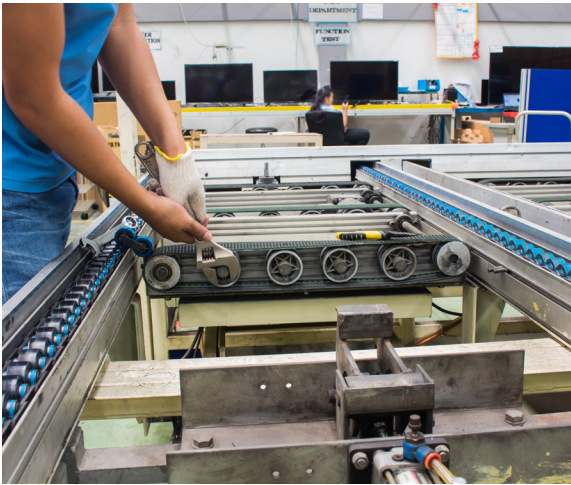




## Controls for Hazardous Energies



**Including  
Lockout/Tagout**



October 2022

This document is neither a substitute for, nor a legal interpretation of, the occupational safety and health regulations. Readers must refer directly to title 8 of the California Code of Regulations and the Labor Code for details regarding the regulations' scopes, specifications, and exceptions, and other requirements that may apply to their operations.

Workplace safety and health information is available online at:

- General information: [www.dir.ca.gov/dosh](http://www.dir.ca.gov/dosh)
- Cal/OSHA regulations: [www.dir.ca.gov/samples/search/query.htm](http://www.dir.ca.gov/samples/search/query.htm)
- Cal/OSHA safety and health publications: [www.dir.ca.gov/dosh/puborder.asp](http://www.dir.ca.gov/dosh/puborder.asp)
- Cal/OSHA etools: [www.dir.ca.gov/dosh/etools/etools.htm](http://www.dir.ca.gov/dosh/etools/etools.htm)

Cal/OSHA Consultation Services offers free telephone, email, and onsite assistance. Find a local office online ([www.dir.ca.gov/dosh/consultation.html](http://www.dir.ca.gov/dosh/consultation.html)) or with the contact information listed in the back of this document.

Copyright © 2022 State of California, Department of Industrial Relations.  
Permission granted to display, perform, reproduce and distribute exclusively for nonprofit and educational purposes, and may not be used for any commercial purpose. All other rights reserved.

# Table of Contents

<b>Key Terms</b>	<b>i</b>
<b>Introduction</b>	<b>1</b>
What is hazardous energy?	1
What happens when hazardous energy is not controlled?	2
California Standards for Controlling Hazardous Energy	3
What employers are covered under the standards?	3
<b>Energy Control Methods</b>	<b>4</b>
Cleaning, Servicing, and Adjusting Operations	4
Repair Work and Setup Operations	4
Exception for Cord and Plug-Connected Electrical Equipment	5
Minor Servicing Exception	5
Repetitive Process Machines	5
Off vs. Locked Out	6
Interlocks Are Not a Substitute for Lockout	6
General Lockout Requirements	6
Shift or personnel changes.	7
Group Lockout/Tagout	7
Common Lockout Methods.	8
Locks, Blocks, and Accident Prevention Tags	9
Agricultural and construction equipment.	11
<b>Creating Hazardous Energy Control Methods and Procedures</b>	<b>12</b>
Evaluations for Energy Control Hazards	13
Writing the Hazardous Energy Control Procedures	13
Writing Machinery/Equipment-Specific Procedural Steps	14
Annual Program Evaluations.	17
<b>Training Employees.</b>	<b>18</b>
<b>Resources</b>	<b>19</b>
Applicable Safety Orders for Controls of Hazardous Energies.	19
Online Resources for Hazardous Energy Control	21



# Key Terms

The following key terms are a combination of definitions and terms found in title 8 of the California Code of Regulations, Code of Federal Regulations, and decisions after reconsideration of the California Occupational Safety and Health Appeals Board.

**Affected employee** is an employee whose job requires them to operate or use a machine or piece of equipment on which cleaning, repairing, servicing, setting-up, or adjusting operations are being performed under lockout or tagout, or whose job requires the employee to work in an area in which such activities are being performed.

**Authorized employee** is a qualified person who locks out or tags out specific machines or equipment in order to perform cleaning, repairing, servicing, setting-up, and adjusting operations on that machine or equipment. An affected employee becomes an authorized employee when that employee's duties include performing cleaning, repairing, servicing, unjamming, setting-up, and adjusting operations.

**Blanking or blinding** means the absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or a skillet blind) that completely covers the bore and that is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.

**Blockout devices** prevent the unexpected movement of machinery/equipment or their working parts from unexpected energization or other sources of energy.

**Cleaning** for the purposes of the control of hazardous energy in accordance with the

standard includes, but is not limited to, freeing the machine or equipment of any dirt or other foreign or offensive matter. Cleaning activities include work that is in preparation for cleaning.

**Disconnecting means** is a device, or group of devices, or other means by which the conductors of a circuit can be disconnected from their source of supply. The disconnecting means must be legibly marked to indicate its purpose and must be capable of being locked in the open position.

**Lockout** is the use of devices, positive methods, and procedures, that will result in the effective isolation or securing of prime movers, machinery, and equipment from mechanical, hydraulic, pneumatic, chemical, electrical, thermal, or other hazardous energy sources. Effectively locked out equipment cannot be operated until the lockout device is removed.

**Lockout devices** use 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. These include blank flanges and bolted slip blinds.

**Operations lock** is a group lock device that is under the control of the responsible authorized employee during group lockout or tagout activities.

