LOCK-OUT / TAG-OUT
SAFETY TRAINING

Introduction | Welcome to Lock-out Tag-out Training

"So I'm on the job one day, doing some repair on a cutting machine....replacing a guide on the table. Pretty routine...everything's going along fine...when all of a sudden I hear...

"My heart practically pops out of my chest...until I realize that someone is powering up the next machine over...not the one I was working on. It gave me a jolt, but it was reassuring to remember that I held the key.
"It's times like this when I realize how lucky I am that there's a policy in place to protect me."

When equipment is running for normal production, machine guards keep people safe. Something else is needed to prevent injuries when the guards are removed during machine repairs and servicing.
A mechanic can be seriously injured, or killed, if a machine starts up unexpectedly while he's working inside of the equipment.

OSHA's standard on the control of hazardous energy is commonly called the Lockout/Tagout standard. In general, as the name implies, the employee doing the repairs applies padlocks or warning tags to the machine's energy supplies to make sure the machine stays off.

This training program explains the requirements of OSHA's Lockout/ Tagout standard. The rule itself is found in section 1910.147 of the OSHA standards. Certain detailed procedures have to be followed, in the right order, for lockout/tagout to be effective.
When the people who do equipment repair, servicing and maintenance work

use locks to control the flow of energy to the machine, these workers literally hold the key to safety.

Michael Hoffman: “What lockout tagout does for me is a it safeguards myself and my fellow associates against mechanical and electrical a action from a the conveyors and the equipment that we’re servicing.”
Dan Miller: “If it wasn’t done the same way every time, steps might be forgotten or skipped which is potentially a hazardous situation.”

Section 2 | Lock-Out / Tag-Out Basics

Lockout/tagout is needed to control the machine’s energy supplies during normal production operations if a worker has to:

- Remove or bypass a machine guard or other safety device;
- Place any part of his or her body into a point of operation (where the machine processes materials); or,

Place any part of his or her body into any other danger zone associated with the machine.

Lockout/tagout is always needed during machine servicing and maintenance. Servicing and maintenance activities include:

- constructing,
- installing,
- setting up,
- adjusting,
- inspecting, and,
- modifying machines or equipment.

Examples include lubricating, cleaning, or unjamming machines or equipment and making adjustments or tool changes.

The standard does not apply to cord and plug connected electric equipment when unplugging the equipment controls the hazards. In this case, the plug has to be under the exclusive control of the employee who is doing the service or maintenance work.

This mechanic will be doing some routine maintenance inside this machine. He’ll need to reach inside the machine’s point of operation, but the maintenance procedure will only take about 10 minutes. Is lockout or tagout required in this situation?
The answer is yes. Lockout/tagout must be used any time someone doing service work will need to place a part of his/her body inside a machine’s area of operation, no matter how brief the procedure.

Lockout/tagout is used to shut down a machine so it's at a "zero energy state"—no energy is available to run the machine. Lockout/tagout is used to control any source of:

- Electrical;
- Mechanical;
- Hydraulic;
- Pneumatic;
- Chemical;
- Thermal; or,
- Other energy.

Stored or residual energy must be relieved, disconnected, restrained and otherwise made safe. For example, a compressed air line can hold pressure even after you turn the valve to shut off the air supply. To bring the air line to a zero energy state, open the line and relieve the pressure.

Even something as simple as waiting for equipment to cool off to a safe temperature is a way to relieve stored energy.

It isn't enough to just have lockout/tagout equipment available in the workplace. The OSHA standard requires employers to have an energy control program that includes:

- Energy control procedures;
- Employee training; and,
- Periodic inspections.

Daniel S. Burger: "Lockout Tagout is important to me because I want to know that my back is covered when I put my hands in the danger zone of a machine. I want to know that someone else can't come up and not know what's going on and flip the switch when my hands might be within a saw blades reach or a clamp might activate and pin me in. Also, I don't want to do that one of my co-workers. Those guys out there are my buddies and I don't want to see that happen to them."

Kevin Meles: "Well as the safety coordinator Lockout Tagout is important to me to help train the employees on the importance of Lockout Tagout, how it's important to them and why they need to abide by Lockout Tagout and even if they don't perform Lockout Tagout, why it's important if it's used in their area."

Section 3 | Employee Responsibilities

So far we've indicated that mechanics use lockout/tagout procedures. Actually, OSHA calls the person who locks out or tags out machines or equipment to do servicing or maintenance work an "authorized employee."

Authorized employees have a huge stake in making sure lockout/tagout procedures are followed correctly. They are the ones most at risk of injury.

