



ERI Safety Videos
Preventing Injuries Through Employee Training



2983

***MORE* HIGH-IMPACT
LOCKOUT/TAGOUT
SAFETY TRAINING**

Leader's Guide

MORE HIGH-IMPACT LOCKOUT/TAGOUT SAFETY TRAINING

This easy-to-use Leader's Guide is provided to assist in conducting a successful presentation. Featured are:

INTRODUCTION: A brief description of the program and the subject that it addresses.

PROGRAM OUTLINE: Summarizes the program content. If the program outline is discussed before the video is presented, the entire program will be more meaningful and successful.

PREPARING FOR AND CONDUCTING THE PRESENTATION: These sections will help you set up the training environment, help you relate the program to site-specific incidents, and provide program objectives for focusing your presentation.

REVIEW QUESTIONS AND ANSWERS: Questions may be copied and given to participants to document how well they understood the information that was presented. Answers to the review questions are provided separately.

INTRODUCTION

Nearly 200 employees are killed and thousands of others injured each year when they are exposed to the sudden, unexpected release of hazardous energy. To protect workers from such incidents, a set of procedures known as lockout/tagout is used to disconnect and isolate all of the hazardous energy sources to a machine, piece of equipment or other device. This program stresses the importance of controlling hazardous energy in all required situations while providing viewers with a basic understanding of the key elements in the lockout/tagout process. Also featured are six workplace injury reenactments that illustrate the devastating consequences of improper lockout/tagout operations.

Topics include situations that require lockout/tagout, "authorized," "affected" and "other employees," proper use of locks and tags, steps involved in performing a lockout procedure, verifying a zero energy state, returning equipment to service and group lockout procedures.

PROGRAM OUTLINE

WHAT THE TERM 'LOCKOUT/TAGOUT' MEANS

- Lockout/tagout is a set of procedures used to disconnect and isolate all sources of hazardous energy to a machine, piece of equipment or other devices. It's called lockout/tagout because a special-purpose lock is used to lock the energy source in a disconnected position and a specialized tag is applied which indicates the equipment should not be operated.
- Performing a lockout/tagout procedure allows workers to service or repair equipment without the risk of the machine starting unexpectedly or hazardous energy being released.
- Performing a lockout/tagout before placing yourself in the path of a potential release of hazardous energy is not only required by your organization and by OSHA, it's also a logical way to protect yourself from injury or death.

WHEN LOCKOUT/TAGOUT IS REQUIRED

- Performing a lockout/tagout is required when a worker removes or bypasses machine guarding, light curtains, electrical cover plates, interlock switches or other safety devices, resulting in exposure to hazards.
- Lockout/tagout is also required before a worker places any part of his or her body in contact with the point of operation of a machine or piece of equipment, or places any part of his or her body into the danger zone associated with a machine's actions or operating cycle.
- Some common situations that require lockout procedures to be performed include repairing electrical equipment, opening chemical lines, clearing jammed mechanisms and adjusting or lubricating machinery.
- While it's imperative that a proper lockout/tagout be performed before conducting these types of operations, keep in mind that only those employees who are trained and authorized by the company are allowed to perform lockout/tagout procedures. This is an important safety point that was not understood by Tom Jackson, a machine operator.

UNAUTHORIZED EMPLOYEE CRUSHED WHEN MACHINE CYCLES UNEXPECTEDLY

- “I worked in the area next to Tom. He was an operator, like me. Operations personnel are not authorized to adjust or lubricate our machines,” says Bonita, one of Tom Jackson’s co-workers. “We have to call maintenance to do it. That always bugged Tom because we know how to make the adjustments; we’re just not allowed to.”
- Tom wasn’t allowed to adjust his machine because the adjustment requires the equipment to be locked out and Tom was not an “authorized employee.”
- OSHA regulations only permit “authorized employees” to conduct lockout operations. Authorized employees have received training on, and must understand, the type and magnitude of the various energy sources supplying the equipment as well as the proper means to isolate and control that energy.
- In addition, authorized employees must understand the specific hazards of the machine, know the proper shut down procedures and be able to verify that all hazardous energy has been released or isolated.
- “On the day Tom died, I noticed him turn off the power to his machine and place a lock and tag on the switch,” Bonita continues. “I thought that was strange, but I figured he must have been helping the maintenance guy or something.”
- “A little while later I heard some screaming, then I saw people running towards his area so I headed over there too,” adds Bonita. “It was awful. All I could see were his legs sticking out from the machine. He was dead before they could even get him out.
- Because he was killed, no one knows exactly what Tom was thinking or what adjustment he was attempting to make, but we do know this: he was not authorized to perform the lockout and likely didn’t understand that his machine was powered from multiple locations.
- When he leaned into the machine to make the adjustment, he tripped a proximity sensor, causing one part of the machine, which still had power, to cycle, crushing him.