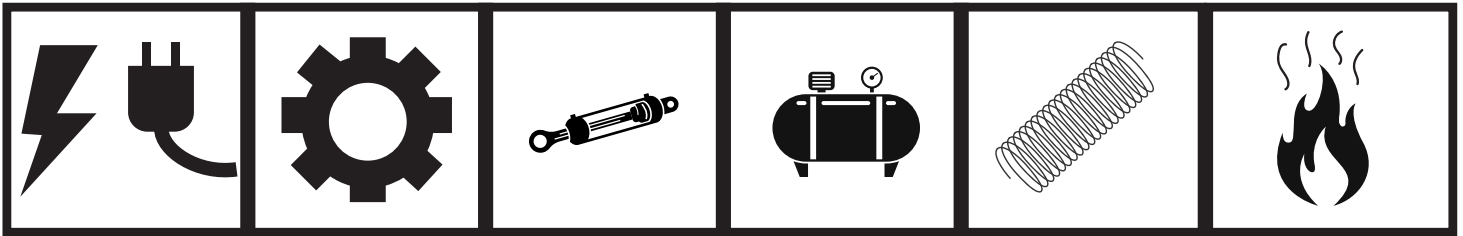


**Servicing** includes routine or minor service work, or other work that is intended to prevent damage to machinery or equipment being serviced. Servicing work also includes replacing a part before the part fails or production is interrupted. Service may be undertaken to enhance or maintain satisfactory functioning of a machine or piece of equipment in regards to quantity or quality of product or to avoid some undesirable side effect.

**Tagout** is 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 devices** are warning devices, such as a tag, that 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.

# Introduction



## What is hazardous energy?

Energy comes in many forms, such as electrical, mechanical, hydraulic, pneumatic, and thermal. Different kinds of energies cause machinery and equipment to move or do work. Any energy can be hazardous, especially when it is unexpectedly contacted (like electricity) or causes unintended movement of machinery or equipment while employees perform cleaning, repairing, servicing, setting up, adjusting, or unjamming activities on the machinery or equipment.

For example, employees can suffer a variety of injuries when hydraulic or pneumatic pressure is unexpectedly released. They can suffer electric shock, burns, or electrocution when they come into contact with live electrical components. They can suffer crushed body parts, amputations, or death when they become caught in or struck by machine or equipment parts that unexpectedly start to move.

To prevent such accidents, employers must implement and maintain a program and culture that promote safe work activities around all machinery and equipment. All employees working in machinery and equipment areas must be included in the hazardous energy control program.



## What happens when hazardous energy is not controlled?

Failure to develop and follow energy control procedures, including lockout/tagout, before working on machinery or equipment is a significant cause of serious injury and death to workers in California. Cal/OSHA investigates

fatalities and serious injuries and consistently finds that they could have been prevented. All employers should learn from these accidents and take action to protect their own employees.

Here are a few of the accidents and how they could have been prevented:

<p>● A mechanic untrained in lockout/tagout was unclogging the vacuum loading chamber of a machine when the vacuum actuated. His arm was amputated when the loading chamber lid closed on it.</p> <p><b>Prevention: Lock out machinery and potential energy sources to the vacuum, and mechanically block the movable lid before unclogging or unjamming the machine. Employers must conduct training and enforce their energy control procedures when employees are expected to unjam machinery.</b></p>	<p>● An employee's hand and arm were crushed when he attempted to clear a jam on an operating conveyor.</p> <p><b>Prevention: Disconnect power sources and lock out conveyors before unjamming them.</b></p>
<p>● A machine operator was changing out rolls at the end of a plastic-extruding process when he was crushed between the lower and upper turrets that wind the rolls of plastic sheeting. He died from his injuries.</p> <p><b>Prevention: De-energize the turrets while the rolls are being changed or implement alternative means or methods that are as effective.</b></p>	<p>● An employee was cleaning the table of a soup cup filler machine that was equipped with a heat sealant. When a coworker energized the machine, the heat sealant activated and dropped down, severing the employee's finger.</p> <p><b>Prevention: Establish and implement lockout/tagout procedures before cleaning machinery, and implement group lockout/tagout when more than one employee is working on the machine.</b></p>
<p>● A machine operator was cleaning a filling depositor for a pastry-making machine while it was running. The operator's hand was deformed when it was pulled into two moving screw conveyors inside the operating depositor.</p> <p><b>Prevention: Disconnect power sources and lock out all machinery and equipment before cleaning. Extension tools, if used, must be long enough to keep the employee's hands and body away from the zone of danger.</b></p>	<p>● A forklift operator was attempting to repair and reattach a hose on a robot arm of a palletizer when the palletizer activated, striking and crushing the employee.</p> <p><b>Prevention: Establish and implement lockout/tagout procedures and train authorized, affected, and all other employees as required.</b></p> <p>● A mechanic was fatally injured while repairing a dock plate when its supporting rod failed, causing the dock plate to fall and crush him.</p> <p><b>Prevention: Evaluate machinery and equipment in the worksite; identify all sources of energy, including gravitational energy; and use effective blocking as a protection method in the separate procedural steps, as needed.</b></p>



## California Standards for Controlling Hazardous Energy

California Code of Regulations, title 8, section **3314** of the General Industry Safety Orders specifies requirements for the cleaning, repairing, servicing, setting up, and adjusting of machines and equipment that could injure employees upon unexpected energization or start-up or release of stored energy. Hazardous energy controls must be implemented when employees conduct these work operations.

Sections **2320.4** and **2940.13** lay out the basic requirements for lockout, tagout, and blockout for hazardous energy control procedures for low-voltage and high-voltage electrical equipment systems, respectively. Sections **2320.2**, **2941**, **2943**, **2944**, and other sections of the Electrical Safety Orders specify the requirements for working on energized electrical equipment systems.

Section **1595** describes requirements for repairs on haulage and earthmoving vehicles in construction.

Section **3441** applies to servicing, adjusting, cleaning, unclogging, and maintaining agricultural equipment.

Section **3203** of the General Industry Safety Orders requires every employer to establish, implement, and maintain an injury and illness prevention program that includes the following:

- A training program designed to instruct employees in general safe work practices, plus specific instruction regarding any hazards unique to their job assignment.
- Scheduled inspections to identify, evaluate, and correct unsafe conditions and work practices.

More standards related to hazardous energy control and lockout/tagout are included in the **“Resources”** section of this publication.



### What employers are covered under the standards?

Employers must follow the requirements of the applicable standards if they conduct any of the work operations regulated by the standards.

