"We need to be able to have energy when we need but we also need to be able to cut off the source of energy when its flow might potentially be dangerous."

Rob Vajko

2/5/2009
The Basics of Lockout / Tagout

What Lockout/Tagout is
Without energy nothing gets done! Whether we are talking about nuclear energy, electricity, gasoline powered engines or the energy that fuels our bodies, we depend on energy to function.

Energy can also be extremely dangerous and even fatal. Energy must be effectively controlled. We need to be able to have energy when we need but we also need to be able to cut off the source of energy when its flow might potentially be dangerous.

If an electrician is servicing a huge paper cutter, he doesn’t want it to accidentally get turned on.

If someone is using a pulley system hooked up to a truck in order to climb down into a confined space, he doesn’t want someone driving off in the vehicle.

That is the basis of lockout/tagout. All sources of energy that have the potential to unintentionally get activated, started or released must be identified and monitored. This is done through putting locks (lockout) or tags (tagout) to keep the power from being accidentally activated when it shouldn’t be.

OSHA mandates lockout/Tagout with the 29 CFR, Part 1910.147 standard. It is entitled “The Control of Hazardous Energy (Lockout/Tagout) and “This standard covers the servicing and maintenance of machines and equipment in which the unexpected energization or start up of the machines or equipment, or release of stored energy could cause injury to employees”.

What Lockout/Tagout is not
Lockout/Tagout is not intended to deal with installation, maintenance and/or upkeep of generators, electrical utilities, generators, transmitters or conductors (though certainly many of the regulations of the standard will be transferable to these tasks). It is not intended to replace or even compliment electrical manuals or procedures.

What Lockout/Tagout applies to
According to the 29 CFR, part 1910.147 standard, Lockout/Tagout applies to:

- An employee is required to remove or bypass a guard or other safety device
- An employee is required to place any part of his or her body into an area on a machine or piece of equipment where work is actually performed upon the material being processed (point of operation)
- Where an associated danger zone exists during a machine operating cycle.¹

**Identifying all energy sources**

While electricity is the most common source of energy in the workplace, it is not the only one. All sources of energy need to be included in the lockout/tagout program for your company. Other sources of energy may include thermal, pneumatic, hydraulic, mechanical, chemical, gravity or any combination of these.

As an example… While a potentially harmful machine may have no more electrical current flowing through it, if a blade that is usually held in an “up” position is no longer able to stay in that position because the current was shut off, then gravity might become another energy source that would need to be identified and included in the lockout/tagout procedure.

All energy sources must be identified and labeled accordingly. This is especially crucial for machines that have multiple sources of energy and/or machinery that may intermittently start and stop⁴

**Establishing a lockout/Tagout program**

OSHA requires companies to have a written lockout/tagout program. This document must contain:

1. The reasons why the written program is necessary
2. Clear step-by-step procedures involved in shutting down the machine(s), installing locks and tags and testing procedures to verify these procedures
3. Training for authorized personnel and anyone else who might directly or indirectly be involved or affected by this lockout/tagout procedure including any outside contractors

¹ OSHA also gives a list of exceptions. To view the standard, visit the OSHA website at www.osha.gov
⁴ Such a machine may appear to be off when it is, in fact, only “asleep”.
Locks or tags?

Whenever possible, locks are to be used to prevent the power from being unintentionally turned back on. When locks are used, tags may serve as a backup, to further clarify the procedure. The Lockout/Tagout industry has been able to come up with locks for almost all possible energy sources and a call to a safety professional and/or a manufacturer should be enough to help you find a solution for your specific application.

Both locks and tags must be clearly labeled as to the identity of the person who has applied them. This ID labeling is crucial so that only the person who applied the lock (the person who knows why the lock was put there in the first place) is the one to remove it. This prevents someone who may not have all the necessary information from taking an action that might prove detrimental to the person who put the lock there in the first place.

If at all possible, both locks and tags should be locks and tags specifically designed for this procedure as they will have been designed to not be easily removed and to withstand the wear and tear of the maintenance work. The writing on the locks and tags must remain legible until they are removed.

Only authorized personnel should have the key for the lock on the control device and only authorized personnel should be permitted to lock out machines and equipment.

**Group Lockout/Tagout.**

When maintenance of a machine or piece of equipment is done by more than one person, it is advisable to implement a “Group Lockout/Tagout” procedure. A “Group Lockout/Tagout” procedure assigns a different lock to each employee working on the equipment so that the power cannot be restored until each employee has made it clear that they done with their assigned task by removing their own lock. This ensures that the power isn’t accidentally restored when one of the crew is still working.
Lockout hasps such as this allows up to six workers to each lockout the power. The hasp cannot be removed (and therefore the power restored) until every worker has removed his own lock.

