



Control of Hazardous Energy - Lockout/Tagout

An Online Continuing Education Course for Engineers

Course Number: H-1008

Credit: 1 Hour / 1 PDH / 1 CPD

Control of Hazardous Energy: Lockout/Tagout

Introduction

This course presents OSHA's general requirements for controlling hazardous energy during service or maintenance of machines or equipment. The course provides a summary level treatment of this topic. You 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.

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.¹ 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 re-accumulation 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 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.

¹ The standard refers to servicing and maintaining "machines or equipment." Although the terms "machine" and "equipment" have distinct meanings, this course 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.

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).² 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.

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.

² 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.

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.
- 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.

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
- 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.

What must an energy-control procedure include?

Employers must develop, document, and use procedures to control potentially hazardous energy.³ 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 inform employees at least the following information:

- A statement of the scope of the energy-control procedure for each type of machine;
- Specific procedures for the safe transfer of lockout/tagout devices; and
- Specific steps to be followed to verify the effectiveness of lockout devices.

What must workers do?

Before beginning service or maintenance, workers must follow the procedure accomplished in sequence and according to the specific energy-control procedure:

- (1) Prepare for shutdown;
- (2) Shut down the machine;
- (3) Disconnect or isolate all sources of hazardous energy, including stored or residual energy;
- (4) Apply the lockout/tagout device(s);
 1. Release, restrain, or otherwise control 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
- (5) Verify the isolation and deenergization of the machine.

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