Their employees fall into three categories, which determine the requirements for training and responsibilities:

- **Authorized employees**—conduct cleaning, repairing, servicing, setting-up, adjusting, or unjamming operations.
- **Affected employees**—machine/equipment operators or users and other employees who work in the area where energy control procedures are being performed.
- **All other employees** whose work may bring them to an area where energy control procedures could be utilized.



# Energy Control Methods

**F**or all regulated work operations (i.e., cleaning, servicing, adjusting, unjamming, repairing, and setting-up), accident prevention signs or tags, or both, must be placed on the controls of the machines, equipment, and prime movers (or the controls to the power source). However, if the employer has a uniform system with unique and personally identifiable locks placed on the source(s) of energy, then accident prevention signs or tags are not required.

## Cleaning, Servicing, and Adjusting Operations

To control hazardous energies, machinery or equipment that is capable of movement during cleaning, servicing, and adjusting operations (including unjamming) must be stopped and the power source de-energized. When necessary, moveable parts must be blocked or locked out. Employers must take into consideration all movement due to hazardous energies, including residual and stored energies, and protect employees from them.

If machinery or equipment must be capable of movement during cleaning, servicing, adjusting, or unjamming activities, then an appropriate extension tool (e.g., extended swabs, brushes, scrapers) or other means to protect employees from injury must be used. Employees must be thoroughly trained in the safe use and maintenance of the tools, methods, or means.

## Repair Work and Setup Operations

Methods to control hazardous energies during repair work and setup operations must require the prime movers, equipment, or power-driven machines to be locked out at the controls or locked out using another method that seals the controls in the “off” position. If the controls cannot be locked out, then positive means must be taken, such as de-energizing or disconnecting the equipment from its power source. The equipment, machine, or prime mover must be prevented from inadvertent movement or release of stored energy.

## Exception for Cord and Plug-Connected Electrical Equipment

Cleaning, servicing, adjusting, repairing, and setting-up work activities on cord and plug-connected electric equipment are allowed if the hazards of unexpected energization or start-up of the equipment are controlled by both of the following:

- Unplugging the equipment.
- Keeping the plug under the exclusive control of the employee performing the work.



Examples of plug lockout devices



## Minor Servicing Exception

Alternative energy control methods are allowed for minor tool changes and adjustments, and other minor servicing activities, that take place during the machine's normal production operations if both of the following conditions exist:

- The minor activities are routine, repetitive, and integral to the use of the equipment or machinery for production.
- The alternative measures provide effective protection for the employee against moving machinery and equipment.

If either of these conditions is not met, then the employer must implement a full lockout/tagout/blockout program in accordance with section **3314**.

## Repetitive Process Machines

If a repetitive process machine—such as a numerical control machine—requires power to maintain indexing, and repairs, adjustments, testing, or setup cannot be done with the hazardous energy source disconnected, then the following precautions must be taken:

- The operating station where the machine may be activated must at all times be under the control of a qualified operator.
- All participants must be in clear view of the operator or in positive communication with each other.
- All participants must be beyond the reach of machine elements that may move rapidly and present a hazard to them.
- Machine elements that can move rapidly must be separately locked out if the operator must leave the control station to install tools.
- The machine must be de-energized and disconnected from the power source during repair procedures where mechanical components are adjusted or replaced.



Example of a CNC (computer numerical control) machine



## Off vs. Locked Out

There is a difference between turning off a machine or piece of equipment and actually disengaging or de-energizing and locking it out. When an employee simply turns off a control switch, there are no positive means in place to prevent other employees from reactivating the machine or equipment. These accidents illustrate why this is not adequate:

- An employee lost her finger while cleaning a cup filler machine. A coworker had reactivated the machine while the employee was cleaning between the heat sealant and the rotating table.
- An employee had her finger broken and degloved when the dough sheeting machine was simply turned off but then turned on while she was cleaning rollers on the machine.

Prevent these accidents by requiring employees to place locks on the disconnecting means for machinery and equipment to prevent reactivation by other employees during the regulated work operation.

## Interlocks Are Not a Substitute for Lockout

An electrical interlock is a safety device that prevents a machine from harming its operator or damaging itself by stopping the machine when tripped. It is not a substitute for lockout because it is prone to failure and can be easily defeated by workers and supervisors. Relying on interlocks can create a false sense of security:

- A machinist was crushed and seriously injured when he was making adjustments on a molding machine that was on and running. The interlock on the door had been bypassed.

This could have been prevented by implementing energy control procedures, including lockout, tagout, or blockout, regardless of the presence of interlocks on machinery or equipment.



Interlocks are often placed on doors of machines or equipment

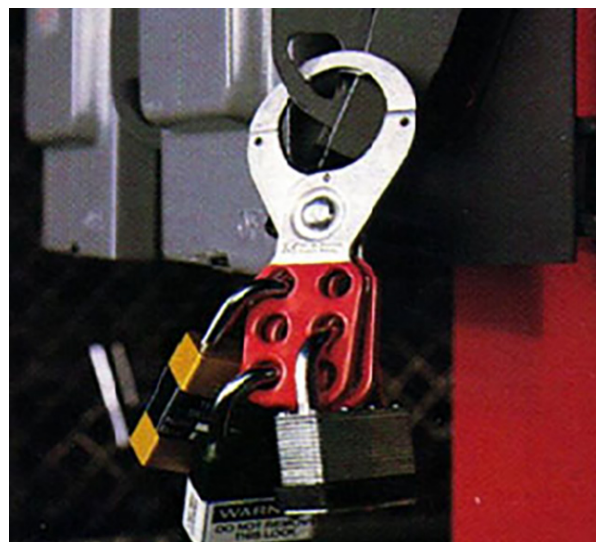
## General Lockout Requirements

The following measures must be included in written general procedures:

- Suitable locks must be issued to all authorized personnel. The locks must have the individual worker's name and identification on it.
- Each worker will have the only key to their assigned lock(s). No employee may remove another employee's lock without proper authority.
- Before turning off the power, the authorized employee must inform the machine operator and confirm that affected employees are no longer operating the machinery. Sudden loss of power could cause an accident.
- When necessary, steam, air, and hydraulic lines must be bled, drained, and cleaned out. There should be no pressure in these lines or reservoir tanks. (For more information on these methods, see "[Common Lockout Methods](#)" on page 8.)
- When necessary, any mechanism under load or pressure, such as springs, must be released and blocked.
- Each person who will be working on the machinery should put a lock on the machine's lockout device(s). Each lock must remain on the machine until the work is completed.
- All energy sources that could activate the machine must be controlled using one of the

methods described in this guide, such as lockout or blockout.