Exceptions to Lockout/Tagout

OSHA does not require a company to enforce lockout/tagout for adjustments and other minor changes that are part of the standard operation procedure. Additionally, any machine that has been determined as posing no danger to personnel during maintenance does not require lockout/tagout.

There may also be exceptions specific to your industry. You should research and be aware of all the rules, regulations and exceptions which might apply to you.

Conclusion

Employers are responsible for the protection of all their employees. The requirements for lockout/tagout standards are:

- Establish a written, documented lockout/tagout procedure.
- Make sure that all personnel are properly trained. This includes making sure that authorized personnel know who they are and others know that they do not have the authorization to lockout or tagout.
- Identify all machinery and equipment that needs lockout/tagout.
- Identify all energy sources on every single piece of equipment and machinery.
- Identify the best way to lock out each of the energy sources.
- Tagout ONLY those energy sources that cannot be locked out.
- Make sure that all locks and tags clearly identify the worker who put them on.
- Make sure that only the employee who put the lock or tag on is allowed or able to remove it.
When all energy sources have been shut off and locked out or tagged, try to manually turn the equipment on and check for any and all movement to make sure that there is no way that any of the parts can shift or move.

Update all procedures and manuals at least once a year.

Practical Help on putting together an effective Lockout/Tagout Program

Though I normally try not to promote a specific manufacturer over another in articles like this, this came across my desk recently and it just made so much sense that I felt that I needed to include it here.

Brady, a manufacturer of signs, lockout/tagout supplies and more, has tried to simplify this complex procedure by making it more visual.

The basic idea is to photograph each piece of equipment that needs to be locked out or tagged out and to label on the photos each source of power as well as the procedure needed to lock or tag it out (see example on the next two pages).

Once this document has been created, laminate it and attach it (clear adhesive pocket on the machine, for example) for easy access.

Every step and procedure is clearly mapped out and labeled making what could have been a complex set of instructions easy to follow and use.

**LOCKOUT TAGOUT PROCEDURE**

**CFR 1910.147**

**Description:** SunTherm AHU  
**Asset #:** N/A  
**Equipment #:** N/A  
**Area:** LL-1  
**Building:** Main  
**Rev:** 0  
**Date:** N/A  
**Origin Date:** 9/5/2007

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**LOCKS & TAGS NEEDED**

**South Side View**

**East Side View**

**ALWAYS PERFORM A MACHINE STOP BEFORE LOCKING OUT DISCONNECTS**

<table>
<thead>
<tr>
<th>ID</th>
<th>Source</th>
<th>Device</th>
<th>Location</th>
<th>Method</th>
<th>Check</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-1</td>
<td>Electrical 120V</td>
<td>Wall switch device</td>
<td>Isolation point on North side of AHU.</td>
<td>Move E-1 disconnect to off. Lock out.</td>
<td>Verify zero voltage reading with meter.</td>
</tr>
<tr>
<td>W-1</td>
<td>Cooling Water Inlet</td>
<td>Ball valve device</td>
<td>Isolation point on South side of AHU.</td>
<td>Turn W-1 valve to closed position. Lock out.</td>
<td>Verify pressure has bled off.</td>
</tr>
<tr>
<td>W-2</td>
<td>Cooling Water Outlet</td>
<td>Ball valve device</td>
<td>Isolation point on South side of AHU.</td>
<td>Turn W-2 valve to closed position. Lock out.</td>
<td>Verify pressure has bled off.</td>
</tr>
</tbody>
</table>

**Kinetic Energy Fan**  
Be sure to wait until all moving parts have come to a complete stop before attempting to service machine.

**Thermal Energy**  
Be sure to wait until heat has dissipated from machine before servicing. Wear proper PPE before beginning work.

**Refrigeration Loop**  
Pressurized refrigeration loop to be serviced by authorized personnel only.

**DANGER**  
OPENING A GUARD DOES NOT CONSTITUTE A LOCKOUT
Any machine modifications must be shown in procedure. Contact safety depart. to update procedure.

**Safety Is Your Responsibility!**
LOCKOUT TAGOUT PROCEDURE - 1910.147

Purpose: To protect authorized employees against unexpected or unplanned activation of equipment or energy while servicing equipment.

Scope: Utilize this procedure for all scheduled PM shutdowns, any maintenance task that requires you to place your body in harms way of the equipment or if you have to leave the area while the equipment is in service.

Enforcement: Failure to properly follow lockout-tagout procedure may result in disciplinary action.

