

TDI

Safety @ Work
Division of Workers' Compensation

Control of Hazardous Energy Lockout/Tagout



**Workplace
Program**



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INTRODUCTION



CAUTION

**USE LOCKOUT
DEVICE DURING
MAINTENANCE OR
ANY OPERATOR
ADJUSTMENT**



A Hazardous Energy Control Program, also known as a **Lockout/Tagout (LOTO)** Program, is designed to prevent injuries caused by the unexpected start-up, energization, or release of stored energy in machinery when it is set up, serviced, or repaired. The specific practices and safety procedures used to make sure machines are properly shut off and not able to start while work on the equipment is performed is known as LOTO. The LOTO process, outlined in the Occupational Safety and Health Administration (OSHA) [29 Code of Federal Regulations \(CFR\) 1910.147](#), requires that **hazardous energy sources** that power machines are “isolated and rendered inoperative” (prevented from working) *before service or repair are started on the equipment*.

Hazardous Energy

Hazardous energy sources include *electrical, chemical, radiation, pneumatic, hydraulic, mechanical, thermal, and gravitational energy sources*. Each of these energy sources must be dissipated (used up) and **isolated** (turned off with a circuit breaker, switch, valve, flange, or

other energy-restraining or energy-releasing device) before maintenance or repairs can start.

Stored Energy

All equipment can store energy even after the power source is isolated. To control the stored energy and prevent it from suddenly releasing and injuring or killing an employee, physical controls – literally locks and tags – are used in a LOTO Program to prevent the machine’s parts from unexpectedly moving or releasing energy.

General Requirements

This publication outlines OSHA’s general requirements for controlling hazardous energy and carrying out a LOTO Program. It contains helpful information and the basic elements for a written plan, but it does not supersede OSHA requirements. Employers should review the OSHA standard for each specific worksite and customize the program accordingly. Since OSHA regulations set minimum requirements, you are encouraged to add additional information to your site-specific program.

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Lockout/Tagout Requirements

A LOTO Program is vital to a strong workplace safety program. OSHA estimates that 120 deaths and 50,000 on-the-job injuries are prevented each year by proper LOTO procedures.¹ However, controlling hazardous energy through effective LOTO steps remains in OSHA's Top 10 list for the most-cited violations.²

To meet the requirements of OSHA's Control of Hazardous Energy Standard, [29 CFR 1910.147](#), employers are responsible for establishing these LOTO procedures:

1. Create a formal, written statement on how to use LOTO procedures.
2. Make procedures easy to access.
3. Define employees' roles and responsibilities for the LOTO Program.
4. Train employees on the LOTO Program.
5. Review and inspect the LOTO Program regularly.
6. Keep proper records.

Create a Written LOTO Statement

Your company's LOTO Program must be in writing and include, at minimum, the following:

- the name and location of the equipment that must be locked out;
- a list of equipment-specific steps controlling hazardous energy when shutting down each machine and starting it again;
- information on any secondary energy sources such as heat, fumes, tension, or other hazards that must be moved or tied down;



- the name of the OSHA-approved device needed to lock out the energy (such as a padlock, blank flange, or bolted slip blind) for each machine or piece of equipment;
- the location of stored lockout devices;
- the process to verify that the LOTO device is locked;
- the process for placing a tag on the lock and identifying the worker who put the tag on it; and
- the steps for bringing the machine or equipment back online after maintenance or service is completed.

¹ Occupational Safety and Health Administration, "OSHA Fact Sheet: Lockout/Tagout." Webpage. <https://www.osha.gov/sites/default/files/publications/factsheet-lockout-tagout.pdf>. Accessed September 28, 2021.

² Nick Schlitz, "Why Isn't Lockout/Tagout Taken More Seriously?" EHSToday, June 9, 2020. <https://www.ehstoday.com/safety/article/21133452/why-isnt-lockouttagout-taken-more-seriously>. Accessed September 28, 2021.

