

Control of Hazardous Energy “Lock-out/Tag-out”

The control of hazardous energy sources is necessary to ensure the safety of fire department personnel and civilians during incidents involving machinery. Of primary concern is the control of electricity; however consideration must be given to other power sources such as natural gas, gasoline, spring-loaded or counterweighted equipment, and other mechanical components that could injure a rescuer or patient.

Whenever possible, all sources of energy to an appliance, circuit, or other work area must be controlled prior to removal of guards, accessing the path of equipment, or otherwise exposing personnel to mechanized components. When energy must remain active during work, such as testing or troubleshooting, personnel must take steps to ensure the energy does not pose an unreasonable hazard and all guards remain in place that do not interfere with the work being performed.

Personnel should recognize the major causes of injuries associated with work on equipment, circuits, or appliances:

- No attempt was made to de-energize the system
- Energy blockage was attempted, but not adequate
- Residual energy was not dissipated
- Energy was accidentally re-activated

The term “zero mechanical state” means the mechanical potential energy of all portions of the equipment or machine is set so that the opening of pipes, tubes, hoses or actuation of any valve, lever or button, will not produce a movement which could cause injury.

Controlling Hazardous Energy Sources

The following steps are typically followed whenever energy is to be controlled during incident or training operations:

1. *IDENTIFY ALL POTENTIAL SOURCES OF ENERGY.* Consider adjacent equipment as well. Be sure to account for any stored energy in the equipment or backup power systems that may activate. Seek input from any building managers, engineers, or equipment manufacturers who are familiar with the equipment in question. Determine if unexpected bypasses or unusual installations were made.
2. *NOTIFY ANY EFFECTED PERSONNEL PRIOR TO SHUTDOWN OF SYSTEMS OR EQUIPMENT.* This helps reduce the possibility of an accidental activation of energy, but is NOT to be relied upon as the only method for controlling energy.
3. *CONTROL EACH SOURCE OF ENERGY.*
 - a. Isolate, block, or dissipate any energy sources at their point of control. The points of control must be secured against tampering, override, and bypassing by either lock or by posting personnel to act as security.

- b. Automatic shutdown devices such as electric eyes, limit switches, and other machine guard monitors should not be relied upon for controlling energy.
 - c. Bring the equipment to a “zero mechanical state.” Any stored or residual energy must be isolated, blocked, or dissipated. Ensure that energy is not allowed to build up again after initially controlling it. Sources of stored energy often include:
 - Hydraulic or pneumatic pressure
 - Vacuum pressure
 - Compressed or extended springs
 - Potential energy due to gravity
 - Mechanical energy (flywheels, belts, or chain drives)
 - Static electricity
 - Stored electrical energy in batteries or capacitors
 - Thermal energy from residual heat or cold
 - Residual chemicals
4. *SECURE THE POINTS OF CONTROL FROM UNAUTHORIZED RE-ENERGIZING.* This can be accomplished by a variety of methods:
- a. Locking and tagging of the controls. Use of a Department-issued padlock and accessories to prevent anyone except the fire department operating the controls. The tag needs to identify the owner of the lock and the reason for the shutdown, i.e. service or maintenance.
 - b. Restricting access to the controls. Securing a control room or entire panel from access by unauthorized persons.
 - c. Posting a qualified person at the control to prevent unauthorized activation of the controls. This is the least desirable method as it requires human intervention to ensure safety and security of the controls.
5. *VERIFY THAT THE EQUIPMENT HAS ACTUALLY BEEN PLACED INTO A “ZERO MECHANICAL STATE.”*
- a. With all guards in place and people outside of the danger area, attempt to operate the equipment or appliance.
 - b. Use testing equipment to determine if energy is still present. It is good practice to check sensing devices on live circuits first to ensure they are operating, and then check the circuit that has been de-energized.
6. *AFTER ALL CHECKS ARE COMPLETED TO VERIFY NO HAZARDOUS ENERGY IS PRESENT, PERFORM THE WORK.*
7. *AFTER COMPLETING WORK, ENSURE ALL COMPONENTS AND GUARDS ARE IN PLACE AND PERSONNEL CLEAR OF POINTS OF DANGER.* Be sure all tools and equipment are removed from the area and clear of moving parts.

8. *UNDER MOST CIRCUMSTANCES, ANY EQUIPMENT SHUT DOWN BY THE FIRE DEPARTMENT SHOULD REMAIN SHUT DOWN UNTIL SERVICED BY A QUALIFIED CONTRACTOR OR BUILDING REPRESENTATIVE.*

Lock-out/Tag-out Kits

All engine, truck, and rescue companies are equipped with a lock-out/tag-out kit to aid in the control of hazardous energy. These kits contain locks and devices to secure a variety of utility shut-off and valves.

