Install insulation blankets – Lock in place using a cable-lock.
2. Transfer / remove cryogenic fluids to a safe area away from the work area.
3. Vent away from work area and lock “open” bleed valves

3.10 EI-LOTO for Fuels: Equipment that stores “on-board” fuel should have the fuel removed from the equipment as best as practically possible. Remove propane gas cylinders to safe storage racks until needed. Drain liquid fuel tanks and safely store liquid fuels away from the work area. Purge fuel piping with compressed air and ventilate empty fuel tanks to ensure no explosive atmosphere inside the tank prior to starting work on the equipment. Use a 4-gas meter to confirm a safe-atmosphere for work to commence. Stage fuel absorbent pads near the work area in case liquid fuels spill during work activities.

If fuels must remain “on-board”, conduct EI-LOTO on fuel shut-off valves, physically disconnect fuel pipes from the shut-off valve and flush fuel systems downstream of closed valves with compressed air to ensure no fuels can leak into the equipment while under EI-LOTO. Physically isolate and protect fuel storage from heat, spark or other ignition sources.

3.11 EI-LOTO for Mechanical Energy: Mechanical components of equipment must be blocked, blinded and bled prior to working on the equipment through a documented EI-LOTO process.

- Blocks and Wedges are placed under raised dies, elevated lifts, counterweights, installing support rods for counterweights or elevated components, a bar through spokes of a wheel, flywheel or fan blades, a wedge- shape wheel-chalk for rolling components, wrapping and locking chains around a movable equipment component and locking it to an immovable object, or any machine component that might
inadvertently move by sliding, falling or rolling. Mechanical components must be set in place on secure blocks (e.g. automotive jack stands) so that the weight of the components are solidly resting on the block and the block cannot be moved prior to starting work.

- **Blinds** are placed in piping at a flange junction to prevent fluid / gas flow in the piping. Blinds are a mechanical “block” that ensures that in no way can hazardous fluids or gas flow through the pipe and cause machine movement or personnel exposure to harm.

- **Bleeds** are valves that must be locked “open” on any pressure vessel or piping system that could store pressure when the system is being worked on. Specific EI-LOTO procedures must be developed that include when and how to install bleeds to ensure equipment safety.

**4.0 Implementation**

**4.1 EI-LOTO Implementation:** Functional Area Supervisors are responsible to assure that all aspects of EI-LOTO implementation are integrated into the department’s operations and activities, and are responsible to ensure staff are trained on, and provided tools to, conduct EI-LOTO.

**4.2 Procedures for individual equipment:** Cal/OSHA requires that every piece of fixed equipment that uses energy to operate must have a written energy isolation (EI-LOTO) procedure as part of the safe work practices on that equipment. This written procedure may act as an SOP for custom research equipment, or a job-planning tool for safe Facilities work, and becomes the basis of training for applying EI-LOTO to the specific piece of equipment. Therefore, equipment owners, supervisors, maintenance personnel, researchers, students, contractors, etc. must be familiar with ALL the energy sources used by the equipment, and how the equipment functions. They must take measures to isolate or eliminate all energy sources prior to performing maintenance or modifications to the equipment. An energy isolation procedure is a step by step instruction that details the location of all energy sources on the equipment and what steps must be taken to isolate / block those energy sources prior to work.

**4.3 Individual Equipment Implementation:** Once an equipment-specific
EI-LOTO procedure is created, it must be provided to any and all personnel who may be called upon to perform EI-LOTO on that equipment as part of their work. The original procedure must be kept by the Functional Area Supervisor and copies made available for quick / easy reference by users.

For “facilities” equipment, the procedure can be saved in a PDF file or stored on a central database. These procedures are to be linked to the equipment’s asset tag number or other unique identification number so that the EI-LOTO procedure generates along with a work-order for equipment.

4.4 Creating EI-LOTO Procedures: Generic EI-LOTO procedures are not adequate.

Every piece of equipment that has source(s) of energy that make the equipment operate must have an equipment-specific written procedure developed for that equipment. An exception to this rule is allowed when multiple identical pieces of equipment are located adjacent to each other, and EI-LOTO procedures is the same for each one. In this situation, the same procedure can be used as long as the specific EI-LOTO energy-disconnect locations for each are individually identified in the procedure.

The equipment-specific EI-LOTO procedure must be shared with anyone who may work on or with that equipment. Equipment operators and maintenance personnel must have documented training on the EI-LOTO procedure, its application within and to a department’s equipment, as well as how to understand and utilize the information provided on the equipment-specific procedure. Such procedures may be documented on the UCSF EI-LOTO template available in Appendix B of this program, or in another written / electronic format that contains all the information needed to convey a procedure to safely conduct EI-LOTO for that specific equipment.

The completed procedure becomes the written energy isolation procedure for that equipment. Original procedures developed are kept by responsible persons in each shop / department. Please contact your Functional Area Supervisor or EH&S for further assistance on how record keeping for EI-LOTO procedures are handled on your campus.

