



**PDHonline Course C467 (4 PDH)**

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**OSHA Required Training – Control of  
Hazardous Energy “Lockout/Tagout” –  
29 CFR 1910.147**

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**2020**

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## **OSHA Required Training**

### **Control of Hazardous Energy “Lockout/Tagout”**

**29 CFR 1910.147**

**OSHA REQUIRED TRAINING  
CONTROL OF HAZARDOUS ENERGY  
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**PREVENTING WORKER DEATHS FROM UNCONTROLLED RELEASE  
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# **OSHA REQUIRED TRAINING CONTROL OF HAZARDOUS ENERGY – EXECUTIVE SUMMARY –**

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## **1.0 OSHA Overview**

The Occupational Safety and Health Administration (OSHA) was created by the United States Congress in 1971 as a federal agency in the Department of Labor. OSHA's mission is to assure the safety and health of America's workers by setting and enforcing standards; providing training, outreach, and education; establishing partnerships; and encouraging continual improvement in workplace safety and health. Since its inception, OSHA has helped to cut workplace fatalities by more than 60 percent and occupational injury and illness rates by 40 percent. At the same time, U.S. employment has doubled from 56 million workers at 3.5 million worksites to more than 115 million workers at 7.2 million sites.

## **2.0 Introduction to Control of Hazardous Energy**

"Lockout/Tagout" (LOTO) refers to specific practices and procedures to safeguard employees from the unexpected energization or startup of machinery and equipment, or the release of hazardous energy during service or maintenance activities. Approximately 3 million workers service equipment and face the greatest risk of injury if lockout/tagout is not properly implemented. Compliance with the OSHA's lockout/tagout standard (29 CFR 1910.147) prevents an estimated 120 fatalities and 50,000 injuries each year. Workers injured on the job from exposure to hazardous energy lose an average of 24 workdays for recuperation. In a study conducted by the United Auto Workers (UAW), 20% of the fatalities (83 of 414) that occurred among their members between 1973 and 1995 were attributed to inadequate hazardous energy control procedures specifically, lockout/tagout procedures. LOTO is addressed in specific standards for the general industry, marine terminals, longshoring, and the construction industry.

## **3.0 Regulatory Standards**

OSHA has established regulatory standards intended to control the release of hazardous energy for general industry, as well as, selected specific industries. An outline of these regulatory standards is provided as follows. This course material will focus primarily on the criteria with the widest application – General Industry (29 CFR 1910.147).



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**General Industry (29 CFR 1910)**

- 1910 Subpart J, General environmental controls
  - 1910.147, The control of hazardous energy (lockout/tagout)
    - Appendix A, Typical minimal lockout procedures
- 1910 Subpart R, Special industries
  - 1910.261, Pulp, paper, and paperboard mills
  - 1910.269, Electric power generation, transmission, and distribution
    - Appendix A, Flow charts
- 1910 Subpart S, Electrical
  - 1910.306, Specific purpose equipment and installations
  - 1910.333, Selection and use of work practices

**Marine Terminals (29 CFR 1917)**

- 1917 Subpart C, Cargo handling gear and equipment
  - 1917.48, Conveyors

**Longshoring (29 CFR 1918)**

- 1918 Subpart G, Cargo handling gear and equipment other than ship's gear
  - 1918.64, Powered conveyors

**Construction Industry (29 CFR 1926)**

- 1926 Subpart K, Electrical
  - 1926.417, Lockout and tagging of circuits
- 1926 Subpart Q, Concrete and masonry construction
  - 1926.702, Requirements for equipment and tools

It should be noted, that twenty-five states, Puerto Rico and the Virgin Islands have OSHA-approved State Plans and have adopted their own standards and enforcement policies. For the most part, these States adopt standards that are identical to Federal OSHA. However, some States have adopted different standards applicable to this topic or may have different enforcement policies.

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**DHHS (NIOSH) Publication No. 99-110**

July 1999

# NIOSH ALERT

## Preventing Worker Deaths from Uncontrolled Release of Electrical, Mechanical, and Other Types of Hazardous Energy

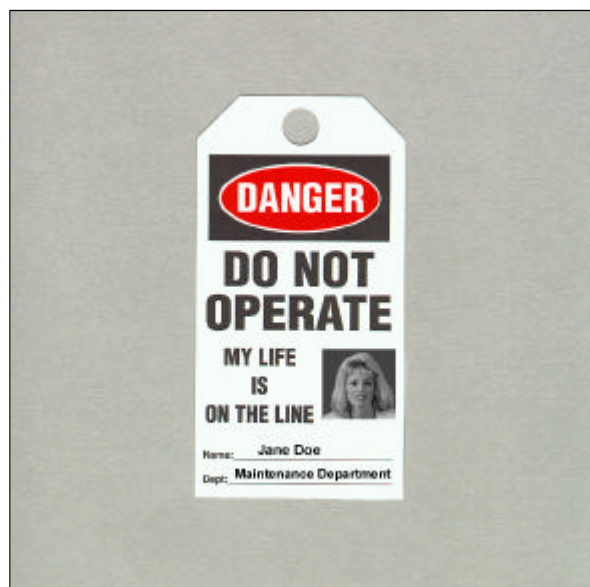
### WARNING!

**Workers who install or service equipment and systems may be injured or killed by the uncontrolled release of hazardous energy.**

Take the following steps to protect yourself if you install or service equipment and systems:

- Follow OSHA regulations.
- Identify and label all sources of hazardous energy.
- Before beginning work, do the following:
  1. De-energize all sources of hazardous energy:
    - Disconnect or shut down engines or motors.
    - De-energize electrical circuits.
    - Block fluid (gas or liquid) flow in hydraulic or pneumatic systems.
    - Block machine parts against motion.
  2. Block or dissipate stored energy:
    - Discharge capacitors.
    - Release or block springs that are under compression or tension.
    - Vent fluids from pressure vessels, tanks, or accumulators—but never vent toxic, flammable, or explosive substances directly into the atmosphere.
  3. Lockout and tagout all forms of hazardous energy—including electrical breaker panels, control valves, etc.
  4. Make sure that only **one key** exists for each of your assigned locks and that only you hold that key.

5. Verify by test and/or observation that all energy sources are de-energized.
  6. Inspect repair work before removing your lock and activating the equipment.
  7. Make sure that only you remove your assigned lock.
  8. Make sure that you and your co-workers are clear of danger points before re-energizing the system.
- Participate in all training programs offered by your employers.



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Only the worker who installs a lock and tag should remove them after work is complete and inspected.

For additional information, see ***NIOSH Alert: Preventing Worker Injuries and Deaths from Hazardous Energy Release*** [DHHS (NIOSH) Publication No. 99-110]. Single copies of the Alert are available free from the following:

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National Institute for Occupational Safety and Health

## Preventing Worker Deaths from Uncontrolled Release of Electrical, Mechanical, and Other Types of Hazardous Energy

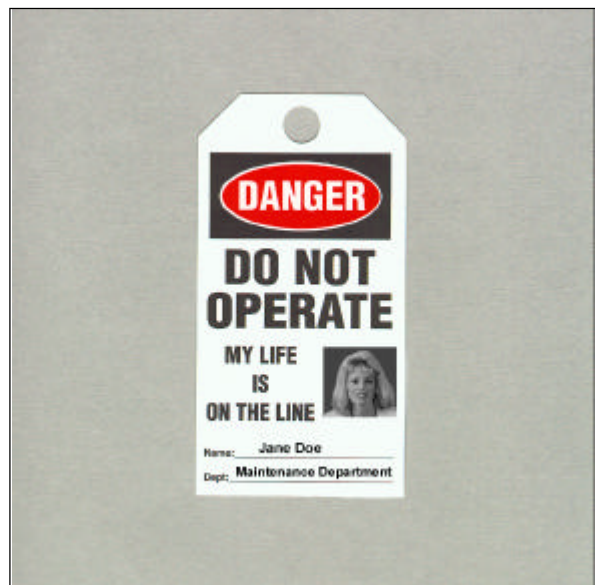
### WARNING!

Workers who install or service equipment and systems may be injured or killed by the uncontrolled release of hazardous energy.

The National Institute for Occupational Safety and Health (NIOSH) requests assistance in preventing the death or injury of workers exposed to the unexpected or uncontrolled release of hazardous energy. In this Alert, *hazardous energy* is any type of energy in sufficient quantity to cause injury to a worker. Common sources of hazardous energy include electricity, mechanical motion, pressurized air, and hot and cold temperatures. Hazardous energy releases may occur during the installation, maintenance, service, or repair of machines, equipment, processes, or systems. Investigations conducted as part of the NIOSH Fatality Assessment and Control Evaluation (FACE) Program suggest that developing and following hazardous energy control procedures could prevent worker injuries and fatalities.

This Alert describes five fatal incidents in which workers contacted uncontrolled hazardous energy during installation, maintenance, service, or repair work. To prevent such deaths, the recommendations in this Alert should be followed by every employer, manager,

supervisor, and worker who installs, maintains, services, or repairs machines, equipment, processes, or systems. NIOSH requests that trade journal editors, safety and health officials, and others responsible for worker safety and health bring this Alert to the attention of employers and workers who are at risk.



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Only the worker who installs a lock and tag should remove them after work is complete and inspected.

## BACKGROUND

### Number of Workers Killed

No detailed national data are available on the number of workers killed each year by contact with uncontrolled hazardous energy. However, during the period 1982–1997, NIOSH investigated 1,281 fatal incidents as part of their FACE Program. Of these, 152 involved installation, maintenance, service, or repair tasks on or near machines, equipment, processes, or systems. Because the FACE program was active in only 20 States between 1982 and 1997, these fatalities represent only a portion of the U.S. workers who were killed by contact with uncontrolled hazardous energy.

### Contributing Factors

Review of these 152 incidents suggests that three related factors contributed to these fatalities:

- Failure to completely de-energize, isolate, block, and/or dissipate the energy source (82% of the incidents, or 124 of 152)
- Failure to lockout *and* tagout energy control devices and isolation points after de-energization (11% of the incidents, or 17 of 152)
- Failure to verify that the energy source was de-energized before beginning work (7% of the incidents, or 11 of 152)

In a study conducted by the United Auto Workers (UAW), 20% of the fatalities (83 of 414) that occurred among their members between 1973 and 1995 were attributed to inadequate hazardous energy control procedures—specifically, lockout/tagout procedures. The energy sources involved in

these fatalities included kinetic, potential, electrical, and thermal energy [UAW 1997].

## CURRENT OSHA REGULATIONS

Current Occupational Safety and Health Administration (OSHA) standards for general industry are established to prevent injuries and fatalities from contact with hazardous energy [29 CFR<sup>\*</sup> 1910.147]. This standard requires employers to “establish a program consisting of energy control procedures, employee training and periodic inspections to ensure 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.”

Other OSHA standards for general industry cite the need for de-energizing electrical energy and locking and tagging electrical circuits and equipment before performing maintenance and servicing tasks. The following OSHA standards contain lockout/tagout-related requirements:

1910.146	Permit-Required Confined Spaces
1910.177	Servicing Multi-Piece and Single Piece Rim Wheels
1910.178	Powered Industrial Trucks
1910.179	Overhead and Gantry Cranes

<sup>\*</sup> *Code of Federal Regulations*. See CFR in references.

1910.181	Derricks
1910.213	Woodworking Machinery
1910.217	Mechanical Power Presses
1910.218	Forging Machines
1910.261	Pulp, Paper, and Paperboard Mills
1910.262	Textiles
1910.263	Bakery Equipment
1910.265	Sawmills
1910.269	Electric Power Generation, Transmission, and Distribution
1910.272	Grain Handling
1910.305	Wiring Methods, Components, and Equipment for General Use
1910.306	Specific Purpose Equipment and Installations
1910.333	Selection and Use of Work Practices

OSHA standards for construction also contain requirements for protecting workers from electrical hazards [29 CFR 1926.416 and 29 CFR 1926.417]. These standards require that workers exposed to any part of an electrical power circuit be protected through de-energizing and grounding of the circuit or through appropriate guarding. These standards also require that all de-energized circuits be rendered inoperable and tagged out.