If you are an authorized employee, you must be able to:

- Recognize the sources of hazardous energy in the workplace;
- Know the types of, and amounts of, hazardous energy available in the workplace;
- Demonstrate proper lockout/tagout procedures; and,
- Explain the limitations of using a tagout system alone.

If you operate a machine that's being locked or tagged out, or if you work in an area where lockout/tagout is being used, you're affected by the lockout/tagout procedures. OSHA calls you an "affected employee."
If you are an affected employee you must know:

- The purpose and use of lockout/tagout procedures; and,
- The limitations of using a tagout system alone.

You should also know the differences between an authorized employee and an affected employee. An affected employee becomes an authorized employee when his or her duties include performing covered service or maintenance work.

For example, a machine you're operating might become jammed with material, or it may need to have a part replaced. You should be able to recognize situations that require lockout/tagout.

As an affected employee, you're limited to shutting down the equipment, calling for repairs and staying clear of the machine. In order for you to actually do the repairs, you need to have the proper training and equipment you need to be an authorized employee.

Affected employees must know when a lockout/tagout procedure is taking place. Affected employees have to be notified before lockout/tagout devices are applied and after they are removed. If you're an affected employee, don't try to help with the repairs; during lockout/tagout, stay clear of the machine.

The workplace is not made up only of mechanics and machine operators. Sometimes people need to spend time in the production area to deliver supplies, ask questions, etc. Lockout/tagout procedures might be underway during those times.

Other employees whose work operations are or may be in an area where energy control procedures may be used need basic instruction in lockout/tagout procedures.

They must know that they are not allowed to try to restart or re-energize equipment or machines that is locked or tagged out. They also need to know the limitations of using a tagout system alone.

The person responsible for locking or tagging out equipment for service or maintenance is called an authorized employee. This individual physically places the lock on the equipment; typically this is a mechanic or other maintenance worker.

An affected employee is someone who either operates the equipment being serviced under lockout/tagout or works in an area where lockout/tagout is being used.

"Other" employees are those who either work in—or might have to pass through—an area where lockout/tagout may be used.
No matter which category you're in, remember this basic rule: never try to re-start equipment that has been locked or tagged out.

Section 4 | Lock-Out / Tag-Out: Your Key to Safety

There is no one, single lockout procedure that applies to all equipment. The basic steps of a lockout/tagout procedure are the same, but each different type of machine in the workplace has a different detailed lockout/tagout procedure.

Documented energy control (or lockout/tagout) procedures must clearly: Identify the machines or equipment to which they apply;

- Outline the intended use of the procedures;
- Indicate specific steps to lock out or tag out the machine or equipment;
- Include rules and authorizations for using the procedures; and,
- Have an explanation of how compliance will be enforced.

Some types of machines don't need written lockout/tagout procedures. Generally these are machines with a single, easy-to-identify energy isolating device and no potential for stored energy. Lockout/tagout is still required for this equipment; it's just not required to have the procedure in writing.

When you use a machine, you turn it on and off at the equipment's panel. You use dials, toggle switches, etc. to control how
However, if you just flip a switch to the "off" position at the before you duck into a machine to do a repair job, there is prevent a co-worker from turning the machine back on.

When you use lockout/tagout, the machine stays off even if a coworker flips a switch at the control panel.
This is because you shut off the machine's energy supply at what is called an "energy isolating device," and you place a padlock on the device to keep it in a safe or "off" position. All of the power to the machine is cut off, and the controls on the machine's control panel do not start up the equipment.

An energy isolating device is a mechanical device that physically prevents the transmission or release of energy. These devices include (but are not

limited to) the following:

- Manually operated electrical circuit breakers;
- Electrical disconnect switches;
- Line valves;
- Physical blocks; and,
- Any similar device used to block or isolate energy.

Energy isolating devices physically prevent the transmission or release of energy to a machine. Manually operated circuit breakers, disconnect switches, line valves and machine blocks are some examples of energy isolating devices.

Some examples of things that can't be used as energy isolating devices are machine controls, like push buttons or other on/off switches.

Lockout provides the best protection. With lockout, the energy isolating device is locked in a safe or "off" position.

In addition to the lock, sturdy items like valve covers or circuit breaker covers can be used to help achieve lockout. Pipes can be locked out by using blank flanges and bolted slip blinds to stop the flow of material through the pipe. OSHA calls the locks and these other items "lockout devices."

Since 1990, machines or equipment that are replaced or that undergo major repair, renovation or modification have to be designed to accept a lockout device.