Supervisors must assure that all equipment under their responsibility have written EI-LOTO procedures. The supervisor may create the procedure, or
may delegate this task to “Qualified Persons” who will perform this task.

4.5 Determining EI-LOTO Sequence: As part of EI-LOTO procedure development, the sequence that all energy sources are isolated must be determined and documented in the procedure. For example, some types of equipment may need to have the “main electrical power” shut off before the “control electrical power” and then the compressed air shut off last in order for the equipment to be safely locked and tagged out. The “Qualified Person” who develops the EI-LOTO procedure must determine the safest sequence for shut down and include this on the procedure as a step-by-step process.

Usually, re-energizing the equipment for normal operation is done by simply reversing the EI-LOTO shut-down sequence. However, this may not be the case for some equipment, and if this is the case must be noted on the EI-LOTO procedure developed for that specific piece of equipment.

4.7 Equipment and Training: Every Functional Area Supervisor is responsible for identifying all energy isolation locations and the specific types of equipment needed to safely isolate and install a hasp and lock on the isolation location. They are also responsible to provide keyed padlocks, tags and hasps to all “Qualified Personnel” who will be conducting EI-LOTO activities.
Lockout/ Tagout Flow Chart

Is work energized?

Can it be isolated/ locked out?
- NO: Obtain energized work permit
- YES: Proceed with EI-LOTO

Does the work adversely affect end user operations?
- NO: Proceed with EI-LOTO
- YES: Submit a shutdown request

Is there a equipment specific procedure?
- YES: Use equipment specific procedure
- NO: Use Generic LOTO procedure/ Develop equipment specific procedure

Can a lock be used?
- YES: Use a lock
- NO: Use a tag

How many people on the task?
- One: Singlular locks can be used
- Multiple: Multi-hasp must be used
APPENDIX – B: EI-LOTO Sample “Equipment Specific” Procedure Form

<table>
<thead>
<tr>
<th>Equip. Name:</th>
<th>Building:</th>
<th>Location / Room Number:</th>
</tr>
</thead>
</table>

**Describe scope of work here:**

**Instructions:** Follow the steps to create a written sequence for de-energizing, lockout, testing, and start-up of equipment requiring energy isolation. Use completed procedure for safety meetings / training for the equipment-specific lockout process. Discuss with workers how equipment energy isolation – LOTO is applied to this specific equipment during these planned job / tasks. Also, discuss communication methods on the job site.

<table>
<thead>
<tr>
<th>Step 1 - Survey and Check off [X] all Energy Sources</th>
<th>Step 2 – Note Magnitude and type of each energy source</th>
<th>Step 3 – Note Device and Location of each energy disconnecting / isolation source / method.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: ENERGY SOURCE</td>
<td>2: MAGNITUDE / TYPE</td>
<td>3: ISOLATION DEVICE / LOCATION / METHOD</td>
</tr>
<tr>
<td>ELECTRICITY – Main power</td>
<td>Amps: Volts: # Phase:</td>
<td></td>
</tr>
<tr>
<td>ELECTRICITY – Control circuit(s)</td>
<td>Amps: Volts: # Phase:</td>
<td></td>
</tr>
<tr>
<td>BATTERY / SOLAR / ALT POWER AC/DC/PH:</td>
<td>Amps: Volts:</td>
<td></td>
</tr>
<tr>
<td>COMPRESSED AIR / GASES</td>
<td>PSI: Gas Type:</td>
<td></td>
</tr>
<tr>
<td>STEAM / CONDENSATE</td>
<td>PSI: Source:</td>
<td></td>
</tr>
<tr>
<td>FLUID UNDER PRESSURE</td>
<td>PSI: Source:</td>
<td></td>
</tr>
<tr>
<td>HEAT / COLD +/ - °C or +/ - °F</td>
<td>Temp: Source:</td>
<td></td>
</tr>
<tr>
<td>VACUUM CHAMBER / PIPING</td>
<td>Hg¹¹: Source:</td>
<td></td>
</tr>
<tr>
<td>FUEL(S) - SOLID / LIQUID / GAS</td>
<td>Volume: Fuel:</td>
<td></td>
</tr>
<tr>
<td>ROTATING WHEEL / FAN / DRIVE</td>
<td>Details:</td>
<td></td>
</tr>
<tr>
<td>SUSPENDED WEIGHT</td>
<td>Details:</td>
<td></td>
</tr>
<tr>
<td>MECHANICAL OTHER:</td>
<td>Details:</td>
<td></td>
</tr>
</tbody>
</table>

**Instructions continued:** Isolate energy sources in sequence. Assure each worker installs their own lock on each disconnect location. Supervisor/Authorized Person installs warning tags. Verify Energy Isolation prior to starting work. When testing / jogging equipment, follow program procedures on the back of this form. When restoring equipment to operation, reverse isolation sequence unless otherwise discussed / approved by the Project Supervisor. Use Personal Protective Equipment and safety equipment as noted below during work activities. Contact EH&S for technical support and special concerns at 510-642-3073.