AFFECTED & OTHER EMPLOYEES

- In addition to authorized employees, OSHA also defines two other classes of employee relative to lockout/tagout operations, “affected employees” and “other employees.”
- Affected employees include those who are operators of equipment which is being locked and tagged out of service or work in areas where a lockout procedure could take place.
- Affected employees must be notified before a lockout procedure is begun and told which equipment is to be locked out. Affected employees must also be notified before equipment is re-energized.
- Other employees are those not directly affected by a lockout. Other employees must be able to recognize when a lockout is in progress and understand not to remove a lock and tag and to not re-energize any locked and tagged equipment.
- Again, only authorized employees may perform lockout/tagout procedures. Of course, being an authorized employee is meaningless if you choose not to perform the lockout when required.

FAILURE TO USE ASSIST DEVICE OR LOCKOUT MACHINE RESULTS IN MANGLED ARM

- “It’s not uncommon for the machine to get jammed, but it sure is aggravating when it happens,” polishing machine operator Lindsey Walters says in an interview. “On the day I was hurt, I was running behind in my work and was feeling rushed. It wasn’t shaping up to be a very good day. Of course, that’s the time the machine decides to jam up!”
- “The procedure calls for using a special tool to clear the jam, something to keep your arms clear of any moving parts. Technically, it’s called an assist device. Anyway, if that doesn’t work we’re supposed to do a full lockout before we go any further,” she notes.

- “I couldn’t find the assist device, so I decided to just use my hand,” adds Lindsey. “I mean, the machine has never pulled the assist device into it, so why would it decide to grab my hand?”
- Machines don’t decide anything. Machines don’t think at all; unfortunately, neither did Lindsey when she decided to place her hand near the in-running action of her machine without locking it out.
- “I grabbed hold of the jammed material and pulled really hard; all of a sudden, the machine seemed to pull back!” Lindsey says. “I couldn’t let go fast enough before my arm was inside the machine up past my elbow. It hurt so bad and I was terrified.”
- A co-worker quickly hit the E-Stop, but the damage had already been done. Lindsey’s arm had been severely damaged by the moving parts of her machine.
- “Now I’m left with this. Look, if you’re supposed to do the lockout, do it. It doesn’t matter how simple it may seem to clear a jam or do some other routine maintenance. If you stick your hand in a machine without locking it out, you just may not get it back; and, if you do, you may not want it back,” Lindsey reluctantly admits.

PROPER USE OF LOCKS & TAGS

- Just as only authorized employees can perform lockout procedures, only authorized locks, tags and devices may be applied during lockout operation.
- Locks and tags used by your organization will be standardized by color, shape or size. Tags will have a standard type of print and format.
- Before attaching a tag, make sure it includes your name and all other information your company requires.
- Keep in mind that lockout locks and tags are not to be used for any other purposes.

STEPS INVOLVED IN PERFORMING A LOCKOUT PROCEDURE

- Remember that the written lockout procedure will detail the specific steps to follow and the order in which they should be performed.
- First, notify all affected employees that you will be doing a lockout, which equipment is involved and the purpose of the operation.
- Next, shut down the equipment with the normal on/off controls.
- Isolate all energy sources with an energy-isolating device. Energy-isolating devices are mechanical devices that physically prevent the release or transmission of energy; for example circuit breakers, disconnect switches or a line valve.
- Control circuit devices such as push buttons or selector switches are not energy-isolating devices and should not be used to control energy during lockout operations.
- Once the energy source is isolated, use the lock and tag provided by your employer to lock the energy isolation device.
- Keep in mind that electricity is not the only type of energy which must be controlled. Other energy sources include mechanical, hydraulic, pneumatic, chemical, thermal and the force of gravity.
- Once all energy sources are controlled and locked, there is one final and very critical step. You must test the lockout to verify it has been successful. Try to operate the equipment by using its normal on/off controls to ensure that it will not start. This step is so important that many organizations refer to their energy control program as “Lock, Tag and Try.”

VERIFYING A ZERO ENERGY STATE

- When qualified electricians perform a lockout procedure in order to service electrical equipment, they must test the lockout to ensure that no voltage exists.

- This is often referred to as verifying a “zero energy state” and must be performed while wearing appropriate shock and arc flash protection rated for the equipment being tested while using a verified working voltmeter.
- Unfortunately, misplaced confidence or complacency can cause workers to skip this important step, sometimes with tragic results.