- The main valve or main electrical disconnect must be tested to make sure that power to the machine is off.
- Electrical circuits must be checked by qualified persons with appropriate and calibrated electrical testing equipment. An electrical failure could energize the equipment, even if the switch is in the “off” position. Stored energy in electrical capacitors should be safely discharged.
- CAUTION: Disconnects and operating controls must be returned to the “off” position after each test.
- Attach accident prevention tags that state the reason for placing the tag, date and time the tag was placed, name of the person placing the tag, and how they may be contacted.



Lockout device with multiple locks

## Shift or personnel changes

When cleaning, repairing, servicing, setting-up, and adjusting work activities are performed across more than one shift and involve personnel changes, the specific hazardous energy control procedures must include the safe and orderly transfer of lockout/tagout device protection from out-going employees to oncoming employees.

## Group Lockout/Tagout

Whenever servicing or maintenance is performed by a crew, craft, department, or other group, energy control procedures must provide authorized and affected employees with the same level of protection as a personal lockout or tagout device.

When the work activity involves multiple employees within the same department or crew, the procedures must also designate an authorized employee to have primary responsibility for:

- Controlling the group’s lockout or tagout device, such as an operations lock.
- Determining the exposure status of the individual group members.

When the work activity involves multiple crews, crafts, departments, etc., the procedures must designate an authorized employee to have primary responsibility for controlling and coordinating affected work forces to ensure continuity of protection.

In addition, the group procedure must include the use of a group lockout or tagout device, group lockbox, or comparable mechanism. Each authorized employee must add their personal lock or tag devices to the group lockout device when they start work and remove their lock when they stop work on the machine or equipment. Group lockout devices enable all workers to lock out the machine with their individual locks.

Section [3314\(h\)](#) describes the requirements for group lockout/tagout.

## Common Lockout Methods

Frequently, machinery and equipment are locked out using the main disconnect switch. Typically, main disconnect switches have an opening where a lock can be placed when the switch is in the off position.

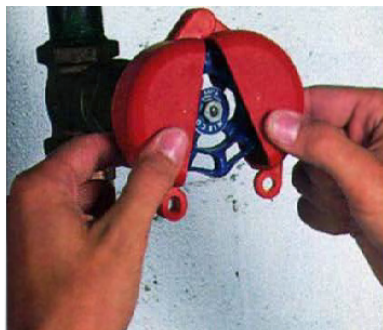
If the switches are in a metal box or cabinet, the box or cabinet itself must be locked out.

If a fuse was removed to de-energize the equipment, the fuse box must be locked.

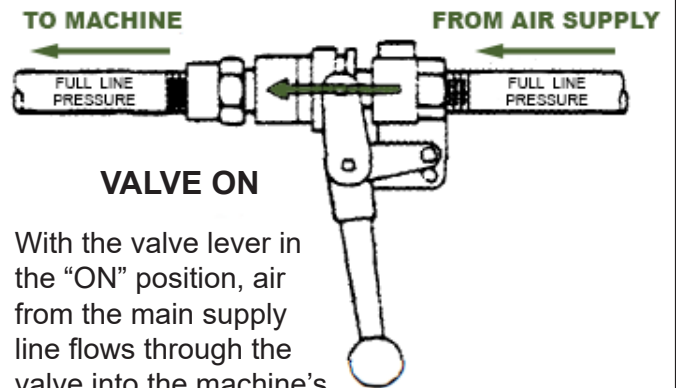
If the controls are in a metal-covered box without an opening for a lock, a common lock hasp and staple can be welded or riveted to the door. Then the switch can be opened (turned off) and the door closed and padlocked. Fuse boxes can also be locked in this way.

Machines activated by compressed air or steam have valves that control movement. Bleed to release any back pressure from the lines and lock out the valves. (See the illustrations to the right and photo on the next page.)

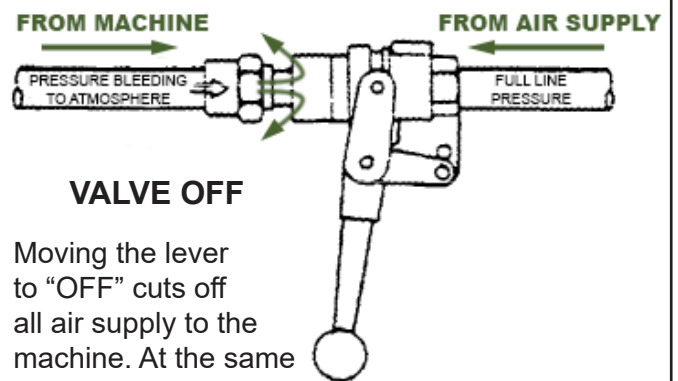
Locking out an electrical box (*below top*) and a hydraulic gate valve (*below bottom*)



Example of a bleeder valve that can be locked out on pneumatic systems.