## FORMS OF HAZARDOUS ENERGY

Workers may be exposed to hazardous energy in several forms and combinations during installation, maintenance, service, or repair work. A comprehensive hazardous energy control program should address all forms of hazardous energy [NIOSH 1983]:

- *Kinetic (mechanical) energy* in the moving parts of mechanical systems
- *Potential energy* stored in pressure vessels, gas tanks, hydraulic or pneumatic systems, and springs (potential energy can be released as hazardous kinetic energy)
- *Electrical energy* from generated electrical power, static sources, or electrical storage devices (such as batteries or capacitors)
- *Thermal energy* (high or low temperature) resulting from mechanical work, radiation, chemical reaction, or electrical resistance

## CASE REPORTS

As part of the FACE Program from 1982 through 1997, NIOSH investigated 152 fatal incidents in which workers contacted uncontrolled hazardous energy. The following case reports summarize five of these investigations.

### Case No. 1—Uncontrolled Kinetic Energy

A 25-year-old male worker at a concrete pipe manufacturing facility died from injuries

he received while cleaning a ribbon-type concrete mixer. The victim's daily tasks included cleaning out the concrete mixer at the end of the shift. The clean-out procedure was to shut off the power at the breaker panel (approximately 35 feet from the mixer), push the toggle switch by the mixer to make sure that the power was off, and then enter the mixer to clean it.

No one witnessed the event, but investigators concluded that the mixer operator had shut off the main breaker and then made a telephone call instead of following the normal procedure for checking the mixer before anyone entered it. The victim did not know that the operator had de-energized the mixer at the breaker. Thinking he was turning the mixer off, he activated the breaker switch and energized the mixer. The victim then entered the mixer and began cleaning without first pushing the toggle switch to make sure that the equipment was de-energized. The mixer operator returned from making his telephone call and pushed the toggle switch to check that the mixer was de-energized. The mixer started, and the operator heard the victim scream. He went immediately to the main breaker panel and shut off the mixer.

Within 30 minutes, the emergency medical service (EMS) transported the victim to a local hospital and then to a local trauma center. He died approximately 4 hours later [NIOSH 1995].

## Case No. 2—Uncontrolled Electrical Energy

A 53-year-old journeyman wireman was electrocuted when he contacted two energized, 6.9-kilovolt buss terminals. The victim and two coworkers (all contract employees) were installing electrical

components of a sulfur dioxide emission control system in a 14-compartment switch house.

The circuit breaker protecting the internal buss<sup>†</sup> within the switch house had been tripped out and marked with a tag—but it had not been secured by locking. This procedure was consistent with the hazardous energy control procedures of the power plant.

The victim and his coworkers were wiping down the individual compartments before a prestartup inspection by power plant personnel. Without the knowledge of the victim and his coworkers, power plant personnel had energized the internal buss in the switch house. When the victim began to wipe down one of the compartments at the south end of the switch house, he contacted the A-phase buss terminal with his right hand and the C-phase buss terminal with his left hand. This act completed a path between phases, and the victim was electrocuted.

A coworker walking past the victim during the incident was blown backward by the arcing and received first-degree flash burns on his face and neck. A second coworker at the north end of the switch house heard the explosion and came to help. He notified the contractor's safety coordinator by radio and requested EMS. The EMS responded in about 15 minutes and transported the victim to a local hospital emergency room where he was pronounced dead [NIOSH 1994].

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<sup>†</sup>A conducting bar, rod, or tube that carries heavy currents to supply several electric circuits.



### Case No. 3—Uncontrolled Kinetic Energy

A 38-year-old worker at a county sanitary landfill died after falling into a large trash compactor used to bale cardboard for recycling. The cardboard was lifted 20 feet by a belt conveyor and fed through a 20-by 44-inch opening into a hopper. The hopper had automatic controls that activated the baler when enough material collected in the baling chamber. When the baler was activated, material in the chamber was compressed by a ram that entered the chamber from the side. Excess material above the chamber was trimmed by a shearer.

On the day of the incident, cardboard jammed at the conveyor discharge opening. Without stopping, de-energizing, or locking out the equipment, the victim rode the conveyor up to the discharge opening to clear the jam. He fell into the hopper and the baling cycle was automatically activated, amputating his legs. The victim bled to death before he could be removed from the machine [Colorado Department of Public Health and Environment 1994].

### Case No. 4—Uncontrolled Potential Energy

The 32-year-old owner of a heavy equipment maintenance business died after a wheel and tire assembly exploded during repair work. The victim was removing the assembly from a test roller when it exploded and struck him with the flying split rim of the wheel.

The test roller was a large, two-wheeled cart that carried about 60,000 pounds of concrete weights. The roller was used in highway construction to test road surfaces for proper compaction.

The victim had been working as a subcontractor to repair the wheel and tire assembly, which had been smoking earlier in the day and was believed to be rubbing against the concrete weights. The assembly consisted of a two-piece outside rim and an inside ring retainer that was held together and mounted on the axle by 20 wheel bolts and nuts. Normal air pressure for the mounted tire was 70 psi.

The victim raised and blocked the roller. Without discharging the air from the tire and using no personal protective equipment, he began to remove the wheel nuts using a pneumatic impact wrench. He had no training or experience with this type of work or in the servicing of this type of wheel. He did not realize that only *some* of the bolts held the wheel tire assembly to the axle. The remainder held the outer half of the rim to the inside half, securing the tire to the wheel. As the victim removed the nineteenth wheel nut, the pressurized air in the tire discharged explosively, causing the split rim to fly off the wheel and strike him. He died from cerebral contusions and lacerations [Minnesota Department of Health 1992].

### Case No. 5—Uncontrolled Kinetic and Thermal Energy

A 33-year-old janitorial worker died after he was trapped inside a linen dryer at a hospital laundry while cleaning plastic debris from the inside of the dryer drum. The cleaning task (which usually took 15 minutes to an hour) involved propping open the door to the dryer with a piece of wood and entering the 4- by 8-foot dryer drum. The melted debris was removed by scraping and chiseling it with screwdrivers and chisels. The dryer was part of an automated system that delivered wet laundry from the washer through an overhead

conveyor to the dryer, where it was dried during a 6-minute cycle with air temperatures of 217E to 230EF. The system control panel was equipped with an error light that was activated if the dryer door was open, indicating that the dryer was out of service.

On the night of the incident, the victim propped the door open and entered the dryer drum without de-energizing or locking out the dryer. He began to clean the inside of the drum. Although the error light had been activated when the door was propped open, the signal was misinterpreted by a coworker, who restarted the system. When the system was restarted, the overhead conveyor delivered a 200-pound load of wet laundry to the dryer—knocking out the wooden door prop, trapping the victim inside, and automatically starting the drying cycle. The victim remained trapped inside until the cycle was completed and was discovered when the load was discharged from the dryer. He died thirty minutes later of severe burns and blunt head trauma [Massachusetts Department of Public Health 1992].

## CONCLUSIONS

Review of the NIOSH FACE data indicates that three related factors contribute to injuries and deaths that occur when workers perform installation, maintenance, service, or repair work near hazardous energy sources:

- Failure to completely de-energize, isolate, block, and/or dissipate the hazardous energy source
- Failure to lockout *and* tagout energy control devices and isolation points after the hazardous energy source has been de-energized

- Failure to verify that the hazardous energy source was de-energized before beginning work

These fatalities could have been prevented if comprehensive hazardous energy control procedures had been implemented and followed.

## RECOMMENDATIONS

NIOSH recommends that employers implement the following steps to prevent injuries and deaths of workers who must work with hazardous energy in their jobs:

1. Comply with OSHA regulations.
2. Develop and implement a hazardous energy control program.
3. Identify and label all hazardous energy sources.
4. De-energize, isolate, block, and/or dissipate all forms of hazardous energy before work begins.
5. Establish lockout/tagout programs that
  - require workers to secure energy control devices with their own individually assigned locks and keys—*only one key for each lock the worker controls*,<sup>‡</sup>

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<sup>‡</sup>Use of master keys should be reserved for unusual circumstances when the worker is absent from the workplace. However, if master keys are necessary, keep them under supervisory control. List the proper procedures for using them in the written program for controlling hazardous energy.

- require that each lock used to secure an energy control device be clearly labeled with durable tags to identify the worker assigned to the lock;
  - make sure that the worker who installs a lock is the one who removes it after all work has been completed; and
  - if work is not completed when the shift changes, workers arriving on shift should apply their locks before departing workers remove their locks.
6. Verify by test and/or observation that all energy sources are de-energized before work begins.
  7. Inspect repair work before reactivating the equipment.
  8. Make sure that all workers are clear of danger points before re-energizing the system.
  9. Train ALL workers in the basic concepts of hazardous energy control.
  10. Include a hazardous energy control program with any confined-space entry program.
  11. Encourage manufacturers to design machines and systems that make it easy to control hazardous energy.

These recommendations are described in more detail in the following sections.

### 1. Comply with OSHA regulations.

Employers and workers must comply with OSHA regulations for controlling hazardous energy during maintenance and installation

work (see 29 CFR 1910.146, 1910.147, 1910.177, 1910.178, 1910.179, 1910.181, 1910.213, 1910.217, 1910.218, 1910.261, 1910.262, 1910.263, 1910.265, 1910.269, 1910.272, 1910.305, 1910.306, 1910.333, 1926.416, and 1926.417). OSHA standards and accepted safe work practices require employers to ensure that all hazardous energy sources are de-energized before work begins. If these sources cannot be de-energized, OSHA requires employers to protect workers with insulation, guarding, and appropriate personal protective equipment.

### 2. Implement a hazardous energy control program.

Employers should develop and implement a written hazardous energy control program that, at a minimum,

- describes safe work procedures,
- establishes formal lockout/tagout procedures,
- trains all employees in the program, and
- enforces the use of the procedures (including disciplinary action for failure to follow them).

Hazardous energy control programs should outline the following safe work practices:

- Identify tasks that may expose workers to hazardous energy.
- Identify and de-energize *all* hazardous energy sources, including those in adjacent equipment.

- Lockout and tagout *all* energy-isolating devices to prevent inadvertent or unauthorized reactivation or startup.
- Isolate, block, and/or dissipate *all* hazardous sources of stored or residual energy, including those in adjacent equipment.
- Before beginning to work, verify energy isolation and de-energization, including that in adjacent equipment or energy sources.
- After work is complete, verify that all personnel are clear of danger points before re-energizing the system.

Hazardous energy control among work groups must be coordinated when multiple employers are involved in large projects and when shift changes occur during such activities. Outside contractors should work with the facility owner to make sure that an adequate hazardous energy control program is implemented specifically for contract workers.

### 3. Identify and label all hazardous energy sources.

Employers should use jobsite surveys to ensure that *all* hazardous energy sources (including those in adjacent equipment) are identified before beginning *any* installation, maintenance, service, or repair tasks. Hazardous energy includes mechanical motion, potential or stored energy, electrical energy, thermal energy, and chemical reactions. Energy-isolating devices such as breaker panels and control valves should be clearly labeled [NIOSH 1983].

### 4. De-energize, isolate, block, and/or dissipate all forms of hazardous energy.

All forms of hazardous energy should be de-energized, isolated, blocked, and/or

dissipated before workers begin *any* installation, maintenance, service, or repair work. The method of energy control depends on the form of energy involved and the available means to control it. ***Energy is considered to be isolated or blocked when its flow or use cannot occur*** [NIOSH 1983].

