Executive Order #511
Lockout / Tagout (Control of Stored Energy)
Summary of Standards and Recommendations

This summary of standards was prepared by the Massachusetts Department of Labor Standards ("DLS") for informational purposes and does not constitute an official interpretation by OSHA or any other agencies/entities listed as a source of standards or guidance in this document, nor an exhaustive recitation of the requirements therein. Rather, the summary is provided for the health and safety committees to assess current health and safety management of this hazard against the nationally-recognized standard. As the information provided in this document is only a summary, please consult the full standard(s) as well as any other needed sources of technical assistance for developing or improving your lockout / tagout program.

It is important to note that state workers are not covered by OSHA standards; the information generated by the health and safety committees will serve to guide the Massachusetts Employee Safety and Health Advisory Committee in identifying effective and practical strategies and policies for improving the health and safety of state workers.

Technical Standard or Guideline:

OSHA 29 CFR 1910.147, The Control of Hazardous Energy* (Lockout/Tagout)

Note: This standard applies to control of hazardous electricity to electrified machinery and equipment, and also to all other types of hazardous stored energy (e.g., hydraulic, kinetic, gravity), in order to conduct repair and maintenance. Lockout/tagout for control of hazardous energy to electrical infrastructure (such as panel boxes, wiring, etc.) generally falls under the NFPA 70E standard, and is covered in the answers document for electricians. A fundamental principle of the OSHA lockout/tagout standard is to achieve a fully de-energized state prior to repair of equipment. For electrified equipment, if it is absolutely infeasible to work in a de-energized state, then the NFPA 70E requirements must be followed.

The same basic safety principles and steps for lockout/tagout are used in both of these standards:

- Knowledge of all of the hazardous energy sources feeding into the equipment (through diagrammatic drawings, manuals, etc.).

- Knowledge of the steps needed to temporarily block (isolate) all of the energy sources into the equipment so that repair/maintenance can be conducted safely.
- Testing to ensure that energy has been successfully blocked from all sources.
- Use of lockout/tagout devices to ensure that the blocked energy is not accidentally reopened (for example, applying a physical lock to keep a circuit on/off switch in the off position while an employee is working on the device/machine/equipment).

* *This is the primary national or state standard/guideline for this hazard. Your agency may be following an internal standard of practice or a standard from another source for this hazard. For the gap analysis, if you are following a standard other than the primary worker protection standard listed above, please indicate which standard, if any, is being followed by your agency. If this is an internal standard of practice, please report the basis upon which the determination was made to adopt the standard.*

Highlights of the Standard:

The purpose of this standard is to protect employees from the unexpected release of hazardous stored energy during maintenance and repair of equipment. This will also include inspection of equipment, considered as part of maintenance.

Establishment of an energy control program including:

- Written energy control procedures. This shall include:
  - Specific procedural steps for shutting down, isolating, blocking and securing machines to control hazardous energy.
  - Specific procedural steps for placement, removal, and transfer or lockout or tagout devices.
  - Specific requirements for testing each machine/equipment to verify the effectiveness of energy control measures before the employee begins work on the machine/equipment.
- Use of protective materials and hardware such as locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners or other hardware for isolating, securing or blocking machines/equipment from energy sources.
- Periodic inspections (at least annually) of energy control procedures to ensure that they are being followed and to make any needed corrections to the procedure.
- Training for both employees conducting lockout/tagout procedures and also affected employees working in the area.

Policy:

It is recommended that the policy of the agency is to follow the OSHA standard for control of stored energy. The OSHA standard states that “before any employee performs

any servicing or maintenance on a machine or equipment where the unexpected energizing, start-up, or release of stored energy could occur and cause injury, the machine or equipment shall be isolated from the energy source and rendered inoperative," and provides detailed steps on how to achieve this.

As noted in the answers document for "Electricians," it should be a matter of policy to eliminate live work, with only very limited and necessary exceptions allowed (for example life support equipment with no alternate energy source). De-energizing is not required at voltage levels of 50 volts or less. *Stopping the practice of working live when this is not necessary is the strongest and most effective measure you can take to prevent electrocutions, electrical shocks, electrical burns, flash burns, and other electrically-related injuries and fatalities.*

Training and Certification/Licensing Requirements:

Training is required to ensure that the purpose and function of the energy control program are understood by employees. Training must also ensure that employees have the knowledge and skills required for the safe application, usage, and removal of the energy controls. Basically, employees should understand when there is a potential risk from hazardous energy, and how to effectively and safely block this energy from all of the different equipment they maintain or repair.