<table>
<thead>
<tr>
<th>#</th>
<th>STEP</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Notify</td>
<td>Notify all affected employees that servicing or maintenance is required on a machine or equipment and that the machine or equipment must be shut down and locked out to perform the servicing or maintenance.</td>
</tr>
<tr>
<td>2</td>
<td>Review Lockout Procedure</td>
<td>The authorized employee shall refer to the company procedure to identify the type and magnitude of the energy that the machine or equipment utilizes, shall understand the hazards of the energy, and shall know the methods to control the energy.</td>
</tr>
<tr>
<td>3</td>
<td>Perform Machine Stop</td>
<td>If the machine or equipment is operating, shut it down by the normal stopping procedure (depress the stop button, open switch, close valve, etc.). Reference operating procedure for normal shutdown.</td>
</tr>
<tr>
<td>4</td>
<td>Isolate Energy</td>
<td>Follow graphical lockout-tagout procedure from top to bottom to de-activate the energy isolating device(s) so that the machine or equipment is isolated from the energy source(s). Note: It may be necessary to dissipate the non-lockout energy sources before isolating the lockout energy sources (i.e. lower machine to lowest position before locking out).</td>
</tr>
<tr>
<td>5</td>
<td>Lockout Energy</td>
<td>Perform all lockout-tagout procedure steps from top to bottom starting with page 1. Lock out &amp; tag out the energy isolating device(s) with assigned individual lock(s) &amp; tag(s).</td>
</tr>
<tr>
<td>6</td>
<td>Dissipate Energy</td>
<td>Stored or residual energy (such as in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure, etc.) must be dissipated or restrained by methods such as grounding, reenergizing, blocking, bleeding down, etc.</td>
</tr>
<tr>
<td>7</td>
<td>Attempt Restart</td>
<td>Ensure that the equipment is disconnected from the energy source(s) by first checking that no personnel are exposed, then verify the isolation of the equipment by operating the push button or other normal operating control(s) or by testing to make certain the equipment will not operate. Caution: Return operating control(s) to neutral or &quot;off&quot; position after verifying the isolation of the equipment.</td>
</tr>
</tbody>
</table>

RESTORE TO SERVICE SEQUENCE

<table>
<thead>
<tr>
<th>#</th>
<th>STEP</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Check Machine</td>
<td>Check the machine or equipment and the immediate area around the machine to ensure that nonessential items have been removed and that the machine or equipment components are operationally intact.</td>
</tr>
<tr>
<td>2</td>
<td>Check Area</td>
<td>Check the work area to ensure that all employees have been safely positioned or removed from the area.</td>
</tr>
<tr>
<td>3</td>
<td>Verify Machine</td>
<td>Verify that the controls are in neutral.</td>
</tr>
<tr>
<td>4</td>
<td>Remove Lockout</td>
<td>Remove the locks, tags and lockout devices and reenergize the machine or equipment. Reverse the order of all lockout-tagout procedure steps from bottom to top starting from the last page. Note: The removal of some form of blocking may require reenergization of the machine before safe removal.</td>
</tr>
<tr>
<td>5</td>
<td>Notify</td>
<td>Notify affected employees that the servicing or maintenance is completed and the machine or equipment is ready for use</td>
</tr>
</tbody>
</table>

Glossary of relevant terms

**Affected employee.** An employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout or tagout, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed.

**Authorized employee.** A person who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment. An affected employee becomes an authorized employee when that employee's duties include performing servicing or maintenance covered under this section.

**Capable of being locked out.** An energy isolating device is capable of being locked out if it has a hasp or other means of attachment to which, or through which, a lock can be affixed, or it has a locking mechanism built into it. Other energy isolating devices are capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy isolating device or permanently alter its energy control capability.

**Energized.** Connected to an energy source or containing residual or stored energy.

**Energy isolating device.** A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following: A manually operated electrical circuit breaker; a disconnect switch; a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors, and, in addition, no pole can be operated independently; a line valve; a block; and any similar device used to block or isolate energy. Push buttons, selector switches and other control circuit type devices are not energy isolating devices.

**Energy source.** Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

**Hot tap.** A procedure used in the repair, maintenance and services activities which involves welding on a piece of equipment (pipelines, vessels or tanks) under pressure, in order to install connections or appurtenances. It is commonly used to replace or add sections of pipeline without the interruption of service for air, gas, water, steam, and petrochemical distribution systems.

**Lockout.** The placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.
Lockout device. A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy isolating device in the safe position and prevent the energizing of a machine or equipment. Included are blank flanges and bolted slip blinds.

Normal production operations. The utilization of a machine or equipment to perform its intended production function.

Servicing and/or maintenance. Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning or unjamming of machines or equipment and making adjustments or tool changes, where the employee may be exposed to the unexpected energization or startup of the equipment or release of hazardous energy.

Setting up. Any work performed to prepare a machine or equipment to perform its normal production operation.

Tagout. The placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

Tagout device. A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

This list is taken directly from the OSHA 29 CFR, Part 1910.147(C) section of the standard.