To isolate or block energy, take the following steps:

- Disconnect or shut down engines or motors that power mechanical systems.
- De-energize electrical circuits by disconnecting the power source from the circuit.
- Block fluid (gas, liquid, or vapor) flow in hydraulic, pneumatic, or steam systems by using control valves or by capping or blanking<sup>§</sup> the lines.
- Block machine parts against motion that might result from gravity (falling).

Some forms of energy must also be dissipated after a system has been de-energized. System components such as electrical capacitors, hydraulic accumulators, or air reservoirs may retain sufficient energy to cause serious injury or death—even though the component has been de-energized, isolated, or blocked from the system and locked out.

Energy can be dissipated by taking the following steps:

- Vent fluids from pressure vessels, tanks, or accumulators until internal pressure

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<sup>§</sup>Lines can be blanked by inserting a solid plate between the flanges of a joint.

is at atmospheric levels. However, do not vent vessels or tanks containing toxic, flammable, or explosive substances directly to the atmosphere.

- Discharge capacitors by grounding.
- Release or block springs that are under tension or compression.
- Dissipate inertial forces by allowing the system to come to a complete stop after the machine or equipment has been shut down and isolated from its energy sources.

## 5. Establish lockout/tagout programs requiring individually assigned locks and keys to secure energy control devices.

Lockout/tagout programs should be based on the principle of *only one key for each lock the worker controls*.<sup>\*\*</sup> This means the following:

- Workers are assigned individual locks operable by only one key for use in securing energy control devices (breaker panels, control valves, manual override switches, etc.).
- Each worker maintains custody of the key for each of his or her assigned locks.<sup>\*\*</sup>

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<sup>\*\*</sup> Use of master keys should be reserved for unusual circumstances when the worker is absent from the workplace. However, if master keys are necessary, keep them under supervisory control. List the proper procedures for using them in the written program for controlling hazardous energy.

- Each lock is labeled with a durable tag or other means that identifies its owner.
- When work is performed by more than one worker, each worker applies his or her own lock to the energy-securing device. Scissors-type hasps made of hardened steel are available to facilitate the use of more than one lock to secure an energy control device.
- All de-energized circuits and systems are clearly labeled with durable tags.
- The worker who installs a lock is the one who removes it after all work has been completed [NIOSH 1988].
- If work is not complete when the shift changes, workers arriving on shift apply their locks before departing workers remove their locks.

Because tags can be easily removed, they are not a substitute for locks. Workers are safest with a program that uses *both* locks and warning tags to prevent systems from being inadvertently re-energized [NIOSH 1988].

## 6. Verify that all energy sources are de-energized before work begins.

Employers should establish and enforce company policies requiring workers to verify that all energy sources are de-energized before work begins. This verification should ensure that all energy sources (including stored energy) are controlled (that is, de-energized, isolated, blocked, and/or dissipated) before work begins. Appropriate testing equipment should be required as needed.

### **7. Inspect repair work before re-energizing the equipment.**

To ensure that equipment will operate as expected when it is re-energized, employers should require qualified persons to inspect completed installation, maintenance, service, or repair work. The inspection should verify that installation, repairs, and modifications were performed correctly and that the correct replacement parts were used. When equivalent or updated parts must be substituted for original parts, the system may need to be modified. Re-energized equipment should be closely monitored for several operating cycles to ensure that it is functioning correctly and safely.

### **8. Make sure that all persons are clear of danger points before re-energizing the system.**

Employers should develop procedures to verify that all persons are clear of danger points before re-energizing the system. Locks and tags should be removed only by the workers who installed them—and only after workers have been cleared from the danger points. This may require visual inspections and searches of areas around machinery or electrical circuits to assure that workers will not be exposed to the release of hazardous energy when equipment is re-energized. Workers should be informed about impending equipment start-up with warning devices they can see and hear. Such devices will help assure that workers are clear before equipment is re-energized.

### **9. Train workers in the basic concepts of hazardous energy control.**

Employers should train ALL workers in the basic concepts of hazardous energy control, including energy isolation,

locking and tagging of control devices, verifying de-energization, and clearing danger points before re-energizing equipment. Workers whose duties involve installation, maintenance, service, or repair work should be trained in the detailed control procedures required for their particular equipment. This training should enable workers to identify tasks that might expose them to hazardous energy and the effective methods for its control.

### **10. Include a hazardous energy control program with any confined-space entry program.**

When work requires entry into confined spaces such as utility vaults or tanks, employers should incorporate a hazardous energy control program as part of their confined-space entry program—according to OSHA standards [29 CFR 1910.146 and 1910.147] and published NIOSH guidelines [NIOSH 1979, 1987].

### **11. Design machines and systems that make it easy to control hazardous energy.**

Employers should encourage manufacturers to design control valves, switches, and equipment that are easy to access and lockout.

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We greatly appreciate your help in protecting the safety and health of U.S. workers.

Linda Rosenstock, M.D., M.P.H.  
Director, National Institute for Occupational Safety and Health  
Centers for Disease Control and Prevention

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# Control of Hazardous Energy

## Lockout/Tagout

OSHA 3120  
2002 (Revised)



U.S. Department of Labor

# **Control of Hazardous Energy Lockout/Tagout**

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U.S. Department of Labor  
Elaine L. Chao, Secretary

Occupational Safety and Health Administration  
John L. Henshaw, Assistant Secretary

OSHA 3120  
2002 (Revised)

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### How should I use this booklet?

This booklet presents OSHA’s general requirements for controlling hazardous energy during service or maintenance of machines or equipment. It is not intended to replace or to supplement OSHA standards regarding the control of hazardous energy. After reading this booklet, employers and other interested parties are urged to review the OSHA standards on the control of hazardous energy to gain a complete understanding of the requirements regarding the control of hazardous energy. These standards, as well as other relevant resources, are identified throughout this publication.

### What is “lockout/tagout”?


“Lockout/tagout” refers to specific practices and procedures to safeguard employees from the unexpected energization or startup of machinery and equipment, or the release of hazardous energy during service or maintenance activities.<sup>1</sup> This requires, in part, that a designated individual turns off and disconnects the machinery or equipment from its energy source(s) before performing service or maintenance and that the authorized employee(s) either lock or tag the energy-isolating device(s) to prevent the release of hazardous energy and take steps to verify that the energy has been isolated effectively. If the potential exists for the release of hazardous stored energy or for the reaccumulation of stored energy to a hazardous level, the employer must ensure that the employee(s) take steps to prevent injury that may result from the release of the stored energy.

Lockout devices hold energy-isolation devices in a safe or “off” position. They provide protection by preventing machines or equipment from becoming energized because they are

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<sup>1</sup> The standard refers to servicing and maintaining “machines or equipment.” Although the terms “machine” and “equipment” have distinct meanings, this booklet uses the term “machines” to refer both to machines and equipment. This is done for purposes of brevity only, and readers should not infer that it is intended to limit the scope of the standard. The term “equipment” is broad in scope and encompasses all types of equipment, including process equipment such as piping systems.

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positive restraints that no one can remove without a key or other unlocking mechanism, or through extraordinary means, such as bolt cutters. Tagout devices, by contrast, are prominent warning devices that an authorized employee fastens to energy-isolating devices to warn employees not to reenergize the machine while he or she services or maintains it. Tagout devices are easier to remove and, by themselves, provide employees with less protection than do lockout devices.

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### **Why do I need to be concerned about lockout/tagout?**

Employees can be seriously or fatally injured if machinery they service or maintain unexpectedly energizes, starts up, or releases stored energy. OSHA's standard on the Control of Hazardous Energy (Lockout/Tagout), found in *Title 29 of the Code of Federal Regulations (CFR) Part 1910.147*, spells out the steps employers must take to prevent accidents associated with hazardous energy. The standard addresses practices and procedures necessary to disable machinery and prevent the release of potentially hazardous energy while maintenance or servicing activities are performed.

Two other OSHA standards also contain energy control provisions: *29 CFR 1910.269* and *1910.333*. In addition, some standards relating to specific types of machinery contain deenergization requirements—such as *29 CFR 1910.179(l)(2)(i)(c)* (requiring the switches to be “open and locked in the open position” before performing preventive maintenance on overhead and gantry cranes).<sup>2</sup> The provisions of Part 1910.147 apply in conjunction with these machine-specific standards to assure that employees will be adequately protected against hazardous energy.

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<sup>2</sup> The standard provides a limited exception to the requirement that energy control procedures be documented. If an employer can demonstrate the existence of EACH of the eight elements listed in 1910.147(c)(4)(i), the employer is not required to document the energy control procedure. However, the exception terminates if circumstances change and ANY of the elements no longer exist.



### How do I know if the OSHA standard applies to me?

If your employees service or maintain machines where the unexpected startup, energization, or the release of stored energy could cause injury, the standard likely applies to you. The standard applies to all sources of energy, including, but not limited to: mechanical, electrical, hydraulic, pneumatic, chemical, and thermal energy.

The standard does not cover electrical hazards from work on, near, or with conductors or equipment in electric utilization (premise wiring) installations, which are outlined by Subpart S of 29 *CFR* Part 1910. You can find the specific lockout and tagout provisions for electrical shock and burn hazards in 29 *CFR* Part 1910.333. Controlling hazardous energy in installations for the exclusive purpose of power generation, transmission, and distribution, including related equipment for communication or metering, is covered by 29 *CFR* 1910.269.

The standard also does not cover the agriculture, construction, and maritime industries or oil and gas well drilling and servicing. Other standards concerning the control of hazardous energy, however, apply in many of these industries/situations.

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### When does the standard not apply to service and maintenance activities performed in industries covered by Part 1910?

The standard does not apply to general industry service and maintenance activities in the following situations, when:

- Exposure to hazardous energy is controlled completely by unplugging the equipment from an electric outlet and where the employee doing the service or maintenance has exclusive control of the plug. This applies only if electricity is the only form of hazardous energy to which employees may be exposed. This exception encompasses many portable hand tools and some cord and plug connected machinery and equipment.

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- An employee performs hot-tap operations on pressurized pipelines that distribute gas, steam, water, or petroleum products, for which the employer shows the following:
    - Continuity of service is essential;
    - Shutdown of the system is impractical; and
    - The employee follows documented procedures and uses special equipment that provides proven, effective employee protection.
  - The employee is performing minor tool changes or other minor servicing activities that are routine, repetitive, and integral to production, and that occur during normal production operations. In these cases, employees must have effective, alternative protection.

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### **How does the standard apply to general industry service and maintenance operations?**

The standard applies to the control of hazardous energy when employees are involved in service or maintenance activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining or servicing machines or equipment. These activities include lubricating, cleaning or unjamming machines, and making adjustments or tool changes, where the employees may be exposed to hazardous energy.

If a service or maintenance activity is part of the normal production operation, the employee performing the servicing may be subjected to hazards not normally associated with the production operation itself. Although machine guarding provisions in Subpart O of 29 *CFR* 1910 cover most normal production operations, workers doing service or maintenance activities during normal production operations must follow lockout/tagout procedures if they:

- Remove or bypass machine guards or other safety devices,
- Place any part of their bodies in or near a machine's point of operation, or

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- Place any part of their bodies in a danger zone associated with machine operations.

Work involving minor tool changes and adjustments or other minor servicing activities that are routine, repetitive, and integral to the use of the production equipment and that occur during normal production operations are not covered by the lockout/tagout standard. This exception is limited, however, and applies only when economic considerations prevent the use of prescribed energy-isolation measures and when the employer provides and requires alternative measures to ensure effective, alternative protection.