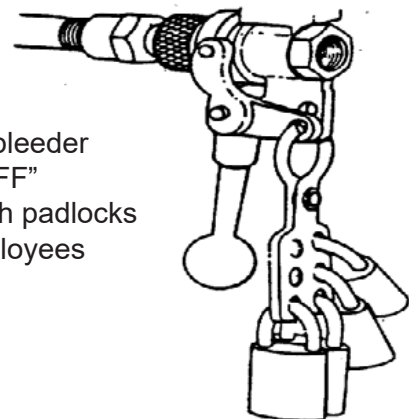


With the valve lever in the "ON" position, air from the main supply line flows through the valve into the machine's operating air lines



Moving the lever to "OFF" cuts off all air supply to the machine. At the same time, exhaust ports are opened, bleeding all air pressure in the machine to atmosphere

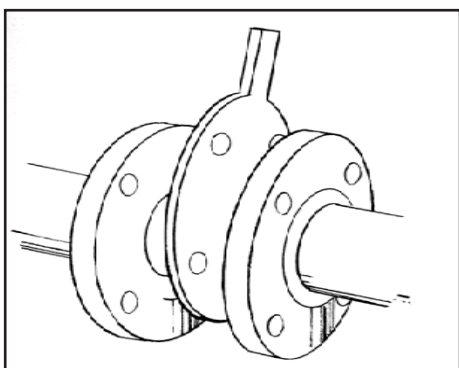
Automatic bleeder valve in "OFF" position with padlocks of four employees



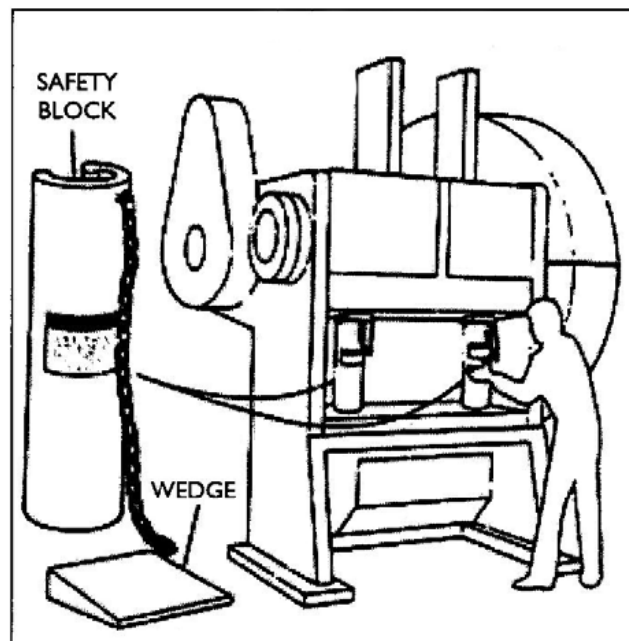




Bleeding air pressure by opening a valve



Example of blinding or blanking



Installing safety blocks on a power press.  
Credit: OSHA

When absolute closure of a pipe, line, or duct is needed, a blockout method such as blinding or blanking must be used. (See image above.)

## Locks, Blocks, and Accident Prevention Tags

Employers must provide energy control materials and hardware, such as locks, blocks, tags, and seals, to authorized employees when required for regulated work operations. The specific type of materials and hardware required for effective lockout/blockout of machinery should be listed in the employer's separate procedural steps. Employers must confirm that the locks, blocks, tags, and seals can be readily secured to the controls of the machine or equipment.

### Locks

Each authorized person must have their own individual lock and key. Though combination locks are allowed, they are not recommended

for lockout purposes due to the challenge of ensuring that the lock stays under the control of the authorized person who placed it. This is particularly true for group lockout/tagout.

The lock should be substantial and durable, and should have the employee's name on it. In addition, locks can be color-coded to indicate different shifts or types of crafts.

### Blocks

Suitable blocks are another important safety device for making a piece of equipment safe for repair or servicing. Blocks must be placed under raised dies, lifts, or any equipment that might inadvertently move by sliding, falling, or rolling onto an employee. See image above.

Effectively placed blocks, special brackets, or appropriate stands, such as those commonly used under raised vehicles, must always be available and used.



Examples of injuries due to ineffective or no blocking:

● A machine operator was unjamming a trimmer that removes flashing from manufactured molded plastic containers. After pulling out a jammed container from the de-energized machine, gravity brought a counterweight down onto his finger, causing a serious injury.

**Prevention: Block or otherwise secure equipment, machinery, or their parts that can become hazardous due to potential or gravitational energy.**

● A truck mechanic working under a tractor trailer was crushed when the jacks used to lift the truck failed. Not enough jacks were provided and the type of jack used could not provide sufficient height for the employee to work.

**Prevention: Provide a sufficient quantity of jacks that can provide the necessary height and withstand the weight of the raised equipment when employees are working under the equipment.**

Another form of blocking is the placement of a blind. A blind is a disk of metal placed in a pipe to ensure that no air, steam, or other substance will pass through that point if the system is accidentally activated. See the image of blinding or blanking on the previous page.

Before installing blinds or blocks, bleed down compressed gas and liquid lines to get rid of any pressure. Coiled springs, spring-loaded devices, and suspended loads must also be safely released so that stored energy will not cause inadvertent movement.

## Accident Prevention Tags/Signs

Tags and signs are used to prevent accidental injury.

When conducting hazardous energy control activities, tags or signs must be used in addition to locks or blocks. Tags and signs are not to be used alone.

Signs and tags must state:

- The signal word, “Danger”
- A message that communicates an instruction to employees, such as “Do Not Start,” “Do Not Energize,” “Do Not Operate,” “Do Not Open,” or “Do Not Close”

Tags should also state:

- The name of the employee who is working on the equipment and how that person may be reached.
- The date and time the tag was put in place.

Tagout devices must be capable of being safely attached by hand and withstanding at least 50 pounds of pull. The means of attaching the tags must be self-locking and non-reusable.

Exception: Tags and signs are not required in cases where both of the following conditions exist:

- The employer has a uniform system of unique and personally identifiable locks designed for lockout.
- The locks are placed on the source of energy.

In addition to subsection (e) of section [3314](#), Cal/OSHA standards that cover accident prevention signs and tags include California Code of Regulations, title 8, sections [3340](#) and [3341](#), respectively.



Example of an accident prevention tag

## Agricultural and Construction Equipment



Any employer can use the energy control methods described in this guide. However, employers in the agriculture or construction industry are required to use specific measures for certain types of equipment.

For agricultural equipment, please refer to section [3441\(a\)](#) for specific requirements to stop the engine, lock out the power source, and make sure everyone is clear before servicing or performing maintenance.

When repairing construction equipment, such as haulage vehicles, tractors, bulldozers, and similar equipment, please refer to section [1595](#). Requirements for trucks with dump bodies include using permanently attached positive means of support that can lock into position so that the dump body will not accidentally lower.