Make the Procedures Easy to Access

LOTO procedures should be readily available to employees and management. Employers may choose to use binders or a dedicated software system in a location that is easily accessible to all employees.

Employees' Roles and Responsibilities

Employers are tasked with making sure all workers are notified and aware of their role during LOTO procedures. Responsible persons include, but are not limited to, the following:

- **Program Administrator**
The Program Administrator is often a management staff member assigned by the employer to enforce the LOTO Program. This individual is responsible for ensuring that hazardous energy is controlled according to LOTO procedures at all times.
- **Affected Employee**
Affected employees are the workers who operate or use the machines or equipment that are being serviced or maintained. The OSHA standard

requires that affected employees are informed of a shutdown even if they are not involved in the service or the maintenance of the machinery or equipment.

- **Authorized Employee**
An authorized employee is the person who will perform the LOTO procedure before maintenance or repairs to the machinery or equipment begins. Specifically, a machine operator or maintenance mechanic may be designated as the authorized employee responsible to make sure all precautions and needed lockouts are in place before starting repair work. An authorized employee and an affected employee may be the same person if the affected employee's duties also include performing service or repairs on the equipment.
- **LOTO Team**
All employees are responsible for complying with the LOTO Program and using the proper devices. Since the process of creating, overseeing, and maintaining an effective LOTO Program is often daunting, employers can delegate the responsibility to a LOTO Team rather than one person. A LOTO Team should be comprised of qualified, knowledgeable individuals who come from various workgroups directly affected by the LOTO standard. These individuals may include, but are not limited to the:
 - program administrator;
 - maintenance supervisor;
 - maintenance mechanics;



- line supervisors;
- immediate work area supervisors;
- machine operators or production workers;
- safety committee members;
- safety manager; and
- training manager.

Often, LOTO Team responsibilities may be divided as follows:

- The immediate supervisor of the work area and the mechanical maintenance supervisor share joint responsibility to make sure machine operators and maintenance mechanics follow and comply with LOTO procedures.
- Since line supervisors or the

maintenance supervisor(s) usually decide whether the equipment should be locked out, these individuals often take on the duties of keeping records for the procedures.

- The safety manager is most often responsible for assuring overall compliance, coordinating team activities, and conducting the training.
- The safety committee, the safety manager, the maintenance manager, or the line supervisors often conduct regular inspections as required by OSHA.
- The maintenance mechanics and the machine operators are often tasked with collecting the equipment inventory and data used to create LOTO procedures.

Lockout/Tagout Employee Training

A LOTO program is only as good as the training used to teach it. All employees should receive basic LOTO awareness training that includes:

- the importance of respecting locked and tagged machinery;
- the understanding that voiding a lock or tag and attempting to start the equipment can cause loss of life or limb to another employee;
- the safe application, use, and removal of energy controls; and
- the disciplinary measures for tampering with locked or tagged equipment.



In addition, all supervisors should receive authorized employee training since they will be responsible for making sure proper LOTO procedures and practices are observed.

Authorized employee training should include:

- instructions on lockout procedures;
- the use and limitations of tags;
- recognizing hazardous energy sources; and
- methods and means for isolating and controlling energy.

Training should be conducted by a designated [qualified person](#), such as the maintenance supervisor, and another designated individual, such as the safety manager, should keep training or retraining records.

Regular Review and Inspection

A LOTO Program is not something management can set and forget. Regular inspections help monitor the effectiveness of the LOTO Program and verify that procedures are kept up-to-date to keep workers safe. It is best to set a specific time when the annual review and inspection of the preceding year's LOTO activities can be conducted.

It is the Program Administrator's task to ensure that changes to equipment and the lockout devices and methods used are reflected in the updated LOTO Program. A designated individual, such as the safety manager, should maintain these records and make them available for OSHA inspection.