Authorized employees (those who will do the actual lockout/tagout in preparation for their work on machines/equipment) must be trained in:

- Recognition of applicable hazardous energy sources.
- The type and magnitude of the available energy in the workplace.
- The methods and means necessary for energy isolation and control (how to prevent the hazardous energy from getting to the machine/equipment being worked on).

State inspectors who could be exposed to hazardous release of energy during inspection of equipment should be trained to the level of an "authorized employee," as they will be at the same risk level. Gathering this level of knowledge should be part of the communication between agencies/inspectors and the on-site employers where inspections will occur.

Affected employees (those employees who operate the machines/equipment or work in the area where lockout/tagout will occur) must be trained to understand the purpose and use of the energy control procedure.

Engineering Controls – Requirements:

As of January 2, 1990, with installation of new equipment, or replacement, renovation, major repair or modification of existing equipment/machines, energy isolating devices on this machine/equipment shall be designed to accept lockout/tagout devices (for example with a hasp or other means of attachment to which a lock can be affixed, or a built-in locking mechanism).

Administrative Controls – Requirements:

Lockout/Tagout Safety Manager
Though not required by the OSHA standard, appointing a lockout/tagout program manager will be helpful in ensuring that all of the requirements of lockout/tagout are met.

Energy Control Procedures
Written energy control procedures shall be developed for all machines and equipment. Exception: no procedures are necessary if all of the following criteria are met:

- The machine/equipment has no potential for stored or residual energy or reaccumulation of stored energy after shut down which could endanger employees.
- The machine/equipment has a single energy source which can be readily identified and isolated (e.g., a hand tool with a cord and plug that is under the control of the operator).
- The isolation and locking out of that energy source will completely deenergize and deactivate the machine or equipment.
- The machine/equipment is isolated from that energy source and locked out during service or maintenance.
- A single lockout device will achieve a locked out condition.
- The lockout device is under the exclusive control of the authorized employee performing the servicing or maintenance.
- The servicing or maintenance does not create a hazard for other employees. And,
- The employer, in utilizing this exemption, has had no accidents involving the unexpected activation or reenergizing of the machine or equipment during servicing or maintenance.

For machines and equipment not meeting the criteria listed above, a written energy control procedure is required.

- Written energy control procedures shall include:
    - The intended use of the procedure.
    - Specific procedural steps for shutting down, isolating, blocking and securing machines to control hazardous energy.

- Specific procedural steps for placement, removal, and transfer or lockout or tagout devices.
- Specific requirements for testing each machine/equipment to verify the effectiveness of energy control measures before the employee begins work on the machine/equipment.

Knowledge of Machines/Equipment

Developing energy control procedures will require a comprehensive understanding of the sources and pathways of energy into the machine/equipment, and how energy behaves in this equipment. Some examples: a machine may be fed by more than one source of electricity, a machine that conducts a repeated pattern of motion (a stamp press, an amusement ride) may complete its full cycle of motion even if it is shut off in the middle of the cycle. Equipment manuals or other sources of manufacturer's information must be available in order to develop effective energy control procedures. If the machine/equipment has been modified from its factory condition, details on how this affects the machine/equipment must also be available.

For outside inspectors, it is recommended that they require that the equipment manual be provided to them, along with the employer's lockout/tagout procedure for that particular piece of equipment prior to inspection.

Procedures for application and release of lockout/tagout.

A. Establish procedures for the application of energy control (lockout/tagout). These procedures must include the following elements, and must occur in the order listed.

1. Preparation for shutdown.
2. Machine or equipment shutdown.
3. Machine or equipment isolation (from source of hazardous energy).
4. Lockout or tagout device application.
5. De-energization.
6. Verification of energy isolation and de-energization.

For *group lockout/tagout*, in addition to the steps listed in A above, primarily responsibility should be given to one authorized employee to coordinate the efforts of and ensure protection of the entire group. A group lockout/tagout device shall be used, with each authorized employee affixing their own personal lockout/tagout device to the group device.

B. Follow procedures for release of lockout/tagout as per the OSHA standard. The authorized employee must:

1. Check equipment. Remove all non-essential items from the area and ensure that the machine or equipment components are operationally intact.
2. Employees. Ensure that all employees are cleared from the hazard area and notify affected employees once the lockout/tagout device has been removed.
3. Lockout/tagout device shall be removed by the employee who applied the device. If the employee who applied the lockout/tagout device is not available to remove it, the employer shall make all reasonable efforts to ensure that this employee is not at the facility, to contact this employee, and to notify them that the device has been removed before they return to the facility and resume work.