For other equipment not specified above, follow the requirements of section [3314](#) and refer to the equipment manual for guidance.

# Creating Hazardous Energy Control Methods and Procedures

The injuries and fatalities described throughout this guide illustrate the importance of controlling the hazards that result from the unexpected movement, energization, or startup of machines and equipment or release of stored energy. Employers are required to address these hazards by creating, implementing, and maintaining an effective hazardous energy control program.

A comprehensive hazardous energy control program includes:

- Surveying all machinery and equipment at the worksite to identify machinery that should be locked, tagged, and/or blocked out.
  - Must be conducted by responsible persons who are thoroughly familiar with the operations and associated hazards.
- Writing a hazardous energy control procedure that includes:
  - General requirements.
  - Separate procedural steps for the lockout/tagout of each machine or piece of equipment affected by the hazardous energy control procedure.
  - Procedures for group lockout/tagout and shift or personnel changes.
- Selecting and purchasing locks, tags, blocks, and other materials and hardware suitable for the operations.
- Training supervisors and authorized, affected, and all other employees in the hazards and the safety methods associated with their work activities as they relate to the hazardous energy control procedure.
- Enforcing safe practices and energy control procedures.
- Inspecting the energy control procedures to determine their effectiveness, including evaluating authorized employees conducting



regulated work activities (cleaning, servicing, adjusting, unjamming, repairing, and setting-up) on machinery or equipment.

Detailed step-by-step procedures (i.e., procedural steps) are essential for energy control programs:

1. General procedure steps
2. Procedural steps for each specific piece of machinery
3. Steps for training
4. Steps for shutting down
5. Steps for dissipating or restraining stored energy
6. Steps for placing lockout, blockout, and tagout devices
7. Steps for testing lockout prior to work activities
8. Steps for returning to normal operations

**IMPORTANT:** Each piece of machinery or equipment requires specific written procedures.

## Evaluations for Energy Control Hazards

Employers must evaluate the worksite to identify all energy sources that may cause hazardous movement of machinery and equipment.

The survey should include a physical site inspection of machinery and equipment and a study of drawings, wiring or piping schematics, and equipment manuals.

An effective survey to develop written energy control procedures includes identification of:

- All machinery and equipment on which employees (or outside service personnel) will conduct cleaning, servicing, adjusting, unjamming, repairing, or setting-up work activities.
- The regulated work activities associated with each machine.
- Affected and authorized employees.
- The disconnecting means of the machinery and equipment.
- The types of hazardous energies associated with the machine or equipment.
- The functions or parts of the machine associated with the hazard.
- Potential injuries associated with the hazards and the lockout/tagout/blockout methods that will protect employees from injury.

Sample evaluation forms for establishing your hazardous energy control procedures—general and equipment-specific—are available on the [Publications](#) webpage in the “Lockout/Tagout Sample Forms: Evaluations, Procedures, and Permit” publication.

## Writing the Hazardous Energy Control Procedures

The best way to put an effective lockout/tagout program into practice is to establish a written standardized hazardous energy control procedure.

Typical energy sources to look for:

- Kinetic
  - Motion (e.g., fans, blades, presses)
  - Electrical (e.g., generators, capacitors)
  - Thermal (e.g., ovens, steam)
  - Radiant (e.g., lasers, electromagnetic fields, microwaves, x-rays, ultraviolet, infrared)
- Potential
  - Gravitational (e.g., commercial doors, dock plates, latches, swing platforms, heavy machine parts)
  - Stored mechanical (e.g., compressed springs, stretched rubber)
  - Hydraulic (pressurized liquid)
  - Pneumatic (pressurized air or other gas), found in pipes, heated chemical drums, vats, and other containers

The procedure must include the scope, purpose, authorization, rules, and techniques to control hazardous energy and the method the employer uses to ensure employees comply with the employer’s procedures.

The written program must describe:

- The intended use of the procedure.
- The general procedural steps for shutting down, isolating, blocking, and securing machines or equipment to control hazardous energy.
- Machine/equipment-specific procedural steps for safe lockout/tagout.
- Procedural steps for the placement, removal, and transfer of lockout/tagout devices and responsibilities.
- Testing machines and equipment for effective lockout/tagout and other hazardous energy control devices.

Outside contractors and servicing personnel must have been trained in hazardous energy control and must follow the host employer’s written procedures.

Hazardous energy control (lockout/tagout) written program requirements are detailed in section **3314** subsection (g).

A sample procedure, Lockout/Tagout Model Program, is available on the [Cal/OSHA Publications](#) webpage. Employers may use the Cal/OSHA model program as a template to help them develop their own procedures that are specific to their worksite.

Although not required by Cal/OSHA standards, employers may wish to issue lockout/tagout permits to grant permission to authorized persons to conduct the regulated work operations. A sample permit is also available in the “Lockout/Tagout Sample Forms: Evaluations, Procedures, and Permit” publication.

### Writing Machinery/Equipment-Specific Procedural Steps

Many injuries can be prevented if specific procedural steps for the safe control of hazardous energies of machines or equipment are written and followed.

Employers must develop and provide a separate lockout/tagout procedure for each machine or piece of equipment on which the regulated work operations are conducted. Employers should review and include the manufacturer’s lockout/tagout procedures and other safety instructions in the procedural steps, as applicable.

The written lockout/tagout procedure must be in a detailed step-by-step format (i.e., procedural steps) and include the sequence for access,

de-energizing, lockout, clearance, release, and start-up:

- Job objectives and equipment involved.
- Employees authorized to perform lockout.
- All the energy sources for each machine, including stored energy.
- Steps to shut down, isolate, block, and secure machinery.
- Procedural steps to apply lockout, tagout, and blockout.
- Steps to dissipate residual/stored sources of energy.
- Steps to verify or test lockout effectiveness.
- Steps to start machinery during lockout/tagout for evaluation and testing.
- Procedural steps to return the machine or equipment to normal operations.

In many maintenance and repair operations, machinery may need to be tested and energized before additional maintenance work can be performed.