Whenever the standard is applicable, the machinery must be shut off and isolated from its energy sources, and lockout or tagout devices must be applied to the energy-isolation devices. In addition, the authorized employee(s) must take steps to verify that he or she has effectively isolated the energy. When there is stored or residual energy, the authorized employee(s) must take steps to render that energy safe. If the possibility exists for reaccumulation of stored energy to hazardous levels, the employer must ensure that the worker(s) perform verification steps regularly to detect such reaccumulation before it has the potential to cause injury.

### What are OSHA's requirements?

OSHA's standard establishes minimum performance requirements for controlling hazardous energy. The standard specifies that employers must establish an energy-control program to ensure that employees isolate machines from their energy sources and render them inoperative before any employee services or maintains them.

As part of an energy-control program, employers must:

- Establish energy-control procedures for removing the energy supply from machines and for putting appropriate lockout or tagout devices on the energy-isolating devices to prevent unexpected reenergization. When appropriate, the procedure also must address stored or potentially reaccumulated energy;
- Train employees on the energy-control program, including the safe application, use, and removal of energy controls; and
- Inspect these procedures periodically (at least annually) to ensure that they are being followed and that they remain effective in preventing employee exposure to hazardous energy.

If employers use tagout devices on machinery that can be locked out, they must adopt additional measures to provide the same level of employee protection that lockout devices would provide. Within the broad boundaries of the standard, employers have the flexibility to develop programs and procedures that meet the needs of their individual workplaces and the particular types of machines being maintained or serviced.

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## What must an energy-control procedure include?

Employers must develop, document, and use procedures to control potentially hazardous energy.<sup>3</sup> The procedures explain what employees must know and do to control hazardous energy effectively when they service or maintain machinery. If this information is the same for the various machines used at a workplace, then a single energy-control procedure may suffice. For example, similar machines (those using the same type and magnitude of energy) that have the same or similar types of control measures can be covered by a single procedure. Employers must develop separate energy-control procedures if their workplaces have more variable conditions such as multiple energy sources, different power connections, or different control sequences that workers must follow to shut down various pieces of machinery.

The energy-control procedures must outline the scope, purpose, authorization, rules, and techniques that employees will use to control hazardous energy sources, as well as the means that will be used to enforce compliance. These procedures must provide employees at least the following information:

- A statement on how to use the procedures;
- Specific procedural steps to shut down, isolate, block, and secure machines;
- Specific steps designating the safe placement, removal, and transfer of lockout/tagout devices and identifying who has responsibility for the lockout/tagout devices; and
- Specific requirements for testing machines to determine and verify the effectiveness of lockout devices, tagout devices, and other energy-control measures.

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<sup>3</sup> The standard provides a limited exception to the requirement that energy control procedures be documented. If an employer can demonstrate the existence of EACH of the eight elements listed in 1910.147(c)(4)(i), the employer is not required to document the energy control procedure. However, the exception terminates if circumstances change and ANY of the elements no longer exist.

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In Appendix A to 1910.147, OSHA provides a *Typical Minimal Lockout Procedure* for employers to consult when preparing their own specific energy-control procedures. The outline is a nonmandatory guideline to help employers and employees comply with the standard. Nothing in the appendix adds to or detracts from any of the requirements in the standard.

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### **What must workers do before they begin service or maintenance activities?**

Before beginning service or maintenance, the following steps must be accomplished in sequence and according to the specific provisions of the employer's energy-control procedure:

- (1) Prepare for shutdown;
- (2) Shut down the machine;
- (3) Disconnect or isolate the machine from the energy source(s);
- (4) Apply the lockout or tagout device(s) to the energy-isolating device(s);
- (5) Release, restrain, or otherwise render safe all potential hazardous stored or residual energy. If a possibility exists for reaccumulation of hazardous energy, regularly verify during the service and maintenance that such energy has not reaccumulated to hazardous levels; and
- (6) Verify the isolation and deenergization of the machine.

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### **What must workers do before they remove their lockout or tagout device and reenergize the machine?**

Employees who work on deenergized machinery may be seriously injured or killed if someone removes lockout/tagout devices and reenergizes machinery without their knowledge. Thus, it is extremely important that all employees respect lockout and tagout devices and that only the person(s) who applied these devices remove them.

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Before removing lockout or tagout devices, the employees must take the following steps in accordance with the specific provisions of the employer's energy-control procedure:

- Inspect machines or their components to assure that they are operationally intact and that nonessential items are removed from the area; and
- Check to assure that everyone is positioned safely and away from machines.

After removing the lockout or tagout devices but before reenergizing the machine, the employer must assure that all employees who operate or work with the machine, as well as those in the area where service or maintenance is performed, know that the devices have been removed and that the machine is capable of being reenergized. (See Sections 6(e) and (f) of 29 *CFR* Part 1910.147 for specific requirements.) In the rare situation in which the employee who placed the lockout/tagout device is unable to remove that device, another person may remove it under the direction of the employer, provided that the employer strictly adheres to the specific procedures outlined in the standard. (See 29 *CFR* 1910.147(e)(3).)

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### **When do I use lockout and how do I do it?**

You must use a lockout program (or tagout program that provides a level of protection equal to that achieved through lockout) whenever your employees engage in service or maintenance operations on machines that are capable of being locked out and that expose them to hazardous energy from unexpected energization, startup, or release of stored energy.

The primary way to prevent the release of hazardous energy during service and maintenance activities is by using energy-isolating devices such as manually operated circuit breakers, disconnect switches, and line valves and safety blocks. Lockout requires use of a lock or other lockout device to hold the energy-isolating device in a safe position to prevent machinery from becoming reenergized. Lockout also requires

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employees to follow an established procedure to ensure that machinery will not be reenergized until the same employee who placed the lockout device on the energy-isolating device removes it.

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### **How can I determine if the energy-isolating device can be locked out?**

An energy-isolating device is considered “capable of being locked out” if it meets one of the following requirements:

- Is designed with a hasp or other part to which you can attach a lock such as a lockable electric disconnect switch;
- Has a locking mechanism built into it; or
- Can be locked without dismantling, rebuilding, or replacing the energy-isolating device or permanently altering its energy-control capability, such as a lockable valve cover or circuit breaker blockout.

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### **What do I do if I cannot lock out the equipment?**

Sometimes it is not possible to lock out the energy-isolating device associated with the machinery. In that case, you must securely fasten a tagout device as close as safely possible to the energy-isolating device in a position where it will be immediately obvious to anyone attempting to operate the device. You also must meet all of the tagout provisions of the standard. The tag alerts employees to the hazard of reenergization and states that employees may not operate the machinery to which it is attached until the tag is removed in accordance with an established procedure.



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## **What other options do I have?**

If it is possible to lock out an energy-isolating device, employers must use lockout devices unless they develop, document, and use a tagout procedure that provides employees with a level of protection equal to that provided by a lockout device. In a tagout program, an employer can attain an equal level of protection by complying with all tagout-related provisions of the standard and using at least one added safety measure that prevents unexpected reenergization. Such measures might include removing an isolating circuit element, blocking a controlling switch, opening an extra disconnecting device, or removing a valve handle to minimize the possibility that machines might inadvertently be reenergized while employees perform service and maintenance activities.

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## **When can tagout devices be used instead of lockout devices?**

When an energy-isolating device cannot be locked out, the employer must modify or replace the energy-isolating device to make it capable of being locked out or use a tagout system. Whenever employers significantly repair, renovate, or modify machinery or install new or replacement machinery, however, they must ensure that the energy-isolating devices for the machinery are capable of being locked out.

Tagout devices may be used on energy-isolating devices that are capable of being locked out if the employer develops and implements the tagout in a way that provides employees with a level of protection equal to that achieved through a lockout system.

When using a tagout system, the employer must comply with all tagout-related provisions of the standard and train employees in the limitations of tags, in addition to providing normal hazardous energy control training for all employees.

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## What are the limitations of tagout devices?

A tagout device is a prominent warning that clearly states that the machinery being controlled must not be operated until the tag is removed in accordance with an established procedure. Tags are essentially warning devices and do not provide the physical restraint of a lock. Tags may evoke a false sense of security. For these reasons, OSHA considers lockout devices to be more secure and more effective than tagout devices in protecting employees from hazardous energy.

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## What are the requirements for lockout/tagout devices?

Whether lockout or tagout devices are used, they must be the only devices the employer uses in conjunction with energy-isolating devices to control hazardous energy. The employer must provide these devices and they must be singularly identified and not used for other purposes. In addition, they must have the following characteristics:

- Durable enough to withstand workplace conditions. Tagout devices must not deteriorate or become illegible even when used with corrosive components such as acid or alkali chemicals or in wet environments.
- Standardized according to color, shape, or size. Tagout devices also must be standardized according to print and format. Tags must be legible and understandable by all employees. They must warn employees about the hazards if the machine is energized, and offer employees clear instruction such as: “Do Not Start,” “Do Not Open,” “Do Not Close,” “Do Not Energize,” or “Do Not Operate.”
- Substantial enough to minimize the likelihood of premature or accidental removal. Employees should be able to remove locks only by using excessive force with special tools such as bolt cutters or other metal-cutting tools. Tag attachments must be non-reusable, self-locking, and non-releasable, with a minimum unlocking strength

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of 50 pounds. Tags must be attachable by hand, and the device for attaching the tag should be a one-piece nylon cable tie or its equivalent so it can withstand all environments and conditions.

- Labeled to identify the specific employees authorized to apply and remove them.

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### **What do employees need to know about lockout/tagout programs?**

Training must ensure that employees understand the purpose, function, and restrictions of the energy-control program. Employers must provide training specific to the needs of “authorized,” “affected,” and “other” employees.

“Authorized” employees are those responsible for implementing the energy-control procedures or performing the service or maintenance activities. They need the knowledge and skills necessary for the safe application, use, and removal of energy-isolating devices. They also need training in the following:

- Hazardous energy source recognition;
- The type and magnitude of the hazardous energy sources in the workplace; and
- Energy-control procedures, including the methods and means to isolate and control those energy sources.

“Affected” employees (usually machine operators or users) are employees who operate the relevant machinery or whose jobs require them to be in the area where service or maintenance is performed. These employees do not service or maintain machinery or perform lockout/tagout activities. Affected employees must receive training in the purpose and use of energy-control procedures. They also need to be able to do the following:

- Recognize when the energy-control procedure is being used,

- 
- Understand the purpose of the procedure, and
  - Understand the importance of not tampering with lockout or tagout devices and not starting or using equipment that has been locked or tagged out.

All other employees whose work operations are or may be in an area where energy-control procedures are used must receive instruction regarding the energy-control procedure and the prohibition against removing a lockout or tagout device and attempting to restart, reenergize, or operate the machinery.

In addition, if tagout devices are used, all employees must receive training regarding the limitations of tags. (See 29 *CFR* 1910.147(c)(7)(ii).)

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### **When is training necessary?**

The employer must provide initial training before starting service and maintenance activities and must provide retraining as necessary. In addition, the employer must certify that the training has been given to all employees covered by the standard. The certification must contain each employee's name and dates of training.

Employers must provide retraining for all authorized and affected employees whenever there is a change in the following:

- Job assignments,
- Machinery or processes that present a new hazard, or
- Energy-control procedures.

Retraining also is necessary whenever a periodic inspection reveals, or an employer has reason to believe, that shortcomings exist in an employee's knowledge or use of the energy-control procedure.

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## **What if I need power to test or position machines, equipment, or components?**

OSHA allows the temporary removal of lockout or tagout devices and the reenergization of the machine only in limited situations for particular tasks that require energization—for example, when power is needed to test or position machines, equipment, or components. However, this temporary exception applies only for the limited time required to perform the particular task requiring energization. Employers must provide effective protection from hazardous energy when employees perform these operations. The following steps must be performed in sequence before reenergization:

1. Clear tools and materials from machines.
2. Clear employees from the area around the machines.
3. Remove the lockout or tagout devices as specified in the standard.
4. Energize the machine and proceed with testing or positioning.
5. Deenergize all systems, isolate the machine from the energy source, and reapply energy-control measures if additional service or maintenance is required.