Proper Recordkeeping

LOTO-related recordkeeping must include, but is not limited to, the following:

- **Training Records**
Training records should include the attendees' names, dates, topics, trainer's name, sample training materials or a syllabus, the trainer's credentials, and the employees' completed quiz results.
- **Lock and Key Issue Records**
Keep a record of when locks and keys were issued, why, and to whom.
- **LOTO Activity Log**
The activity log needs to include who, what, when, where, and why a lockout was performed. Smaller facilities may use one centrally-located log, usually maintained by



the supervisor. In larger facilities, each department or workgroup should maintain area-specific logs that are collected annually and stored in a central archive. In department-specific cases, the area supervisors maintain the LOTO Activity Log for their area, while the maintenance supervisor or the safety manager usually maintain the archived Activity Logs.

- **Inventory List**
An inventory list of all LOTO devices and their stored location should be maintained.
- **Procedures List**
A master binder or document management system listing all machine-specific LOTO procedures should be available in an accessible location for all employees.

Lockout/Tagout Procedures

A designated authorized employee should perform the following six LOTO procedures to prevent the unexpected release of energy during equipment maintenance, repair, and set-up:

Prepare for Shutdown

The authorized employee must:

- investigate and identify all forms of hazardous energy and know how to control it;
- obtain a copy of the machine-specific energy control procedure for use during equipment shutdown; and
- notify all affected employees that a lockout or tagout system is going to be used and the reason why.

Equipment Shutdown

If the machine or equipment is operating, shut it down using the manufacturer's or employer's normal stopping procedures. Inform all affected employees about the shutdown, even if they are not involved in the service or maintenance.

Energy Isolation

Isolate the equipment from any energy source. Isolation may mean many things, such as turning off the power at a breaker or shutting a valve. However, among other safety concerns, remember that:

- electrical equipment can store energy in capacitors;



- machines running on hydraulic or pneumatic energy can keep pressure in areas between the energy-isolating device and the moving parts;
- equipment running on chemical energy can have fuel in the lines;
- springs and tension belts can contain stored mechanical energy; and
- pistons suspended in mid-motion can store energy from gravity.

Apply LOTO Devices

Apply the assigned lockout device, such as a padlock, blank flanges, or bolted slip blinds to keep the equipment in a safe (energy-isolating) position. Then, if tags are used, place a tag on the device in the same manner as the lock. Fill tags out completely and correctly using the authorized employee's name who is performing the lockout and any other vital information. *Pulling a fuse or flipping a circuit breaker is no substitute for locking out!*

Check for Stored Energy

Even after the energy source has been disconnected and the machine has been locked out, hazardous energy may remain in the machine. Make sure all parts have stopped moving and dissipate (use up the energy), restrain, or make non-hazardous in some way all stored energy before maintenance or service begins. Ways to release stored energy may include:

- grounding the equipment;
- releasing tension on springs;
- blocking the movement of spring-driven or hydraulic and pneumatic parts;
- placing braces or blocks on parts that could fall because of gravity;
- bleeding or depressurizing lines;

- venting open valves; or
- repositioning the equipment.

Verify Isolation of Equipment

Clear all personnel from dangerous areas and check again to make sure the equipment is isolated correctly and de-energized before repair or maintenance begins.

- Verify that the main disconnect switch or circuit breaker cannot be moved to the ON position.
- Press all operating controls to ensure there is no power.
- Return all power switches to the OFF or NEUTRAL position.
- Informing employees in the area that the work is about to begin.

Restoring Equipment to Normal Operations

When the servicing or maintenance is completed and the machine or equipment is ready to return to its normal operating condition, the following LOTO procedures should be used:

- **Check to make sure that all nonessential items have been removed.**
Look around the machinery and the immediate area to ensure all tools have been accounted for and have not been left in or on the equipment. Replace all system components, safety mechanisms, covers, and guards. Return all parts, spare parts, accessories, and damaged components to the appropriate locations or inventories.
- **Confirm that all employees have been safely positioned or removed from the area.**
Workers completing any project with LOTO are required to make sure that there are no people inside, around, or near the equipment to be restarted.