**Step 4 – List sequence of Energy Isolation Number 1 up to 12**

**Step 5 – Check off [X] and circle all PPE and safety equipment to be used for Energy Isolation.**

**PPE to be worn during work**

- GOGGLES / FACE SHIELD / WELD GEAR
- BOOTS – STEEL TOE / RUBBER / OTHER
- GLOVES – LEATHER / RUBBER / INSULATED
- SAFETY HARNESS / LANYARD & LINE
- RESPIRATOR – DUST / CHEMICAL
- THERMAL – HEAT / COLD PROTECTION
- APRON / WET GEAR / OTHER
- OTHER:

**Safety Equipment to be used during work**

- FIRE EXTINGUISHER / FIRE WATCHER
- LINES BLINDED & TAGGED
- VALVES / SWITCHES - LOCKED & TAGGED
- REMOVE FLAMMABLES / COMBUSTIBLES
- BLEEDERS LOCKED OPEN & TAGGED
- SHIELDS – ARC CURTAIN / HEAT BLANKET
- BLOCKS / BARS / BARRICADES / CHAINS
- TOOLS - LONG HANDLE / INSULATE

**PROCEDURE PREPARED BY:**

[PRINT NAME]

**SIGNATURE / DATE**

**ANNUAL REVIEW COMPLETED BY:**

[PRINT NAME]

**SIGNATURE / DATE**

UCSF EI-LOTO Program v2.7 19 10/28/2014
## APPENDIX – C: EI-LOTO Important Contact Information

<table>
<thead>
<tr>
<th>Contact</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>EH&amp;S</td>
<td>(415) 476-1300</td>
</tr>
<tr>
<td>UCSF Electrical Safety Engineer</td>
<td>(415) 476-5396</td>
</tr>
<tr>
<td>Facilities Services Customer Service Center</td>
<td>(415) 476-2021</td>
</tr>
<tr>
<td>Parnassus Central Utility Plant Control Room</td>
<td>(415) 476-4066</td>
</tr>
<tr>
<td>UCSF Medical Center Facilities Management – Mission Bay</td>
<td>(415) 353-1120</td>
</tr>
<tr>
<td>UCSF Medical Center Facilities Management – Mount Zion</td>
<td>(415) 885-7576</td>
</tr>
<tr>
<td>UCSF Medical Center Facilities Management – Parnassus</td>
<td>(415) 353-1120</td>
</tr>
</tbody>
</table>
APPENDIX – D: EI-LOTO Training Record of “Qualified Person”

To: Personnel File for ____________________________ (Employee name – please print)

From: ____________________________ (PI / Supervisor name – please print) Date: ____________________________

TO BE COMPLETED BY THE PI / SUPERVISOR OF THE “QUALIFIED PERSON” conducting Energy Isolation – Lockout/Tagout work:

Re: This document confirms required Qualification of the above named person to perform:

(Check all that apply) (Attach additional pages if more space is needed)

☐ Energy Isolation operations and work on the following equipment / locations:
  ☐ All locations and equipment under my supervision
  ☐ All locations and equipment in our Department’s jurisdiction
  ☐ All locations and equipment as this person’s job duties may dictate
  ☐ Specific equipment / locations as listed: ____________________________

☐ Energy Isolation work with the following energy sources (check all that apply):
  ☐ All Energy Sources below
  ☐ Compressed Air ☐ Other Compressed Gases ____________________________
  ☐ Cryogenic Fluids / Gases
  ☐ Electricity (<50 volts) ☐ Electricity (50 – 600 Volts) ☐ Electricity (>600 volts)
  ☐ Flammable materials ☐ Flammable gases ☐ Flammable fluids ☐ Flammable solids
  ☐ Fluids under pressure ☐ Hydraulic systems (<150 psi) ☐ Hydraulic systems (>150psi)
  ☐ Hot Fluids / Gases ☐ Steam
  ☐ Mechanical Equipment – Springs / Counterweights / Fly Wheels / Fan Blades / Blocks
  ☐ Other (describe): ____________________________

This designation of “Qualified Person” is based on evidence of safe performance of all duties related to Energy Isolation through:

(Check all that apply)

☐ Training on UCB EI-LOTO program conducted (including any skill checks or tests).

☐ Experience – This person has been safely performing, and has demonstrated skill in safe Energy Isolation procedures, for ______ years (minimum of five years).

☐ Instruction – This person has received instruction from me or another person who is authorized in Energy Isolation, and who has observed this person’s work while performing Energy Isolation operations, and confirms that the above named person has the knowledge and skills to perform Energy Isolation work safely.

If, for any reason, as their supervisor, I think that this person is not performing work safely, this qualification will be revoked. Below are signature(s) of person(s) verifying training and/or experience:

PI / Supervisor Signature: ____________________________ Date: ____________________________

Qualified Person’s Signature ____________________________ Date: ____________________________

CC: PI / Supervisor file