Implementing the lockout procedures typically follows these steps:

1. Notify affected employees that the machine or equipment will be shut down and locked out.
2. Shut down the machinery or equipment.
3. Isolate energy sources with energy-isolating devices.
4. Lock out energy-isolating devices with assigned locks.
5. Release or restrain stored or residual energy.
6. Test machinery to make sure it can't start up.

Interim Testing

For temporary removal of lockout/tagout devices for an interim test of the equipment during maintenance or repair, follow all of the steps for release of lockout/tagout in B, then reconduct the steps listed in A above.

Tagout vs. Lockout

Tagout devices can be used in place of lockout devices if the energy isolating device is not capable of being lockout out. (Note that there are many products on the market that allow for lockout of equipment that was previously not capable of being locked out, such as gate valves and panel boxes.) In order to achieve full employee protection with tagout, additional means may be necessary. This may include measures such as the removal of an isolating circuit element, blocking of a controlling switch, opening of an extra disconnecting device, or the removal of a valve handle, to reduce the likelihood of inadvertent energization. You are trying to achieve BLOCKOUT of all energy sources.

The OSHA standard states that tagout can also be used instead of lockout, even if lockout is possible, if the employer can demonstrate that tagout provides a level of safety equivalent to lockout. This is NOT recommended.

Outside Personnel

Establish procedures for use of lockout/tagout when outside personnel will be engaged in activities that could put them at risk of exposure to release of hazardous energy. The

lockout/tagout program of either the on-site employer or outside employer may be used (for example, outside personnel may bring their own lockout/tagout devices). However, both employers must communicate and come to a clear understanding of how lockout/tagout will be achieved in advance of work, and whatever procedures are decided on must achieve the level of protection outlined in the OSHA standard, and must include the procedural elements listed in the procedures of application and release of lockout/tagout above.

There are various state inspectors (amusements, elevators, etc.) who conduct tasks that could expose them to a release of hazardous energy, thus they will fall under lockout/tagout requirements as "outside personnel" at the facilities of other employers. It is key to their safety that these inspectors have a solid understanding of the requirements of a good lockout/tagout program, and that there is communication and agreement with the on-site employer on how lockout/tagout protection will be achieved for that piece of equipment prior to beginning the inspection.

Periodic Inspections
Periodic inspections (at least annually) of energy control procedures must be conducted to ensure that they are being followed and to make any needed corrections to any inadequacies identified during the inspection.

- Periodic inspections must be conducted by an authorized employee other than the one using the energy control procedures being evaluated.
- Inspections shall include a review between the inspector and employee of that employee's responsibilities under the procedure.
- Periodic inspections must be certified including: identification of the machine/equipment on which the energy control procedure is used, name of the inspector, name of the authorized employee(s) included in the inspection.

<u>Equipment Controls – Requirements:</u>

Materials and hardware that may be needed for isolating, securing, or blocking of equipment/machines from energy sources include: locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners or other hardware.

Lockout/Tagout Devices
Lockout/tagout devices must meet the following criteria:

- Durable: lockout devices can withstand the environment to which they will be exposed for the full duration that they will be in place. Tags for tagout must be constructed and printed so they will not deteriorate or become illegible in the weather and chemical conditions that they will be in.

- Standardized: lockout devices used within the facility must be standardized in at least one of color, shape, or size. Tags for tagout should use standardized print and format.
- Substantial: Lockout devices are strong enough so they cannot be removed without excessive force or technique, such as use of bolt cutter. Tags, including means of attachment, shall be substantial enough to prevent inadvertent removal. Means of attachment for tags should be non-reusable, and strength should be equivalent to an all environment-tolerant nylon cable tie.
- Identifiable: lockout/tagout devices shall indicate the identity of the employee applying the device.
    - Tagout devices shall warn against the hazardous conditions if the machine/equipment is energized and a statement such as: "Do Not Start," "Do Not Open," "Do Not Energize," or "Do Not Operate."

Web link to full standard or guideline:

Informational resources identified below can also be found on our website at www.mass.gov/dols/eo511.

OSHA Standards:
www.osha.gov, select the "Regulations" tab from the top menu bar. For 1910 standards select the "General Industry" tab. For 1926 standards, select the "Construction" tab. Then, scroll down to find the standard by number.

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