Before removing any LOTO device, inspect the work and account for all personnel including equipment operators, maintenance personnel, contractors, cleaning staff, inspectors, or workers returning from a break or shift change.

- **Verify that the controls are in NEUTRAL, set to OFF, or in a ready-state.**
- **Remove the lockout devices and re-energize the machine or equipment.**

To make sure LOTO removal is performed safely, each lock and tag should be removed from each energy-isolating device by the employee who applied them. In some situations, the original worker who placed the LOTO device may not be available due to a shift or employment change, illness, or another emergency. When the authorized employee who applied the LOTO device is not available to remove it, training and procedures should be developed that include:

 - verifying that the authorized employee who applied the device is not at the facility;
 - making all reasonable efforts to contact the authorized employee to inform them that their LOTO device is getting removed; and
 - ensuring that the authorized employee has this knowledge of the LOTO device removal before he or she resumes work at that location.
- **Notify affected employees that the servicing or maintenance is completed, and the machine or equipment is ready for use.**

Procedures Involving More Than One Person

If more than one individual is required to LOTO equipment, the following procedures should be used:

- Both individuals must place their names on the LOTO device.
- If an energy-isolating device cannot accept multiple locks or tags, a multiple LOTO device (hasp) may be used.
- If lockout is used, a single lock may be used to lock out the machine or equipment with the key being placed in a lockout box or cabinet that allows the use of multiple locks to secure it. Each employee must then use his or her lock to secure the box or cabinet.
- If servicing of equipment lasts more than one work shift, LOTO protection must not be interrupted. Employees completing their shift and preparing to leave the facility must not remove their lock until the next employee to service the equipment is ready to lockout.
- When an employee who applied a lock is not there to remove it, a *two-person rule* will apply, allowing the lock to be cut only in the presence of the work area supervisor, who must report the emergency procedure in detail to the safety manager within 24 hours. The report must include the name of the employee who placed the lock on the equipment and the names of the employee and supervisor who removed the lock.

Procedures Involving Vendors or Contractors

Whenever outside service personnel, contractors, or vendors are engaged in activities covered by OSHA's Control of Hazardous Energy Standard, they must adhere to the host employer's LOTO Program. The contractor must receive Contractor Safety Orientation Training and comply with the host employer's LOTO Program. The host employer's maintenance personnel and the contractor must perform a multiple-person LOTO in all systems, equipment, and machines that the contractor is servicing. In some instances, the contractor may be required to sign a waiver, relieving the company of any liabilities while on site.

Compliance to OSHA CFR 1910.147

If your company has employees who service or maintain machines that could cause an injury, then most likely the LOTO regulations apply to you. Any time someone must construct, install, set up, adjust, inspect, modify, maintain, or service a machine or piece of equipment you must have a procedure in place to do it safely. Even tasks like lubricating, cleaning, unjamming, or changing the attachments must follow the proper lockout procedure. If your employees work in or on machines that could smash, cut, shock, trap, burn, electrocute, or injure a worker you are better off having a LOTO Program in place. Examples of when LOTO procedures are required include, but are not limited to:

- **Engine-Driven Equipment**
This includes repairs, adjustments, and maintenance on conveyors, agitators, vehicles, presses, mills, lathes, exhaust fan blowers, printshop equipment, and similar manufacturing or office equipment.
- **Exposure to Electricity**
This includes work on powerlines, electrical panel boxes, disconnecting switches, and machinery and equipment hook up.

- **Exposure to Hazardous Materials**
This includes repairs and maintenance on pumps, boilers, pipelines, or tanks containing flammable liquids, acids, caustics, steam, or other harmful liquids and gases.