UNVERIFIED LOCKOUT LEADS TO ARC FLASH INJURIES

- “I needed to replace a control power transformer in a piece of equipment which was fed from a remote disconnect. I hadn’t been working in this area for very long, but I felt confident in what I was doing,” says maintenance technician Sam Kinsman. “Our company policy is to not allow hot electrical work, period. There was no question that I was going to shut off the power to the equipment and do the lockout.”
- “I located the disconnect switch that was labeled as supplying power to the equipment,” he adds. “I then turned it off and locked it out. Knowing the equipment was now de-energized, I opened it up and began removing the transformer.”
- Sam’s confidence was indeed misplaced. He didn’t know the equipment was de-energized; how could he? He didn’t bother to test it. All he knew was that he turned off a switch with a label on it that matched the equipment he was servicing. So in effect, he was betting his life on whoever applied those labels.
- “Last thing I remember is reaching towards the transformer with a wrench and then the whole thing seemed to blow up in my face. My hands were burned pretty badly, second and third-degree. They told me later that my hands were burned most severely because they were closest to the arc source,” says Sam. “My face was also damaged and burned from some flying debris. Kind of like red-hot shrapnel, I guess. They also told me I’m lucky I wasn’t hurt worse.”
- Sam was lucky. Even though he wasn’t wearing the arc-rated face shield and gloves required, he was wearing his arc-rated shirt and pants which limited his burn injuries. Of course, Sam wouldn’t have been injured at all had he tested his lockout.
- “Now I know why testing your lockout is so important. I won’t make that mistake again,” Sam concludes.

RETURNING EQUIPMENT TO SERVICE

- When servicing is complete and the equipment needs to be returned to service, the written lockout procedure will specify the steps to be taken and the specific order in which they must be performed. In general, the process typically proceeds from the point of service back to its source of energy.
- First, make sure all tools, excess materials and personnel are cleared from the machine’s areas of operation and from the immediate area and replace all machine guarding, cover plates, light curtains and other safety devices.
- Alert any affected employees and any other employees in the area that the machine is about to be re-energized.
- Lastly, remove locks and tags and return the energy-isolating device to its normal “on” position. Then turn on the equipment or machine using its normal controls and verify that the service or repair was successful before informing any affected employees that the machine or process is back in service.

MAINTENANCE WORKER KILLED AFTER GROUP LOCKOUT MISTAKE

- Sometimes a lockout process isn’t quite as simple as the ones seen so far. Often more than one employee may be involved in the service as well as outside contractors. When this is the case, following each step of the lockout procedure is especially critical, a fact to which Marcus Jones can now attest.
- “I feel awful about what happened. Bobby and I had to enter a confined space to replace the bearings on the sludge macerator,” says Marcus, who was working in the waste treatment area of a plant. “The macerator chops up any solids that sink to the bottom of the vessel.
- “I shut off the power to the macerator motor and placed the group lockout hasp on the disconnect switch,” he continues. “Then I placed my lock and tag on it and headed over to talk to the entry supervisor who was testing the air. I passed Bobby on the way over so I assumed he was going over to place his lock and tag on the hasp also.”

- A group lockout takes place when there is more than one person working on the equipment or system that is controlled by an energy-isolating device.
- In a group lockout, one person will have primary responsibility for the lockout, but each person must attach their own lock and tag to the energy-isolating device. This is often done by using a group lockout hasp which provides space for several locks.
- When work is completed and the procedure for re-energizing the equipment has been followed, each person must remove his own lock and tag. This ensures that all workers are safely clear of the equipment before it is re-energized.
- Unfortunately, Bobby never placed his lock and tag on the group hasp as Marcus assumed. He must have realized that he didn't have it with him and not wanting to hold up the job, he entered the confined space without mentioning it to Marcus.
- This fundamental mistake created a dangerous situation: two workers working under the protection of only one lock.
- "When we were almost finished, Bobby offered to haul out all of the tools and old parts so I could go check on the progress of another job. I was gone for a while and when I came back I passed by the disconnect switch to the macerator motor," says Marcus. "I didn't see Bobby's lock and tag on the hasp so I figured he had finished up and had left the area. Then I removed my lock and turned the power on."
- Unbeknownst to Marcus, Bobby was still inside the space. He had noticed a problem with the float switch, which is used to activate the macerator motor and when he lifted the float switch to inspect his repair, the macerator started. Bobby was knocked off his ladder and into the spinning blades of the newly-repaired macerator.
- "I just don't understand why Bobby's lock wasn't on the group hasp. If it had been, he'd be alive today," Marcus notes.
- Bobby should have placed his own lock on the macerator motor disconnect. In addition, Marcus should have followed the re-energizing procedure by ensuring the area was free of tools, equipment and personnel before re-energizing the motor.
- Many serious incidents often involve more than one error and while you can't always prevent errors committed by others, what you can do is follow lockout procedures to the letter, every time to ensure those errors don't affect you.