The employer must develop, document, and use energy-control procedures that establish a sequence of actions to follow whenever reenergization is required as a part of a service or maintenance activity, since employees may be exposed to significant risks during these transition periods.

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## **What if I use outside contractors for service or maintenance procedures?**

If an outside contractor services or maintains machinery, the onsite employer and the contractor must inform each other of their respective lockout or tagout procedures. The onsite employer also must ensure that employees understand and comply with all requirements of the contractor's energy-control program(s).

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## **What if a group performs service or maintenance activities?**

When a crew, department, or other group performs service or maintenance, they must use a procedure that provides all employees a level of protection equal to that provided by a personal lockout or tagout device. Each employee in the group must have control over the sources of hazardous energy while he or she is involved in service and maintenance activities covered by the standard. Personal control is achieved when each authorized employee affixes a personal lockout/tagout device to a group lockout mechanism instead of relying on a supervisor or other person to provide protection against hazardous energy. Detailed requirements of individual responsibilities are provided in 29 *CFR* 1910.147(f)(3)(ii)(A) through (D). Appendix C of OSHA Directive STD 1-7.3, 29 *CFR* 1910.147, the Control of Hazardous Energy (Lockout/Tagout)-Inspection Procedures and Interpretive Guidance, (September 11, 1990), provides additional guidance.

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## **What if a shift changes during machine service or maintenance?**

Employers must make sure that there is a continuity of lockout or tagout protection. This includes the orderly transfer of lockout or tagout device protection between outgoing and incoming shifts to control hazardous energy. When lockout or tagout devices remain on energy-isolation devices from a previous shift, the incoming shift members must verify for themselves that the machinery is effectively isolated and deenergized.

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## How often do I need to review my lockout/tagout procedures?

Employees are required to review their procedures at least once a year to ensure that they provide adequate worker protection. As part of the review, employers must correct any deviations and inadequacies identified in the energy-control procedure or its application.

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### What does a review entail?

The periodic inspection is intended to assure that employees are familiar with their responsibilities under the procedure and continue to implement energy-control procedures properly. The inspector, who must be an authorized person not involved in using the particular control procedure being inspected, must be able to determine the following:

- Employees are following steps in the energy-control procedure;
- Employees involved know their responsibilities under the procedure; and
- The procedure is adequate to provide the necessary protection, and what changes, if any, are needed.

For a lockout procedure, the periodic inspection must include a review of each authorized employee's responsibilities under the energy-control procedure being inspected. Where tagout is used, the inspector's review also extends to affected employees because of the increased importance of their role in avoiding accidental or inadvertent activation of the machinery. In addition, the employer must certify that the designated inspectors perform periodic inspections. The certification must specify the following:

- Machine or equipment on which the energy-control procedure was used,
- Date of the inspection,
- Names of employees included in the inspection, and
- Name of the person who performed the inspection.

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## What additional information does OSHA provide about lockout/tagout?

To gain a more comprehensive understanding of the requirements for controlling hazardous energy, employers and other interested persons should review the following:

- OSHA standards with provisions regarding the control of hazardous energy such as *29 CFR* 1910.147, The control of hazardous energy (lockout/tagout); *29 CFR* 1910.269, Electric power generation, transmission, and distribution; and *29 CFR* 1910.333, Selection and use of work practices. Employers in the maritime, agriculture, and construction industries are urged to review the provisions for the control of hazardous energy contained in *29 CFR* Parts 1915, 1917, 1918, 1925, and 1926.
- The regulatory preambles to *29 CFR* 1910.147 (*54 Federal Register* 36644 (September 1, 1989)) and 1910.269 (*59 Federal Register* 4320 (January 31, 1994)), which contain comments from interested parties and OSHA's explanation for the provisions of the standards.
- OSHA instructions concerning the control of hazardous energy—Directive CPL 2-1.18A, Enforcement of the Electrical Power Generation, Transmission, and Distribution Standard (October 20, 1997) and OSHA Directive STD 1-7.3, *29 CFR* 1910.147, the Control of Hazardous Energy (Lockout/Tagout)-Inspection Procedures and Interpretive Guidance, (September 11, 1990).
- OSHA letters of interpretation regarding the application of standards concerning the control of hazardous energy.

Most of these documents are available on the OSHA website at [www.osha.gov](http://www.osha.gov).





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Additionally, OSHA offers a variety of web-based tools to help educate employers and employees about the lockout/tagout standard and how to apply it in their workplace. These include the following:

- The Lockout/Tagout Interactive Training Program, which includes a tutorial, five abstracts with a detailed discussion of major lockout/tagout issues involved, and interactive case studies;
- The Lockout/Tagout Plus Expert Advisor, an interactive, expert, diagnostic software package to help users understand and apply OSHA standards that protect workers from the release of hazardous energy; and
- The Lockout/Tagout electronic Compliance Assistant Tool (eCAT), an illustrated tool to help businesses identify and correct workplace hazards.

These tools are available on the OSHA website at [www.osha.gov](http://www.osha.gov). For the Lockout/Tagout Interactive Training Program, click on **Technical Links**. For the Expert Advisor and eCAT, click on **eTools**.

## Commonly Used Terms

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**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 the standard.

**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 involve welding on a piece of equipment (pipelines, vessels, or tanks) under pressure, in order to install connections or appurtenances. It is commonly used

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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 uses 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 lubricating, cleaning or unjamming 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.

### How can OSHA help me?

OSHA can provide extensive help through a variety of programs, including assistance about safety and health programs, state plans, workplace consultations, voluntary protection programs, strategic partnerships, training and education, and more.

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### How does safety and health program management assistance help employers and employees?

Effective management of worker safety and health protection is a decisive factor in reducing the extent and severity of work-related injuries and illnesses and their related costs. In fact, an effective safety and health program forms the basis of good worker protection and can save time and money—about \$4 for every dollar spent—and increase productivity.

To assist employers and employees in developing effective safety and health programs, OSHA published recommended *Safety and Health Program Management Guidelines* (*Federal Register* 54(18):3908-3916, January 26, 1989). These voluntary guidelines can be applied to all worksites covered by OSHA.

The guidelines identify four general elements that are critical to the development of a successful safety and health management program:

- Management leadership and employee involvement,
- Worksite analysis,
- Hazard prevention and control, and
- Safety and health training.

The guidelines recommend specific actions under each of these general elements to achieve an effective safety and health program. The *Federal Register* notice is available online at [www.osha.gov](http://www.osha.gov).

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## What are state plans?

State plans are OSHA-approved job safety and health programs operated by individual states or territories instead of Federal OSHA. The *Occupational Safety and Health Act of 1970 (OSH Act)* encourages states to develop and operate their own job safety and health plans and permits state enforcement of OSHA standards if the state has an approved plan. Once OSHA approves a state plan, it funds 50 percent of the program's operating costs. State plans must provide standards and enforcement programs, as well as voluntary compliance activities that are at least as effective as those of Federal OSHA.

There are 26 state plans: 23 cover both private and public (state and local governments) employment, and 3 (Connecticut, New Jersey, and New York) cover only the public sector. For more information on state plans, see the listing at the end of this publication, or visit OSHA's website at [www.osha.gov](http://www.osha.gov).

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## How can consultation assistance help employers?

In addition to helping employers identify and correct specific hazards, OSHA's consultation service provides free, onsite assistance in developing and implementing effective workplace safety and health management systems that emphasize the prevention of worker injuries and illnesses.

Comprehensive consultation assistance provided by OSHA includes a hazard survey of the worksite and an appraisal of all aspects of the employer's existing safety and health management system. In addition, the service offers assistance to employers in developing and implementing an effective safety and health management system. Employers also may receive training and education services, as well as limited assistance away from the worksite.

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## **Who can get consultation assistance and what does it cost?**

Consultation assistance is available to small employers with fewer than 250 employees at a fixed site and no more than 500 corporatewide who want help in establishing and maintaining a safe and healthful workplace.

Funded largely by OSHA, the service is provided at no cost to the employer. Primarily developed for smaller employers with more hazardous operations, the consultation service is delivered by state governments employing professional safety and health consultants. No penalties are proposed or citations issued for hazards identified by the consultant. The employer's only obligation is to correct all identified serious hazards within the agreed-upon correction time frame.

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## **Can OSHA assure privacy to an employer who asks for consultation assistance?**

OSHA provides consultation assistance to the employer with the assurance that his or her name and firm and any information about the workplace will not be routinely reported to OSHA enforcement staff.

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## **Can an employer be cited for violations after receiving consultation assistance?**

If an employer fails to eliminate or control a serious hazard within the agreed-upon timeframe, the Consultation Project Manager must refer the situation to the OSHA enforcement office for appropriate action. This is a rare occurrence, however, since employers request the service for the expressed purpose of identifying and fixing hazards in their workplaces.

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## **What incentives does OSHA provide for seeking consultation assistance?**

Under the consultation program, certain exemplary employers may request participation in OSHA's Safety and Health Achievement Recognition Program (SHARP). Eligibility

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for participation in SHARP includes, but is not limited to, receiving a full-service, comprehensive consultation visit, correcting all identified hazards, and developing an effective safety and health management system.

Employers accepted into SHARP may receive an exemption from programmed inspections (not complaint or accident investigation inspections) for a period of 1 year initially, or 2 years upon renewal.

For more information concerning consultation assistance, see the list of consultation offices beginning on page 34, contact your regional or area OSHA office, or visit OSHA's website at [www.osha.gov](http://www.osha.gov).

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## What are the Voluntary Protection Programs?

Voluntary Protection Programs (VPPs) represent one part of OSHA's effort to extend worker protection beyond the minimum required by OSHA standards. VPP—along with onsite consultation services, full-service area offices, and OSHA's Strategic Partnership Program (OSPP)—represents a cooperative approach which, when coupled with an effective enforcement program, expands worker protection to help meet the goals of the *OSH Act*.

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## How does the VPP work?

There are three levels of VPPs: Star, Merit, and Demonstration. All are designed to do the following:

- Recognize employers who have successfully developed and implemented effective and comprehensive safety and health management systems;
- Encourage these employers to continuously improve their safety and health management systems;
- Motivate other employers to achieve excellent safety and health results in the same outstanding way; and
- Establish a relationship between employers, employees, and OSHA that is based on cooperation.

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## How does VPP help employers and employees?

VPP participation can mean the following:

- Reduced numbers of worker fatalities, injuries, and illnesses;
- Lost-workday case rates generally 50 percent below industry averages;
- Lower workers' compensation and other injury- and illness-related costs;
- Improved employee motivation to work safely, leading to a better quality of life at work;
- Positive community recognition and interaction;
- Further improvement and revitalization of already-good safety and health programs; and
- A positive relationship with OSHA.

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## How does OSHA monitor VPP sites?

OSHA reviews an employer's VPP application and conducts a VPP Onsite Evaluation to verify that the safety and health management systems described are operating effectively at the site. OSHA conducts onsite evaluations on a regular basis, annually for participants at the Demonstration level, every 18 months for Merit, and every 3 to 5 years for Star. Each February, all participants must send a copy of their most recent annual evaluation to their OSHA regional office. This evaluation must include the worksite's record of injuries and illnesses for the past year.

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## Can OSHA inspect an employer who is participating in the VPP?

Sites participating in VPP are not scheduled for regular, programmed inspections. OSHA handles any employee complaints, serious accidents, or significant chemical releases that may occur at VPP sites according to routine enforcement procedures.



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Additional information on VPP is available from OSHA national, regional, and area offices, listed beginning on page 34. Also, see Outreach at OSHA's website at [www.osha.gov](http://www.osha.gov).