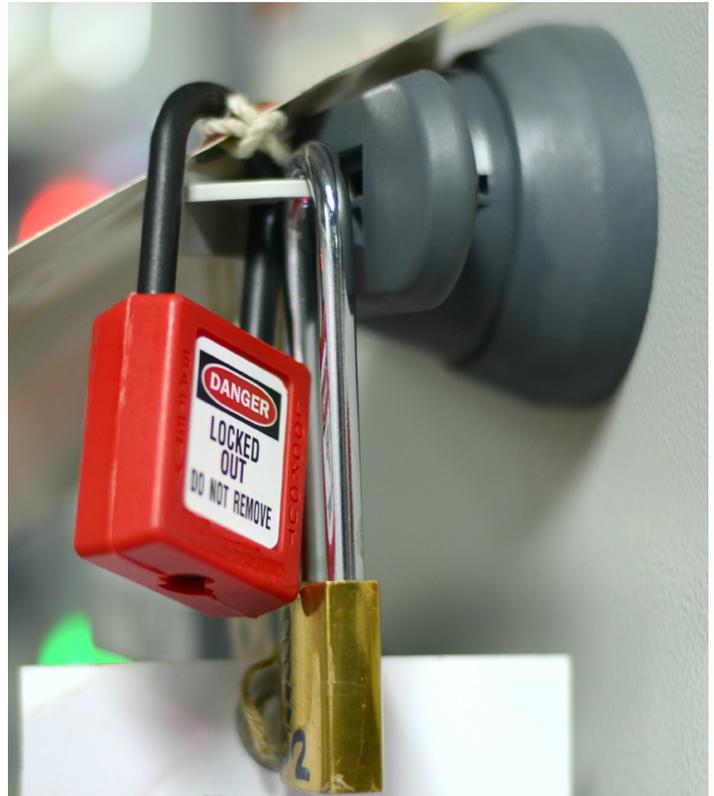
There are a few cases during normal production operations when this standard does not apply. Servicing and maintenance of the machine during normal operations is covered only when an employee is required to:

- remove or bypass a guard or other safety device;
- place any part of their body into an area on a machine or piece of equipment where work is performed on the material being processed; or
- place any part of their body into an area on a machine or piece of equipment where a danger zone exists during a machine's operating cycle.

Minor tool changes and adjustments, and other minor servicing activities that 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. However, these activities must be performed using other safety measures to ensure employees are protected.

[CFR 1910.147](#) does not apply to agriculture, construction, maritime, and oil-and-gas well drilling and servicing, which have separate standards for the control of hazardous energy specific to these industries. Also, it does not apply to [electrical hazards](#) covered by [29 CFR Part 1910 Subpart S](#) or specific LOTO steps for [electrical shock](#) and burn hazards covered by [29 CFR Part 1910.333](#). In addition, it does not apply to the control of hazardous energy in power generation, transmission, and distribution plants, covered by [29 CFR 1910.269](#).



Appendix A: Definitions

Affected Employee - an employee whose job requires him or her to operate or use a machine or equipment on which servicing or maintenance is being performed under LOTO, or whose job requires him or her to work in an area in which such servicing or maintenance is being performed.

Authorized Employee - A person who locks or implements a tagout system procedure on machines or equipment to perform the servicing or maintenance on that machine or equipment. An authorized employee and an affected employee may be the same person when the affected employee's duties also include performing maintenance or service on a machine or equipment, which must be locked, or a tagout system implemented.

Capable of Being Locked Out - an energy-isolating device is considered capable of being locked out if it is designed with a hasp or other attachment or integral part to which a lock can be affixed or if it has a locking mechanism built into it. Other energy-isolating devices are also considered 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 slide gate; a slip blind; a line valve; a block; and any similar device used to block or isolate energy. The term does not include pushbuttons, selector switches, and other control circuit-type devices.

Energy Source - any source of kinetic or potential energy, including but not limited to electrical, mechanical, hydraulic, pneumatic, chemical, and/or thermal energy.

Hot Tap - a procedure used in the repair, maintenance, and services activities that involves welding on a piece of equipment (pipelines, vessels, or tanks) under pressure, to install connections or appurtenances (an attachment that becomes part of the property such as a furnace or air-conditioning unit). It is commonly used to replace or add sections of a 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, according to 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 a safe position and to prevent the energizing of a machine or equipment.