SHORTCUT TO SAVE TIME RESULTS IN SEVERE BURNS & PERMANENT DISFIGUREMENT

- Don't allow other people's attitudes, even those of supervisors, impact the choices you make regarding your personal safety.
- "It was the worst thing I've ever seen and it was partly my fault. I was really hard on the maintenance crew," says Mike, maintenance supervisor at a chemical processing facility. "I lost my temper about lost production time due to preventable failures."
- After that meeting, one of the crew, Gene Roberts, was assigned the job of replacing a valve on part of a piping system for a hot, caustic solution.
- Quite simply, he took a shortcut. Perhaps Gene thought he could "get back" at his supervisor by replacing the valve in record time. Of course, this would require skipping both the lockout and line-breaking procedures.
- He called the control room to close off an upstream valve and asked them to keep it off until he called back, but he never told them why or that he was breaking the line.
- "I happened to be in the area and I saw it happen," says Mike. "The hot solution hit him in the face. He never had a chance after that."

WORKER'S ARM SEVERELY INJURED ON SHEET METAL CONVEYOR

- Remember that lockout procedures are required anytime you remove or defeat any safety devices designed to protect you from a machine's hazards, even if you are not planning on getting too close or even doing any work.
- "I was inspecting the parts of a conveyor system for signs of wear. I didn't plan on doing any actual work so I didn't think I needed to do any type of lockout," says Brian Johnson, a service technician in a plant's production area.
- "I placed my hand on the conveyer frame to get a better look at the worn parts. That's when the conveyor started up," he explains.
- "Looking back, I don't know what I was thinking," Brian says. "We have a lockout procedure designed to make that line safe for inspection. Next time, I'll use it."
- "Next time, I'll do the lockout." That seems to be a common refrain among those who have experienced the devastating results of improper lockout/tagout operations. Tragically, there are many who won't get a second chance to be safe.
- Don't leave your safety to chance. Take control of hazardous energy by understanding and following your organization's lockout/tagout procedures every time they are required.

PREPARE FOR THE SAFETY MEETING

Review each section of this Leader's Guide as well as the DVD or digital media. Here are a few suggestions for using the program:

Make everyone aware of the importance the company places on health and safety and how each person must be an active member of the safety team.

Introduce the program and then play it without interruption. Review the program content by presenting the information in the program outline.

Here are some suggestions for preparing your video equipment and the room or area you use:

Check the room or area for quietness, adequate ventilation and temperature, lighting and unobstructed access.

Check the seating arrangement and the audiovisual equipment to ensure that all participants will be able to see and hear the program.

CONDUCTING THE PRESENTATION

Begin the meeting by welcoming the participants. Introduce yourself and give each person the opportunity to become acquainted if there are new people joining the training session.

Explain that the primary purpose of the program is to stress the importance of controlling hazardous energy in all required situations while providing viewers with a basic understanding of the key elements in the lockout/tagout process.

Introduce the program. Play it without interruption. Review the program content by presenting the information in the program outline.

Lead discussions about specific situations and job tasks at your facility that require lockout/tagout as well as the procedures used to control hazardous energy during these operations.

After watching the program, the viewer will be able to explain the following:

- When lockout/tagout operations are required;
- What “authorized,” “affected” and “other” employees are;
- How to properly use locks and tags;
- What sequence of steps is used when performing a lockout procedure;
- How equipment should be returned to operation after service is complete;
- Why it is imperative that lockout/tagout procedures be implemented in all required situations.

**MORE HIGH-IMPACT LOCKOUT/TAGOUT SAFETY TRAINING
REVIEW QUIZ**

Name _____ **Date** _____

The following quiz is provided to check how well you understand the information presented during this program.

1. Which of the following situations require lockout/tagout procedures to be performed?
 - a. when repairing electrical equipment
 - b. when machine guarding must be removed or bypassed
 - c. when clearing jammed mechanisms on machinery
 - d. all of the above

2. “Affected employees” are permitted to perform lockout procedures if they know how to make proper adjustments on their own machinery.
 - a. true
 - b. false

3. “Other employees” are not required to know anything about lockout operations since they don’t directly affect them.
 - a. true
 - b. false

4. Locks and tags used for lockout/tagout are not to be used for any other purposes.
 - a. true
 - b. false

5. _____ are mechanical devices that physically prevent the release or transmission of energy.
 - a. Control circuit devices
 - b. Current-transforming devices
 - c. Energy-isolating devices

6. What is the final and very critical step in the sequence of a lockout procedure?
 - a. making sure all types of energy are controlled
 - b. testing the lockout to verify it has been successful
 - c. notifying affected employees that service is about to begin

7. What is the first step in returning equipment to service after a lockout?
 - a. making sure tools, materials and personnel are cleared the machine’s area of operation
 - b. removing locks and tags and returning the energy-isolating device to the “on” position
 - c. alerting employees in the area that the machine is about to be re-energized

8. One person will have primary responsibility for the operation during a group lockout.
 - a. true
 - b. false

ANSWERS TO THE REVIEW QUESTIONS

1. d

2. b

3. b

4. a

5. c

6. b

7. a

8. a