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## **How can a partnership with OSHA improve worker safety and health?**

OSHA has learned firsthand that voluntary, cooperative partnerships with employers, employees, and unions can be a useful alternative to traditional enforcement and an effective way to reduce worker deaths, injuries, and illnesses. This is especially true when a partnership leads to the development and implementation of a comprehensive workplace safety and health management system.

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## **What is OSHA's Strategic Partnership Program (OSPP)?**

OSHA Strategic Partnerships are alliances among labor, management, and government to foster improvements in workplace safety and health. These partnerships are voluntary, cooperative relationships between OSHA, employers, employee representatives, and others such as trade unions, trade and professional associations, universities, and other government agencies. OSPPs are the newest member of OSHA's family of cooperative programs.

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## **What do OSPPs do?**

These partnerships encourage, assist, and recognize the efforts of the partners to eliminate serious workplace hazards and achieve a high level of worker safety and health. Whereas OSHA's Consultation Program and VPP entail one-on-one relationships between OSHA and individual worksites, most strategic partnerships seek to have a broader impact by building cooperative relationships with groups of employers and employees.

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## What are the different kinds of OSPPs?

There are two major types:

- Comprehensive, which focuses on establishing comprehensive safety and health management systems at partnering worksites; and
- Limited, which helps identify and eliminate hazards associated with worker deaths, injuries, and illnesses, or have goals other than establishing comprehensive worksite safety and health programs.

OSHA is interested in creating new OSPPs at the national, regional, and local levels. OSHA also has found limited partnerships to be valuable. Limited partnerships might address the elimination or control of a specific industry hazard.

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## What are the benefits of participation in the OSPP?

Like VPP, OSPP can mean the following:

- Fewer worker fatalities, injuries, and illnesses;
- Lower workers' compensation and other injury- and illness-related costs;
- Improved employee motivation to work safely, leading to a better quality of life at work and enhanced productivity;
- Positive community recognition and interaction;
- Development of or improvement in safety and health management systems; and
- Positive interaction with OSHA.

For more information about this program, contact your nearest OSHA office or go to the agency website at [www.osha.gov](http://www.osha.gov).

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## **Does OSHA have occupational safety and health training for employers and employees?**

Yes. The OSHA Training Institute in Des Plaines, IL, provides basic and advanced training and education in safety and health for federal and state compliance officers, state consultants, other federal agency personnel, and private-sector employers, employees, and their representatives.

Institute courses cover diverse safety and health topics including electrical hazards, machine guarding, personal protective equipment, ventilation, and ergonomics. The facility includes classrooms, laboratories, a library, and an audiovisual unit. The laboratories contain various demonstrations and equipment, such as power presses, woodworking and welding shops, a complete industrial ventilation unit, and a sound demonstration laboratory. More than 57 courses dealing with subjects such as safety and health in the construction industry and methods of compliance with OSHA standards are available for personnel in the private sector.

In addition, OSHA's 73 area offices are full-service centers offering a variety of informational services such as personnel for speaking engagements, publications, audiovisual aids on workplace hazards, and technical advice.

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## **Does OSHA give money to organizations for training and education?**

OSHA awards grants through its Susan Harwood Training Grant Program to nonprofit organizations to provide safety and health training and education to employers and workers in the workplace. The grants focus on programs that will educate workers and employers in small business (fewer than 250 employees), train workers and employers about new OSHA standards, or a high-risk activities or hazards. Grants are awarded for 1 year and may be renewed for an additional 12 months depending on whether the grantee has performed satisfactorily.

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OSHA expects each organization awarded a grant to develop a training and/or education program that addresses a safety and health topic named by OSHA, recruit workers and employers for the training, and conduct the training. Grantees are also expected to follow up with people who have been trained to find out what changes were made to reduce the hazards in their workplaces as a result of the training.

Each year OSHA has a national competition that is announced in the *Federal Register* and on the Internet at [www.osha-slc.gov/Training/sharwood/sharwood.html](http://www.osha-slc.gov/Training/sharwood/sharwood.html). If you do not have access to the Internet, you can contact the OSHA Office of Training and Education, 1555 Times Drive, Des Plaines, IL 60018, (847) 297-4810, for more information.

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### **Does OSHA have other assistance materials available?**

Yes. OSHA has a variety of materials and tools available on its website at [www.osha.gov](http://www.osha.gov). These include eTools, Expert Advisors, Electronic Compliance Assistance Tools (eCATS), Technical Links, regulations, directives, publications, videos, and other information for employers and employees. OSHA's software programs and compliance assistance tools walk you through challenging safety and health issues and common problems to find the best solutions for your workplace. OSHA's comprehensive publications program includes more than 100 titles to help you understand OSHA requirements and programs.

OSHA's CD-ROM includes standards, interpretations, directives, and more and can be purchased on CD-ROM from the U.S. Government Printing Office. To order, write to the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, or phone (202) 512-1800. Specify *OSHA Regulations, Documents and Technical Information on CD-ROM (ORDT)*, GPO Order No. S/N 729-013-00000-5.

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## What do I do in case of an emergency or to file a complaint?

To report an emergency, file a complaint, or seek OSHA advice, assistance, or products, call (800) 321-OSHA or contact your nearest OSHA regional or area office listed at the end of this publication. The teletypewriter (TTY) number is (877) 889-5627.

You can also file a complaint online and obtain more information on OSHA federal and state programs by visiting OSHA's website at [www.osha.gov](http://www.osha.gov).

For more information on grants, training, and education, write: OSHA Training Institute, Office of Training and Education, 1555 Times Drive, Des Plaines, IL 60018; call (847) 297-4810; or see **Outreach** on OSHA's website at [www.osha.gov](http://www.osha.gov).

### OSHA Regional Offices

#### Region I

(CT,\* MA, ME, NH, RI, VT\*)  
JFK Federal Building  
Room E-340  
Boston, MA 02203  
Telephone: (617) 565-9860

#### Region II

(NJ,\* NY,\* PR,\* VI\*)  
201 Varick Street  
Room 670  
New York, NY 10014  
Telephone: (212) 337-2378

#### Region III

(DC, DE, MD,\* PA, VA,\* WV)  
The Curtis Center—Suite 740 West  
170 S. Independence Mall West  
Philadelphia, PA 19106-3309  
Telephone: (215) 861-4900

#### Region IV

(AL, FL, GA, KY,\* MS, NC,\* SC,\* TN\*)  
Atlanta Federal Center  
61 Forsyth Street, SW, Room 6T50  
Atlanta, GA 30303  
Telephone: (404) 562-2300

#### Region V

(IL, IN,\* MI,\* MN,\* OH, WI)  
230 South Dearborn Street  
Room 3244  
Chicago, IL 60604  
Telephone: (312) 353-2220

#### Region VI

(AR, LA, MN,\* OK, TX)  
525 Griffin Street  
Room 602  
Dallas, TX 75202  
Telephone: (214) 767-4731

#### Region VII

(IA,\* KS, MO, NE)  
City Center Square  
1100 Main Street, Suite 800  
Kansas City, MO 64105  
Telephone: (816) 426-5861

#### Region VIII

(CO, MT, ND, SD, UT,\* WY\*)  
1999 Broadway  
Suite 1690  
Denver, CO 80802-5716  
Telephone: (303) 844-1600

#### Region IX

(American Samoa, AZ,\* CA,\* Guam, HI,\* NV,\*  
Commonwealth of the  
Northern Mariana Islands)  
71 Stevenson Street  
4th Floor  
San Francisco, CA 94105  
Telephone: (415) 975-4310

#### Region X

(AK,\* ID, OR,\* WA\*)  
1111 Third Avenue  
Suite 715  
Seattle, WA 98101-3212  
Telephone: (206) 553-5930

\* These states and territories operate their own OSHA-approved job safety and health programs (Connecticut, New Jersey, and New York plans cover public employees only). States with approved programs must have a standard that is identical to, or at least as effective as, the federal standard.

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## OSHA Area Offices

Anchorage, AK (907) 271-5152	Tucker, GA (770) 493-6644/6742/8419
Birmingham, AL (205) 731-1534	Des Moines, IA (515) 284-4794
Mobile, AL (334) 441-6131	Boise, ID (208) 321-2960
Little Rock, AR (501) 324-6291 (5818)	Calumet City, IL (708) 891-3800
Phoenix, AZ (602) 640-2348	Des Plaines, IL (847) 803-4800
Sacramento, CA (916) 566-7471	Fairview Heights, IL (618) 632-8612
San Diego, CA (619) 557-5909	North Aurora, IL (630) 896-8700
Denver, CO (303) 844-5285	Peoria, IL (309) 671-7033
Englewood, CO (303) 843-4500	Indianapolis, IN (317) 226-7290
Bridgeport, CT (203) 579-5581	Wichita, KS (316) 269-6644
Hartford, CT (860) 240-3152	Frankfort, KY (502) 227-7024
Wilmington, DE (302) 573-6518	Baton Rouge, LA (225) 389-0474 (0431)
Fort Lauderdale, FL (954) 424-0242	Braintree, MA (617) 565-6924
Jacksonville, FL (904) 232-2895	Methuen, MA (617) 565-8110
Tampa, FL (813) 626-1177	Springfield, MA (413) 785-0123
Savannah, GA (912) 652-4393	Linthicum, MD (410) 865-2055/2056
Smyrna, GA (770) 984-8700	Augusta, ME (207) 622-8417

Bangor, ME  
(207) 941-8177

Portland, ME  
(207) 780-3178

Lansing, MI  
(517) 327-0904

Minneapolis, MN  
(612) 664-5460

Kansas City, MO  
(816) 483-9531

St. Louis, MO  
(314) 425-4289

Jackson, MS  
(601) 965-4606

Billings, MT  
(406) 247-7494

Raleigh, NC  
(919) 856-4770

Bismark, ND  
(701) 250-4521

Omaha, NE  
(402) 221-3182

Concord, NH  
(603) 225-1629

Avenel, NJ  
(732) 750-3270

Hasbrouck Heights, NJ  
(201) 288-1700

Marlton, NJ  
(609) 757-5181

Parsippany, NJ  
(973) 263-1003

Albuquerque, NM  
(505) 248-5302

Carson City, NV  
(775) 885-6963

Albany, NY  
(518) 464-4338

Bayside, NY  
(718) 279-9060

Bowmansville, NY  
(716) 684-3891

New York, NY  
(212) 466-2482

North Syracuse, NY  
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**Occupational Safety  
and Health Administration**

U.S. Department of Labor

- **Part Number:** 1910
  - **Part Title:** Occupational Safety and Health Standards
  - **Subpart:** J
  - **Subpart Title:** General Environmental Controls
  - **Standard Number:** 1910.147
  - **Title:** The control of hazardous energy (lockout/tagout).
  - **Appendix:** A
- 

## **1910.147(a)**

### **Scope, application and purpose -**

#### **1910.147(a)(1)**

##### **Scope**

#### **1910.147(a)(1)(i)**

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. This standard establishes minimum performance requirements for the control of such hazardous energy.

#### **1910.147(a)(1)(ii)**

This standard does not cover the following:

#### **1910.147(a)(1)(ii)(A)**

Construction, agriculture and maritime employment;

#### **1910.147(a)(1)(ii)(B)**

Installations under the exclusive control of electric utilities for the purpose of power generation, transmission and distribution, including related equipment for communication or metering; and

#### **1910.147(a)(1)(ii)(C)**

Exposure to electrical hazards from work on, near, or with conductors or equipment in electric utilization installations, which is covered by Subpart S of this part; and

#### **..1910.147(a)(1)(ii)(D)**

#### **1910.147(a)(1)(ii)(D)**

Oil and gas well drilling and servicing.

#### **1910.147(a)(2)**

##### **Application.**

#### **1910.147(a)(2)(i)**

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This standard applies to the control of energy during servicing and/or maintenance of machines and equipment.