Normal Production Operation - the utilization of a machine or equipment to perform its intended production function.

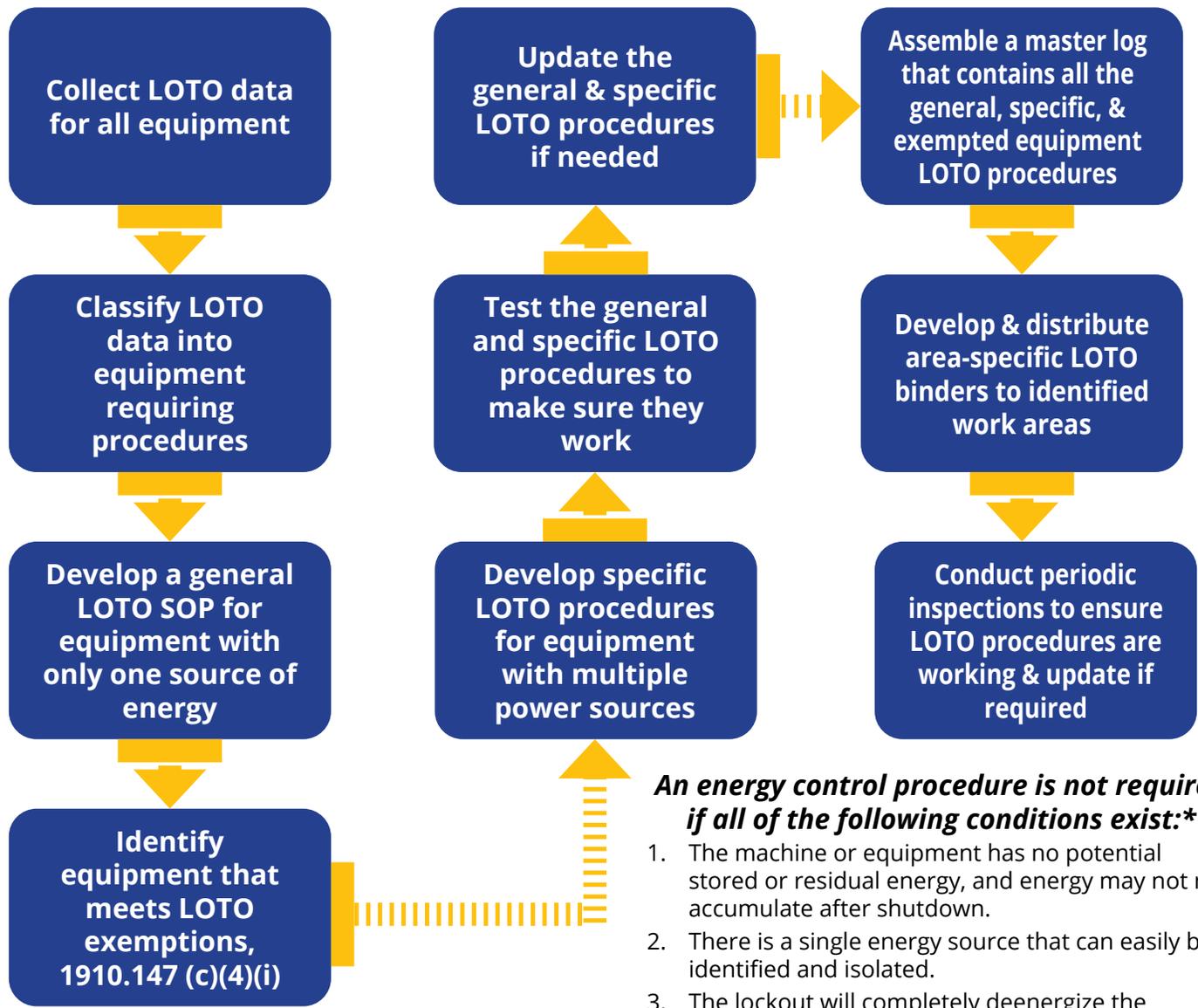
Servicing or Maintenance - workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, maintaining, or servicing machines or equipment. These activities include lubrication, cleaning or un-jamming of machines or equipment, adjusting, or tool changes, where the employee may be exposed to the unexpected energization or start-up 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 using 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 according to 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.