In these cases, create additional procedural steps for the following:

- Clearing all personnel to safety.
- Clearing away tools and materials from equipment.
- Removing lockout devices and re-energizing systems, using the established safe procedure.
- Conducting the tryout or test.
- Neutralizing all energy sources once again, purging all systems, and locking out equipment prior to continuing work on the equipment.



## Alternative worker protections

The design and performance limitations of certain equipment may render the established lockout procedures infeasible under certain circumstances. Such tasks include:

- Cleaning, servicing, or adjusting tasks when the machinery or equipment must be capable of movement during performance of the task.
- Minor servicing activities, such as minor tool changes and adjustments that are routine, repetitive, and integral to the use of the equipment or machinery for production.
- Work on cord and plug-connected electrical equipment.
- Repetitive process machines.

For those kinds of equipment, employers may use alternative worker protections that keep employees away from moving parts. This could include use of extension tools, such as extended swabs, brushes, push sticks, grabbers, and scrapers. The applied methods must be described in the separate written procedural steps, except in the case of the minor servicing activities specified above, which are exempt from the requirements of section **3314**.

Note that employers may require use of extension tools anytime because they help keep employees away from moving parts of the machinery or equipment.



An employer may use one set of procedural steps for a group or type of machinery or equipment when either of the following two conditions are met:

1. All of the following are true for the group or type of machinery or equipment:
  - Operational controls are configured in a similar manner.
  - Locations of disconnect points (energy isolating devices) are identified.
  - The sequence of steps to safely lockout or tagout the machinery or equipment are similar.
2. Each piece of machinery or equipment has a single energy supply that is readily identified and isolated (for instance, the machine has one power cord and can be unplugged from power) and has no stored or residual hazardous energy of any kind.

Photographs depicting the safe methods for lockout/tagout strengthen the effectiveness of procedural steps. Employers should consider including photographs that identify the disconnecting means and the use of locks, tags, blocks, or any other safety devices.

## Controls for Hazardous Energies

Separate detailed, specific procedural steps must take into consideration all the potential hazardous energies on particular categories of machinery and equipment. They must also provide clear

instructions so that employees can conduct covered work operations safely.

Without both of these, accidents happen:

- An HVAC mechanic de-energized a heating and air conditioning unit to work on the blower housing. He was electrocuted when the gold chain he was wearing came near a capacitor that was capable of storing more than 300 volts of alternating current.
- A contractor was taking measurements of an overhead electrical conductor he believed to be de-energized. He received a serious electrical shock due to an arc flash when he came close to the line.
- While two welders were disassembling a hatch with a strut serving as a lift assist, the compressed spring-loaded strut flew apart and struck one of the welders, amputating his fingers.
- A maintenance worker was replacing filters on a natural gas fuel filtration skid. The unpurged internal pressure of the system caused the steel-top cover to violently strike and kill the worker as he was removing it.
- A building engineer had shut down an HVAC unit to work on it. The fan blades did not stop rotating immediately so they struck the worker's finger, amputating it.
- A meat-processing machine operator had stopped the machine to clear excess meat from the paper feed. His finger was amputated when stored energy caused the machine to cycle and the worker's finger was caught in the moving parts.

Prevent these kinds of accidents by establishing and implementing safe procedural steps that include dissipating stored energy and verifying machinery or equipment are de-energized.

Sample forms for machine/equipment-specific evaluations and machine/equipment-specific procedural steps are available in the "Lockout/Tagout Sample Forms: Evaluations, Procedures, and Permit" publication.



## Restoring equipment to normal operations

Include step-by-step procedures for restoring equipment to service after work is completed and the equipment is ready to be returned to normal operation, specifically:

- Informing affected employees and all other workers in the area.
- Removing all nonessential items.
- Ensuring that all equipment components are operationally intact, including guards and safety devices.
- Repairing or replacing defective guards before removing lockout devices and blocks.
- Removing each lockout device and block using the correct removal sequence.
- Making a visual check before restoring energy to ensure that everyone is physically clear of the equipment.

## Annual Program Evaluations

The employer is required to conduct evaluations of the energy control procedures at least annually to determine their continued effectiveness and the need for updating their written procedures. The inspection must include a review of lockout/tagout responsibilities among the inspector and the authorized employees.

The program evaluator must:

- Be an authorized person other than the one who implements the hazardous energy control procedure or procedural steps being inspected.
- Certify that the inspection was performed.

An effective evaluation will identify if:

- Any new machinery or equipment require separate written procedural steps.
- There are any new hazardous energies feeding the machinery or equipment that were not previously identified.
- The current written general program and separate procedural steps require updating.
- The methods used to control hazardous energies are effective in protecting the workers.
- Authorized employees are following the employer's hazardous energy control procedures.
- Machine operators are following the employer's hazardous energy control procedure while conducting regulated work activities, such as unjamming, adjusting, and cleaning.
- Any employees require training or retraining.
- Inspections should be conducted more frequently.

The requirements for periodic inspections of energy control procedures are found in section [3314\(j\)](#).

Sample forms for the evaluation of general and machine/equipment-specific hazardous energy control procedures are available in the "Lockout/Tagout Sample Forms: Evaluations, Procedures, and Permit" publication available on the [Cal/OSHA Publications](#) webpage.

# Training Employees

**A**ll employees must be informed of the purpose of accident prevention tags used in their workplace and the hazards associated with removing them. Employees must be provided additional training depending on their job duties.

**Authorized employees**—who conduct cleaning, repairing, servicing, setting-up, adjusting, or unjamming—must be trained on the hazards related to performing those activities as well as on the employer’s hazardous energy control procedures. Each authorized employee must receive instruction on the hazardous energies and their controls specific to the employee’s work activities. Authorized employees must understand and follow the machine/equipment-specific procedural steps established by their employer.

**Affected employees**—machine/equipment operators or users and other employees who work in the area where energy control procedures are being performed—must be instructed in the purpose and use of the hazardous energy control procedure. Instruction must include recognition of the regulated work activities and the prohibition of conducting those work activities, including cleaning and unjamming. Note: Any employee whose duties require them to clean or unjam (or conduct any other regulated work activity on) machinery or equipment must receive full authorized employee training.