**1910.147(a)(2)(ii)**

Normal production operations are not covered by this standard (See Subpart O of this Part). Servicing and/or maintenance which takes place during normal production operations is covered by this standard only if:

**1910.147(a)(2)(ii)(A)**

An employee is required to remove or bypass a guard or other safety device; or

**1910.147(a)(2)(ii)(B)**

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) or where an associated danger zone exists during a machine operating cycle.

Note: **Exception to paragraph (a)(2)(ii):** Minor tool changes and adjustments, and other minor servicing activities, which take place during normal production operations, are not covered by this standard if they are routine, repetitive, and integral to the use of the equipment for production, provided that the work is performed using alternative measures which provide effective protection (See Subpart O of this Part).

**1910.147(a)(2)(iii)**

This standard does not apply to the following:

**..1910.147(a)(2)(iii)(A)**

**1910.147(a)(2)(iii)(A)**

Work on cord and plug connected electric equipment for which exposure to the hazards of unexpected energization or start up of the equipment is controlled by the unplugging of the equipment from the energy source and by the plug being under the exclusive control of the employee performing the servicing or maintenance.

**1910.147(a)(2)(iii)(B)**

Hot tap operations involving transmission and distribution systems for substances such as gas, steam, water or petroleum products when they are performed on pressurized pipelines, provided that the employer demonstrates that-

**1910.147(a)(2)(iii)(B)(1)**

continuity of service is essential;

**1910.147(a)(2)(iii)(B)(2)**

shutdown of the system is impractical; and

**1910.147(a)(2)(iii)(B)(3)**

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documented procedures are followed, and special equipment is used which will provide proven effective protection for employees.

### **1910.147(a)(3)**

#### **Purpose.**

### **1910.147(a)(3)(i)**

This section requires employers to establish a program and utilize procedures for affixing appropriate lockout devices or tagout devices to energy isolating devices, and to otherwise disable machines or equipment to prevent unexpected energization, start up or release of stored energy in order to prevent injury to employees.

### **1910.147(a)(3)(ii)**

When other standards in this part require the use of lockout or tagout, they shall be used and supplemented by the procedural and training requirements of this section.

### **1910.147(b)**

#### **Definitions applicable to this section.**

**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.



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**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.

## **..1910.147(c)**

### **1910.147(c)**

#### **General -**

#### **[1910.147\(c\)\(1\)](#)**

**Energy control program.** The employer shall establish a program consisting of energy control procedures, employee training and periodic inspections to ensure that before any employee performs any servicing or maintenance on a machine or equipment where the unexpected energizing, startup or release of stored energy could occur and cause injury, the machine or equipment shall be isolated from the energy source and rendered inoperative.

#### **[1910.147\(c\)\(2\)](#)**

#### **Lockout/tagout.**

##### **1910.147(c)(2)(i)**

If an energy isolating device is not capable of being locked out, the employer's energy control program under paragraph (c)(1) of this section shall utilize a tagout system.

##### **1910.147(c)(2)(ii)**

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If an energy isolating device is capable of being locked out, the employer's energy control program under paragraph (c)(1) of this section shall utilize lockout, unless the employer can demonstrate that the utilization of a tagout system will provide full employee protection as set forth in paragraph (c)(3) of this section.

#### **1910.147(c)(2)(iii)**

After January 2, 1990, whenever replacement or major repair, renovation or modification of a machine or equipment is performed, and whenever new machines or equipment are installed, energy isolating devices for such machine or equipment shall be designed to accept a lockout device.

#### **1910.147(c)(3)**

##### **Full employee protection.**

##### **1910.147(c)(3)(i)**

When a tagout device is used on an energy isolating device which is capable of being locked out, the tagout device shall be attached at the same location that the lockout device would have been attached, and the employer shall demonstrate that the tagout program will provide a level of safety equivalent to that obtained by using a lockout program.

##### **..1910.147(c)(3)(ii)**

##### **1910.147(c)(3)(ii)**

In demonstrating that a level of safety is achieved in the tagout program which is equivalent to the level of safety obtained by using a lockout program, the employer shall demonstrate full compliance with all tagout-related provisions of this standard together with such additional elements as are necessary to provide the equivalent safety available from the use of a lockout device. Additional means to be considered as part of the demonstration of full employee protection shall include the implementation of additional safety 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.

#### **1910.147(c)(4)**

##### **Energy control procedure.**

##### **1910.147(c)(4)(i)**

Procedures shall be developed, documented and utilized for the control of potentially hazardous energy when employees are engaged in the activities covered by this section.

Note: **Exception:** The employer need not document the required procedure for a particular machine or equipment, when all of the following elements exist: (1) The machine or equipment has no potential for stored or residual energy or reaccumulation of stored energy after shut down which could endanger employees; (2) the machine or equipment has a single energy source which can be readily identified and isolated; (3) the isolation and locking out of that energy source will completely deenergize and deactivate the machine or equipment; (4) the machine or equipment is isolated from that energy source and locked out during servicing or maintenance; (5) a single lockout device will achieve a lockout condition; (6) the lockout device is under the exclusive control of the authorized employee performing the servicing or maintenance; (7) the servicing or maintenance does not create hazards for other employees; and (8) the employer, in utilizing this exception, has had no accidents involving the unexpected activation or reenergization of the machine or equipment during servicing or

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maintenance.

**1910.147(c)(4)(ii)**

The procedures shall clearly and specifically outline the scope, purpose, authorization, rules, and techniques to be utilized for the control of hazardous energy, and the means to enforce compliance including, but not limited to, the following:

**1910.147(c)(4)(ii)(A)**

A specific statement of the intended use of the procedure;

**1910.147(c)(4)(ii)(B)**

Specific procedural steps for shutting down, isolating, blocking and securing machines or equipment to control hazardous energy;

**1910.147(c)(4)(ii)(C)**

Specific procedural steps for the placement, removal and transfer of lockout devices or tagout devices and the responsibility for them; and

**..1910.147(c)(4)(ii)(D)**

**1910.147(c)(4)(ii)(D)**

Specific requirements for testing a machine or equipment to determine and verify the effectiveness of lockout devices, tagout devices, and other energy control measures.

**1910.147(c)(5)**

**Protective materials and hardware.**

**1910.147(c)(5)(i)**

Locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners, or other hardware shall be provided by the employer for isolating, securing or blocking of machines or equipment from energy sources.

**1910.147(c)(5)(ii)**

Lockout devices and tagout devices shall be singularly identified; shall be the only devices(s) used for controlling energy; shall not be used for other purposes; and shall meet the following requirements:

**1910.147(c)(5)(ii)(A)**

**Durable.**

**1910.147(c)(5)(ii)(A)(1)**

Lockout and tagout devices shall be capable of withstanding the environment to which they are exposed for the maximum period of time that exposure is expected.

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**1910.147(c)(5)(ii)(A)(2)**

Tagout devices shall be constructed and printed so that exposure to weather conditions or wet and damp locations will not cause the tag to deteriorate or the message on the tag to become illegible.

**1910.147(c)(5)(ii)(A)(3)**

Tags shall not deteriorate when used in corrosive environments such as areas where acid and alkali chemicals are handled and stored.

**..1910.147(c)(5)(ii)(B)**

**1910.147(c)(5)(ii)(B)**

**Standardized.** Lockout and tagout devices shall be standardized within the facility in at least one of the following criteria: Color; shape; or size; and additionally, in the case of tagout devices, print and format shall be standardized.

**1910.147(c)(5)(ii)(C)**

**Substantial -**

**1910.147(c)(5)(ii)(C)(1)**

**Lockout devices.** Lockout devices shall be substantial enough to prevent removal without the use of excessive force or unusual techniques, such as with the use of bolt cutters or other metal cutting tools.

**1910.147(c)(5)(ii)(C)(2)**

**Tagout devices.** Tagout devices, including their means of attachment, shall be substantial enough to prevent inadvertent or accidental removal. Tagout device attachment means shall be of a non-reusable type, attachable by hand, self-locking, and non-releasable with a minimum unlocking strength of no less than 50 pounds and having the general design and basic characteristics of being at least equivalent to a one-piece, all environment-tolerant nylon cable tie.

**1910.147(c)(5)(ii)(D)**

**Identifiable.** Lockout devices and tagout devices shall indicate the identity of the employee applying the device(s).

**1910.147(c)(5)(iii)**

Tagout devices shall warn against hazardous conditions if the machine or equipment is energized and shall include a legend such as the following: **Do Not Start. Do Not Open. Do Not Close. Do Not Energize. Do Not Operate.**

**..1910.147(c)(6)**

**1910.147(c)(6)**

**Periodic inspection.**

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**1910.147(c)(6)(i)**

The employer shall conduct a periodic inspection of the energy control procedure at least annually to ensure that the procedure and the requirements of this standard are being followed.

**1910.147(c)(6)(i)(A)**

The periodic inspection shall be performed by an authorized employee other than the ones(s) utilizing the energy control procedure being inspected.

**1910.147(c)(6)(i)(B)**

The periodic inspection shall be conducted to correct any deviations or inadequacies identified.

**1910.147(c)(6)(i)(C)**

Where lockout is used for energy control, the periodic inspection shall include a review, between the inspector and each authorized employee, of that employee's responsibilities under the energy control procedure being inspected.

**1910.147(c)(6)(i)(D)**

Where tagout is used for energy control, the periodic inspection shall include a review, between the inspector and each authorized and affected employee, of that employee's responsibilities under the energy control procedure being inspected, and the elements set forth in paragraph (c)(7)(ii) of this section.

**..1910.147(c)(6)(ii)****1910.147(c)(6)(ii)**

The employer shall certify that the periodic inspections have been performed. The certification shall identify the machine or equipment on which the energy control procedure was being utilized, the date of the inspection, the employees included in the inspection, and the person performing the inspection.

**1910.147(c)(7)****Training and communication.****1910.147(c)(7)(i)**

The employer shall provide training to ensure that the purpose and function of the energy control program are understood by employees and that the knowledge and skills required for the safe application, usage, and removal of the energy controls are acquired by employees. The training shall include the following:

**1910.147(c)(7)(i)(A)**

Each authorized employee shall receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for energy isolation and control.

**1910.147(c)(7)(i)(B)**

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Each affected employee shall be instructed in the purpose and use of the energy control procedure.

**1910.147(c)(7)(i)(C)**

All other employees whose work operations are or may be in an area where energy control procedures may be utilized, shall be instructed about the procedure, and about the prohibition relating to attempts to restart or reenergize machines or equipment which are locked out or tagged out.

**1910.147(c)(7)(ii)**

When tagout systems are used, employees shall also be trained in the following limitations of tags:

**..1910.147(c)(7)(ii)(A)**

**1910.147(c)(7)(ii)(A)**

Tags are essentially warning devices affixed to energy isolating devices, and do not provide the physical restraint on those devices that is provided by a lock.

**1910.147(c)(7)(ii)(B)**

When a tag is attached to an energy isolating means, it is not to be removed without authorization of the authorized person responsible for it, and it is never to be bypassed, ignored, or otherwise defeated.

**1910.147(c)(7)(ii)(C)**

Tags must be legible and understandable by all authorized employees, affected employees, and all other employees whose work operations are or may be in the area, in order to be effective.

**1910.147(c)(7)(ii)(D)**

Tags and their means of attachment must be made of materials which will withstand the environmental conditions encountered in the workplace.

**1910.147(c)(7)(ii)(E)**

Tags may evoke a false sense of security, and their meaning needs to be understood as part of the overall energy control program.

**1910.147(c)(7)(ii)(F)**

Tags must be securely attached to energy isolating devices so that they cannot be inadvertently or accidentally detached during use.

**1910.147(c)(7)(iii)**

Employee retraining.