Appendix B: Energy Control Program Flowchart



An energy control procedure is not required if all of the following conditions exist:*

1. The machine or equipment has no potential stored or residual energy, and energy may not re-accumulate after shutdown.
2. There is a single energy source that can easily be identified and isolated.
3. The lockout will completely deenergize the equipment.
4. The equipment is isolated and locked out from the energy source during maintenance.
5. A single lockout device will achieve the required isolation.
6. The lockout device is under the exclusive control of the authorized employee performing the work.
7. The work does not create hazards for other employees.
8. Previous use of this exemption has not caused accidents involving unexpected re-energization or startup.

****Required Conditions for Lockout Tagout Procedure Exemption - 1910.147(c)(4)(i).***

Appendix C: Energy Control Procedure Form

Instructions: The Authorized Employee and the Program Administrator will complete this digital, fillable form for each piece of equipment separately. This form should inventory all energy sources and LOTO points for each piece of equipment. When finished, group equipment according to common procedures or common functions. The master copy of these forms shall be kept in one or more central location(s), including but not limited to the Safety Office, the Maintenance Supervisor's office, or the Production Manager's office. There must be 24/7 access to the facility's master LOTO binder or dedicated software system. Use additional forms as new equipment is acquired.

Date Written:	Procedure Written By:	Date Revised:
Date Reviewed:	Reviewing Personnel:	
Date Approved:	Approvals:	

Procedure Description

Equipment Description:		
Serial Number:	Location of Equipment:	Area or Department:
Number of Lockout Points:	Lockout Device(s) Needed:	
Lockout Procedure:		
Procedure to Verify Lockout is Complete:		
Release and Start Up Procedure:		

Appendix G:

Lockout/Tagout Quiz

Name:

Date:

Department:

Badge or ID #:

1. What is the primary purpose of locking and tagging out a machine?
 - a. to comply with OSHA Regulations;
 - b. to keep someone from using the equipment;
 - c. to isolate the equipment from its energy sources (make sure it cannot be turned on); or
 - d. none of the above.

2. Which is not a situation where we would need to lock out a machine?
 - a. repairing equipment;
 - b. cleaning, lubricating, or general maintenance;
 - c. clearing jammed mechanisms; or
 - d. none of the above

3. Which of the following is not a type of energy requiring lockout/tagout procedures?
 - a. electrical;
 - b. kinetic;
 - c. hydraulic; or
 - d. pneumatic.

4. Which devices can be used for the purpose of lockout?
 - a. padlocks and chains;
 - b. valve clamps and wedges;
 - c. key blocks and pins; or
 - d. all of the above.

5. If you do not have a lock, you can use a tag in its place to lockout a machine.
 - a. True
 - b. False

6. Any employee can lock out a machine.
 - a. True
 - b. False

7. Who can remove the installed lock or tag on a locked-out machine?
 - a. anyone who gets the key;
 - b. only the maintenance supervisor;
 - c. only maintenance personnel; or
 - d. the employee who installed the lock.

8. If a machine, already under lockout procedures, will be restarted, first follow the normal release and start up procedure. Afterwards, reinstate original locks and tags.
 - a. True
 - b. False

9. Once affected personnel have been notified that the proper lockout procedure has been followed and the machinery has been verified as properly locked out, all of the requirements in this program have been fulfilled.
 - a. True
 - b. False

Quiz Answers:

1. c; 2. d; 3. b; 4. d; 5. False; 6. False; 7. d; 8. True; 9. False



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