In general, if you can use a lockout device on the machine or equipment, use lockout procedures. However, some older equipment may not be able to accept a lockout device. In this case, a tag-out system is used.

Tagout uses a warning tag that is securely fastened to an energy isolating device using a non-reusable nylon cable tie (or equivalent).
To provide full employee protection when you have to use a tagout system, take additional safety measures such as removing a circuit element, blocking a control switch, opening an extra disconnecting device or removing a valve handle, to reduce the chance of the equipment being energized.

All employees need to be aware of the limitations of tags when a tagout system is used:

Tags are warning devices. They do not provide the same physical control as a lock.

- Tags must not be bypassed or ignored.
- Tags can only be removed by the authorized employee who applied them.
- Tags must be legible.
- Tags must be understandable by all employees in the area.

- Tags must hold up under the conditions of use.
- Tags may evoke a false sense of security.

Isolate equipment
The authorized employee isolates the machine from its energy sources by physically locating and operating the energy isolating devices.

Apply lockout/tagout devices
The authorized employee applies lockout/tagout devices to each of the machine's energy isolating devices.

Release stored energy
Any potentially hazardous stored or residual energy must be released, relieved, disconnected or restrained. The authorized employee can do this by:

- Bleeding off pressure;
- Blocking elevated parts in place;
- Draining lines;
- Letting equipment cool;
- Discharging capacitors;
- and Other methods specified in the lockout/tagout procedures.

Verification
During this last, crucial step the authorized employee may operate the switches and dials on the machine's control panel to verify that the equipment doesn't start. The employee should then return the controls to their "off" positions.

The verification process could also involve reading pressure or temperature gauges and using test equipment.

Generally speaking, here are the steps involved in properly tagging out equipment.

First, review the lockout procedure for the machine.
Then, gather information about the type or types of energy that the machine uses...how much energy is involved...and the related hazards.

Next, the equipment needs to be turned off by following the established shutdown procedures.

Notify the affected employees that you are about to perform a lockout. Then locate the energy isolating devices and place them in the "off" or "safe" position to cut off energy flow to the machine.

Next, lock out the energy isolating devices for the machine, holding them in the "off" position. The authorized employee's name must be clearly marked on the locks.

Releasing stored energy can include bleeding off air pressure, draining lines, discharging capacitors...or simply letting machinery cool down to make sure it's safe to work on.

The last step is to make sure that the lockout procedures have successfully shut down all energy sources and verify that the machine is at a zero energy state before starting the service work. This can include reading pressure or temperature gauges, using test equipment, or attempting to start the machine.

Looks like the lockout was successful, so repair work can be started with confidence. Because he has the only key, the authorized employee knows that until he removes the locks, energy can't be restored to the machine. Once the repair job is complete, there are specific steps required to release the lockout. The first one is to replace all the guards and remove any tools or supplies. Then, check the machine to make sure it's intact and ready to operate.

Next, check the work area around the machine to make sure everyone's in a safe place, away from the machine.

When the coast is clear, you can safely remove the lockout devices and restore energy to the machine. After the lockout is removed, notify affected employees that the lockout is over and it's safe to run the machine.

Sometimes service or repair work needs to continue during the next shift, or another employee takes over for a mechanic who is called away to another job.

Lockout/tagout needs to continue even though the people working on the project have changed.

Remember that the employee who applied the lockout/tagout device is the employee who must remove it. And, the authorized employee who is working on the machine must be the same person who applied the lockout/tagout device.
An authorized employee is not allowed to merely give the key to his lock to his replacement.

A good way to continue lockout/tagout during personnel changes is for the on-coming worker to apply a lockout/tagout device before the off-going employee removes his.

This can be easily accomplished if the first authorized employee initially applied his lock using a multi-lock hasp on the machine's energy isolating device. These hasps typically hold up to six locks, so it's easy for the oncoming employee to add his lock to the hasp before the off-going employee removes his lock.

In this procedure, there is always a lock on the energy isolating device while the locks are changed.

When repair or maintenance work is completed, follow these procedures:
Check the machine.

Before any lockout/tagout devices are removed, the authorized employee replaces all machine guards and removes tools, blocking devices and nonessential items from the area. The machine is intact and ready to operate.

Check for employees
The authorized employee checks the work area to make sure all employees are in a safe place away from the equipment.

Remove lockout/tagout devices
The lockout/tagout devices may only be removed by the authorized employee who applied them. After the lockout/tagout devices have been removed and before the equipment is started, the affected employees must be notified that the lockout/tagout devices have been removed.