**All other employees** whose work may bring them to an area where energy control procedures

could be utilized must be instructed that they are prohibited from attempting to restart or reenergize machines or equipment that are locked or tagged out.

Employees must be trained prior to conducting work activities. Training must also be provided when:

- The program is established.
- A new energy control hazard is discovered.
- Any procedures are changed.
- New machinery or equipment are introduced.
- Employees are reassigned to different machinery or equipment.

Supervisors of affected and authorized employees must also be trained in order to effectively protect their employees from the risks associated with hazardous energies.

Employees and supervisors must be retrained when a failure to implement hazardous energy control procedures is observed or discovered.

Employers must document all training as required by section **3203**.

# Resources

## Applicable Safety Orders for Controls of Hazardous Energies

California Code of Regulations, title 8, sections relating to methods and controls for protecting employees who are exposed to the hazardous energies of equipment and machinery during cleaning, servicing, adjusting, unjamming, repairing, and setting-up operations include, but are not limited to:

### General Industry Safety Orders:

- 3203** Injury and Illness Prevention Program
- 3273(g)** Working Area - sufficient workspace for servicing machinery below the floor line
- 3314** The Control of Hazardous Energy for the Cleaning, Repairing, Servicing, Setting-Up, and Adjusting Operations of Prime Movers, Machinery and Equipment, Including Lockout/Tagout
- 3328** Machinery and Equipment (safe practices)
- 3329** Pipe Lines (safe practices)
- 3340** Accident Prevention Signs
- 3341** Accident Prevention Tags
- 3441** Operation of Agricultural Equipment
- 4909** Runway Repair (cranes)
- 5157** Permit-Required Confined Spaces
- 5158** Other Confined Space Operations

### Electrical Safety Orders:

- 2320.1 et seq.** Work Procedures (low-voltage)
- 2530.43** Automatic Restarting
- 2530.86** Motor Not in Sight From Controller
- 2530.107** Readily Accessible (disconnect for motors, motor circuits, and controllers)
- 2530.113** Energy Ffrom More Than One Source

- 2534.6** Drainage of Stored Charge (capacitors)
- 2940 et seq.** Work Procedures and Operating Procedures (high-voltage)
- 2941** Work on or in Proximity to Overhead High Voltage Lines
- 2943** Work on or in Proximity to Underground High-Voltage Cables, Conductors or Equipment
- 2944** Work on or in Proximity to Conductors and Equipment Located in High-Voltage Stations, or Switchyards
- 2945** Access and Workspace Requirements

**Construction Safety Orders:**

- 1595** Repair of Haulage Vehicles, Tractors, Bulldozers and Similar Equipment
- 1950 et seq.** Confined Spaces in Construction

**Ship Building, Ship Repairing, and Ship Breaking Safety Orders:**

- 8356** Control of Hazardous Energy (Lockout/Tags-Plus)
- 8397.5** Radar and Communication Systems

## Online Resources for Hazardous Energy Control

### Cal/OSHA

#### *Model Program and Forms to Supplement This Guide*

- A Lockout/Tagout Model Program containing sample general procedures and equipment-specific procedures is available as a Word document.
- Sample forms to help you evaluate your workplace machinery and equipment are available as a PDF document.

You can download both on the [Publications webpage](http://www.dir.ca.gov/dosh/PubOrder.asp#LOBO) at [www.dir.ca.gov/dosh/PubOrder.asp#LOBO](http://www.dir.ca.gov/dosh/PubOrder.asp#LOBO).

#### *More Cal/OSHA Resources*

- **Lockout/Tagout Fact Sheet for Employees:** [www.dir.ca.gov/dosh/dosh\\_publications/Lockout-Tagout-fs.pdf](http://www.dir.ca.gov/dosh/dosh_publications/Lockout-Tagout-fs.pdf)
- **Tailgate/Toolbox Topic - Lockout/Tagout:** [www.dir.ca.gov/dosh/dosh\\_publications/tb\\_lockblock.pdf](http://www.dir.ca.gov/dosh/dosh_publications/tb_lockblock.pdf)
- **Video: Protect Yourself When Cleaning, Adjusting, and Unjamming Machines:** [trainingacademy.dir.ca.gov/page/lockout-video](http://trainingacademy.dir.ca.gov/page/lockout-video)

### Federal OSHA

- **Control of Hazardous Energy (Lockout/Tagout):** [www.osha.gov/control-hazardous-energy](http://www.osha.gov/control-hazardous-energy)
- **Lockout-Tagout Interactive Training Program (eTool):** [www.osha.gov/etools/lockout-tagout](http://www.osha.gov/etools/lockout-tagout)

### State Compensation Insurance Fund (SCIF)

- **Remember to Lockout and Tagout (English):** [www.safeatworkca.com/safety-articles/remember-to-lockout-and-tag-out/](http://www.safeatworkca.com/safety-articles/remember-to-lockout-and-tag-out/)
- **Desconectar y Etiquetar (Remember to Lockout and Tagout in Spanish):** [www.safeatworkca.com/es/articulos-de-seguridad/desconectar-y-etiquetar/](http://www.safeatworkca.com/es/articulos-de-seguridad/desconectar-y-etiquetar/)

### Work Safe BC

- **Lockout for Woodworking (video slideshow):** [www.worksafebc.com/en/resources/health-safety/slide-shows/lockout-for-woodworking](http://www.worksafebc.com/en/resources/health-safety/slide-shows/lockout-for-woodworking)

---

If you have questions or concerns, or if you need additional information on energy control procedures or other occupational safety and health related matters, please contact the **Cal/OSHA Consultation Services office** in your area for free assistance. Addresses and phone numbers are listed on the back cover of this publication.



# Cal/OSHA Consultation Programs

Toll-free Number: 1-800-963-9424

Internet: [www.dir.ca.gov](http://www.dir.ca.gov)

## On-site Assistance Program Area Offices



**Voluntary Protection Program – Oakland, CA 94612 (510) 622-1081**

This guide is available with active links at: [www.dir.ca.gov/dosh/PubOrder.asp](http://www.dir.ca.gov/dosh/PubOrder.asp)