**..1910.147(c)(7)(iii)(A)**

**1910.147(c)(7)(iii)(A)**

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Retraining shall be provided for all authorized and affected employees whenever there is a change in their job assignments, a change in machines, equipment or processes that present a new hazard, or when there is a change in the energy control procedures.

**1910.147(c)(7)(iii)(B)**

Additional retraining shall also be conducted whenever a periodic inspection under paragraph (c)(6) of this section reveals, or whenever the employer has reason to believe that there are deviations from or inadequacies in the employee's knowledge or use of the energy control procedures.

**1910.147(c)(7)(iii)(C)**

The retraining shall reestablish employee proficiency and introduce new or revised control methods and procedures, as necessary.

**1910.147(c)(7)(iv)**

The employer shall certify that employee training has been accomplished and is being kept up to date. The certification shall contain each employee's name and dates of training.

**1910.147(c)(8)**

**Energy isolation.** Lockout or tagout shall be performed only by the authorized employees who are performing the servicing or maintenance.

**1910.147(c)(9)**

**Notification of employees.** Affected employees shall be notified by the employer or authorized employee of the application and removal of lockout devices or tagout devices. Notification shall be given before the controls are applied, and after they are removed from the machine or equipment.

**..1910.147(d)**

**1910.147(d)**

**Application of control.** The established procedures for the application of energy control (the lockout or tagout procedures) shall cover the following elements and actions and shall be done in the following sequence:

**1910.147(d)(1)**

**Preparation for shutdown.** Before an authorized or affected employee turns off a machine or equipment, the authorized employee shall have knowledge of the type and magnitude of the energy, the hazards of the energy to be controlled, and the method or means to control the energy.

**1910.147(d)(2)**

**Machine or equipment shutdown.** The machine or equipment shall be turned off or shut down using the procedures established for the machine or equipment. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the equipment stoppage.

**1910.147(d)(3)**

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**Machine or equipment isolation.** All energy isolating devices that are needed to control the energy to the machine or equipment shall be physically located and operated in such a manner as to isolate the machine or equipment from the energy source(s).

**1910.147(d)(4)**

**Lockout or tagout device application.**

**1910.147(d)(4)(i)**

Lockout or tagout devices shall be affixed to each energy isolating device by authorized employees.

**..1910.147(d)(4)(ii)**

**1910.147(d)(4)(ii)**

Lockout devices, where used, shall be affixed in a manner to that will hold the energy isolating devices in a "safe" or "off" position.

**1910.147(d)(4)(iii)**

Tagout devices, where used, shall be affixed in such a manner as will clearly indicate that the operation or movement of energy isolating devices from the "safe" or "off" position is prohibited.

**1910.147(d)(4)(iii)(A)**

Where tagout devices are used with energy isolating devices designed with the capability of being locked, the tag attachment shall be fastened at the same point at which the lock would have been attached.

**1910.147(d)(4)(iii)(B)**

Where a tag cannot be affixed directly to the energy isolating device, the tag shall be located as close as safely possible to the device, in a position that will be immediately obvious to anyone attempting to operate the device.

**1910.147(d)(5)**

**Stored energy.**

**1910.147(d)(5)(i)**

Following the application of lockout or tagout devices to energy isolating devices, all potentially hazardous stored or residual energy shall be relieved, disconnected, restrained, and otherwise rendered safe.

**..1910.147(d)(5)(ii)**

**1910.147(d)(5)(ii)**

If there is a possibility of reaccumulation of stored energy to a hazardous level, verification of isolation shall be continued until the servicing or maintenance is completed, or until the possibility of such accumulation no longer exists.



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**1910.147(d)(6)**

**Verification of isolation.** Prior to starting work on machines or equipment that have been locked out or tagged out, the authorized employee shall verify that isolation and deenergization of the machine or equipment have been accomplished.

**1910.147(e)**

**Release from lockout or tagout.** Before lockout or tagout devices are removed and energy is restored to the machine or equipment, procedures shall be followed and actions taken by the authorized employee(s) to ensure the following:

**1910.147(e)(1)**

**The machine or equipment.** The work area shall be inspected to ensure that nonessential items have been removed and to ensure that machine or equipment components are operationally intact.

**1910.147(e)(2)**

**Employees.**

**1910.147(e)(2)(i)**

The work area shall be checked to ensure that all employees have been safely positioned or removed.

**1910.147(e)(2)(ii)**

After lockout or tagout devices have been removed and before a machine or equipment is started, affected employees shall be notified that the lockout or tagout device(s) have been removed.

**1910.147(e)(3)**

**Lockout or tagout devices removal.** Each lockout or tagout device shall be removed from each energy isolating device by the employee who applied the device. **Exception to paragraph (e)(3):** When the authorized employee who applied the lockout or tagout device is not available to remove it, that device may be removed under the direction of the employer, provided that specific procedures and training for such removal have been developed, documented and incorporated into the employer's energy control program. The employer shall demonstrate that the specific procedure provides equivalent safety to the removal of the device by the authorized employee who applied it. The specific procedure shall include at least the following elements:

**1910.147(e)(3)(i)**

Verification by the employer that the authorized employee who applied the device is not at the facility:

**1910.147(e)(3)(ii)**

Making all reasonable efforts to contact the authorized employee to inform him/her that his/her lockout or tagout device has been removed; and

**1910.147(e)(3)(iii)**

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Ensuring that the authorized employee has this knowledge before he/she resumes work at that facility.

**..1910.147(f)**

**1910.147(f)**

**Additional requirements.**

**1910.147(f)(1)**

**Testing or positioning of machines, equipment or components thereof.** In situations in which lockout or tagout devices must be temporarily removed from the energy isolating device and the machine or equipment energized to test or position the machine, equipment or component thereof, the following sequence of actions shall be followed:

**1910.147(f)(1)(i)**

Clear the machine or equipment of tools and materials in accordance with paragraph (e)(1) of this section;

**1910.147(f)(1)(ii)**

Remove employees from the machine or equipment area in accordance with paragraph (e)(2) of this section;

**1910.147(f)(1)(iii)**

Remove the lockout or tagout devices as specified in paragraph (e)(3) of this section;

**1910.147(f)(1)(iv)**

Energize and proceed with testing or positioning;

**1910.147(f)(1)(v)**

Deenergize all systems and reapply energy control measures in accordance with paragraph (d) of this section to continue the servicing and/or maintenance.

**1910.147(f)(2)**

**Outside personnel (contractors, etc.).**

**1910.147(f)(2)(i)**

Whenever outside servicing personnel are to be engaged in activities covered by the scope and application of this standard, the on-site employer and the outside employer shall inform each other of their respective lockout or tagout procedures.

**..1910.147(f)(2)(ii)**

**1910.147(f)(2)(ii)**

The on-site employer shall ensure that his/her employees understand and comply with the restrictions and

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prohibitions of the outside employer's energy control program.

### **1910.147(f)(3)**

#### **Group lockout or tagout.**

##### **1910.147(f)(3)(i)**

When servicing and/or maintenance is performed by a crew, craft, department or other group, they shall utilize a procedure which affords the employees a level of protection equivalent to that provided by the implementation of a personal lockout or tagout device.

##### **1910.147(f)(3)(ii)**

Group lockout or tagout devices shall be used in accordance with the procedures required by paragraph (c)(4) of this section including, but not necessarily limited to, the following specific requirements:

##### **1910.147(f)(3)(ii)(A)**

Primary responsibility is vested in an authorized employee for a set number of employees working under the protection of a group lockout or tagout device (such as an operations lock);

##### **1910.147(f)(3)(ii)(B)**

Provision for the authorized employee to ascertain the exposure status of individual group members with regard to the lockout or tagout of the machine or equipment and

##### **1910.147(f)(3)(ii)(C)**

When more than one crew, craft, department, etc. is involved, assignment of overall job-associated lockout or tagout control responsibility to an authorized employee designated to coordinate affected work forces and ensure continuity of protection; and

##### **..1910.147(f)(3)(ii)(D)**

##### **1910.147(f)(3)(ii)(D)**

Each authorized employee shall affix a personal lockout or tagout device to the group lockout device, group lockbox, or comparable mechanism when he or she begins work, and shall remove those devices when he or she stops working on the machine or equipment being serviced or maintained.

##### **1910.147(f)(4)**

**Shift or personnel changes.** Specific procedures shall be utilized during shift or personnel changes to ensure the continuity of lockout or tagout protection, including provision for the orderly transfer of lockout or tagout device protection between off-going and oncoming employees, to minimize exposure to hazards from the unexpected energization or start-up of the machine or equipment, or the release of stored energy.

Note: The following appendix to §1910.147 services as a non-mandatory guideline to assist employers and employees in complying with the requirements of this section, as well as to provide other helpful information. Nothing in the appendix adds to or detracts from any of the requirements of this section.

- **Part Number:** 1910
  - **Part Title:** Occupational Safety and Health Standards
  - **Subpart:** J
  - **Subpart Title:** General Environmental Controls
  - **Standard Number:** 1910.147 App A
  - **Title:** Typical minimal lockout procedures
- 

*General*

The following simple lockout procedure is provided to assist employers in developing their procedures so they meet the requirements of this standard. When the energy isolating devices are not lockable, tagout may be used, provided the employer complies with the provisions of the standard which require additional training and more rigorous periodic inspections. When tagout is used and the energy isolating devices are lockable, the employer must provide full employee protection (see paragraph (c)(3)) and additional training and more rigorous periodic inspections are required. For more complex systems, more comprehensive procedures may need to be developed, documented, and utilized.

Lockout Procedure

Lockout Procedure for

\_\_\_\_\_

(Name of Company for single procedure or identification of equipment if multiple procedures are used).

*Purpose*

This procedure establishes the minimum requirements for the lockout of energy isolating devices whenever maintenance or servicing is done on machines or equipment. It shall be used to ensure that the machine or equipment is stopped, isolated from all potentially hazardous energy sources and locked out before employees perform any servicing or maintenance where the unexpected energization or start-up of the machine or equipment or release of stored energy could cause injury.

*Compliance With This Program*

All employees are required to comply with the restrictions and limitations imposed upon them during the use of lockout. The authorized employees are required to perform the lockout in accordance with this procedure. All employees, upon observing a machine or piece of equipment which is locked out to perform servicing or maintenance shall not attempt to start, energize, or use that machine or equipment.

\_\_\_\_\_

Type of compliance enforcement to be taken for violation of the above.

*Sequence of Lockout*

(1) 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.

\_\_\_\_\_

Name(s)/Job Title(s) of affected employees and how to notify.

(2) 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.

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Type(s) and magnitude(s) of energy, its hazards and the methods to control the energy.

(3) If the machine or equipment is operating, shut it down by the normal stopping procedure (depress the stop button, open switch, close valve, etc.).

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Type(s) and location(s) of machine or equipment operating controls.

(4) De-activate the energy isolating device(s) so that the machine or equipment is isolated from the energy source(s).

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Type(s) and location(s) of energy isolating devices.

(5) Lock out the energy isolating device(s) with assigned individual lock(s).

(6) Stored or residual energy (such as that 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, repositioning, blocking, bleeding down, etc.

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Type(s) of stored energy - methods to dissipate or restrain.

(7) 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 "off" position after verifying the isolation of the equipment.

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Method of verifying the isolation of the equipment.

(8) The machine or equipment is now locked out.

*Restoring Equipment to Service.* When the servicing or maintenance is completed and the machine or equipment is ready to return to normal operating condition, the following steps shall be taken.

(1) 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.

(2) Check the work area to ensure that all employees have been safely positioned or removed from the area.

(3) Verify that the controls are in neutral.

(4) Remove the lockout devices and reenergize the machine or equipment.

Note: The removal of some forms of blocking may require reenergization of of the machine before safe removal.

(5) Notify affected employees that the servicing or maintenance is completed and the machine or equipment is ready for use.