Once the repair job is complete, there are specific steps required to release the lockout. The first one is to replace all the guards and remove any tools or supplies. Then, check the machine to make sure it's intact and ready to operate.

Next, check the work area around the machine to make sure everyone's in a safe place, away from the machine.

When the coast is clear, you can safely remove the lockout devices and restore energy to the machine. After the lockout is removed, notify affected employees that the lockout is over and it's safe to run the machine.

What if your co-worker thought you were done with your part of a repair job, and he removed his lock when he finished? If you didn't have your own lock on the equipment, you'd no longer be protected.

With group lockout/tagout procedures, each person must apply his or her own lock to a multiple lockout device. This can be a multi-lock hasp, a group lockbox or other mechanism.

For example, each of the machine's energy control devices can be locked out using a single lock on each device. The keys for these "job locks" are then placed into a group lockbox. The authorized employee who applied the job locks then applies his or her individual lock to the lockbox and keeps that key.

Each authorized employee who is going to work on the machine can then verify that the machine is locked out and apply his or her own individual lock to the lockbox. No one can get to the keys for the job locks until each authorized employee is done with the work and removes his or her individual lock from the lockbox.

Daniel S Burger: "definitely at shift change it presents a new problem and a new hazard. What we want to do is we lockout the machines with someone's personal lock, when the second or next shift comes in they'll swap out and the second shift person will apply their own lock when the first shift person removes then and only when that happens."

Dan Miller: "If there was not a proper procedure done at shift change, if second shift was not properly informed of what was going on and a lockout was removed, the second shift employee might come over and turn the power on, not knowing why it was off and someone would potentially be hurt by the power being turned on by either the machine moving or electricity being restored to the machine when it shouldn't be."

This machine needs to be shut down for servicing. Because there are two energy sources, two mechanics will work simultaneously on different parts of the machine. How many locks will need to be applied before the work begins?

The answer is four. Each of the mechanics needs to apply two locks: one to each of the energy isolating devices. If only one mechanic applied locks, the other mechanic would risk being injured when the locks were removed.

Section 5 | Employers, Equipment, and Inspections

Part of the basic protection of a lockout/tagout procedure is that the employee who applied the lock or tag has to be the person who removes it. They keep the key to the lock.

But, there could be a situation where the person who applied lockout/tagout just isn't available to remove it.

In this case, the employer can instruct another authorized employee to follow specific procedures to remove the lockout/tagout devices. As part of these procedures, the employer has to take steps to notify the person who applied the lockout/tagout that the locks or tags have been removed.

There are many types of lockout/tagout devices: locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners, blank flanges, bolted slip blinds and other hardware. All equipment used for lockout/tagout must:

- Be provided by the employer.
- Be used only for lockout/tagout. Never use lockout locks to lock tool
- boxes, storage areas, lockers, etc.
- Be durable and hold up to the work environment.
- Have a standard color, shape or size within the facility.
- Be substantial enough to prevent accidental removal without the use of force.
- Identify the employee who applies them.

In addition, all tags must:

- Have a standard print and format, including a warning such as, "Do
- Not Start," "Do Not Open," "Do Not Close," "Do Not Energize," or "Do
- Not Operate"; and,

- Be attached by hand using a non-reusable, self-locking nylon cable tie (or equivalent).

Your employer has to inspect lockout/tagout procedures at least annually. An authorized employee who does not work with the equipment being inspected observes the lockout/tagout procedure. Part of the inspection includes a review of the procedure with each authorized employee who is responsible for following it. If a tagout system is used instead of lockout, affected employees are also included in the review.

You might have to power up and test or position a machine in the middle of a repair job. Authorized employees are allowed to temporarily suspend lockout/tagout when they follow the lockout/tagout procedures and reapply the locks or tags after the tests.

It's not unusual for an outside service to be called in for repairs and maintenance work. You must understand and comply with the restrictions of the contractor's lockout/tagout procedures.

Whether you're a mechanic, a machine operator or someone who spends some time in production areas, you need to know that a person can be seriously injured or killed if a machine starts up unexpectedly during equipment repairs, servicing or maintenance work.

SECTION 6 | Conclusion

If you're an authorized employee, learn the lockout/tagout procedures for the machinery you service. Always follow all of the steps of the procedure in the correct order.

If you're an affected employee, pay attention when you're notified about a lockout/tagout procedure, and stay clear of the machine during the repair job.

Everyone should respect the warnings of a tagout system and be able to recognize lockout/tagout equipment.

Lockout/tagout procedures may take only a few minutes, but they can help keep you healthy for years.