OREGON OCCUPATIONAL SAFETY AND HEALTH DIVISION
DEPARTMENT OF CONSUMER AND BUSINESS SERVICES

PROGRAM DIRECTIVE

Program Directive: PD A-156
Issued: February 15, 1991
Revised: December 12, 2016

SUBJECT: Control of Hazardous Energy – Enforcement Policy and Inspection Procedures (Lockout/Tagout)

PURPOSE: This directive establishes OR-OSHA's enforcement policy for its standards addressing the control of hazardous energy. It instructs OR-OSHA enforcement personnel on both the agency's interpretations of those standards, and on the procedures for enforcing them.

SCOPE: This directive applies OR-OSHA wide. It is not a standard, regulation or any other type of substantive rule. No statement in this instruction should be construed to require the regulated community to adopt any practices, means, methods, operations, or processes beyond those which are already required.

CHAPTER 1 -- BACKGROUND

I. **Cancellations.** This revised directive replaces all older versions of Program Directive A-156

II. **Significant Changes.** Affirmative Defenses, Compliance Officer Safety, Compliance Assistance Flowcharts, Vehicle Hazardous Energy Control, Relationship to Other Standards.

III. **Standard Overview.** The *Control of Hazardous Energy (Lockout/Tagout)*, 1910.147, standard was promulgated on September 1, 1989, at Federal Register, Volume 54, No. 169 (pages 36644-36690), and was effective January 2, 1990, as announced at Federal Register, Volume 54, No. 213, November 6, 1989 (page 46610). The Standard.

A. The standard addresses practices and procedures that are necessary to disable machinery or equipment and to control potentially hazardous energy while servicing and/or maintenance activities are being performed.

B. The standard requires that physical lockout be utilized for equipment or machines which have energy isolating devices capable of being locked out, except when the employer can demonstrate that utilization of a physical tagout system provides full employee protection. For equipment or machines that cannot be physically locked out, the employer must physically use tagout.

C. In addition, the 1910.147 standard supplements and supports other Lockout/Tagout (LOTO) related provisions in the general industry standards by establishing a requirement to develop complementary and uniform energy control procedures and to provide employee training on the procedures. The 1910.147 standard supplements and augments other general industry safeguards that require the use of LOTO – e.g., hazardous energy control requirements contained in Subdivisions O, R and 2/RR.

D. The standard contains definitive criteria for establishing an effective energy control program for the lockout or tagout of energy isolating devices. An energy control program includes energy control procedures, employee training, and periodic inspections to ensure that hazardous energy sources are isolated and rendered safe before and while any employee performs any servicing or maintenance on any machinery or piece of equipment.

NOTE: The success of an employer's energy control program depends upon a commitment to the program through, in part, the development and implementation of:

1. Procedures to clearly and specifically outline the necessary energy control steps to be taken by employees;

2. Effective training to teach employees about the applicable procedure for the servicing or maintenance task to be performed; and

3. Periodic inspections and other management procedures designed to ensure accountability.

For additional program implementation information, see 1910.147 and the *Safety and Health Management Guidelines, Issuance of Voluntary Guidelines* (*Federal Register*, 54, January 26, 1989, pp. 3904-3916) at OSHA's website.

IV. Terminology. The following terms will be used in the following manner:

A. In Chapters 2 through 4 of the directive, the term service or servicing will be used to refer to servicing and maintenance activities when the relevant statement applies to both servicing and maintenance activities.

B. In Chapters 2 through 4, the term machines or machinery will be used to refer to both machines and equipment when the relevant statement applies to both machines and equipment.

C. The terms he and she, as well as his or her, will be used interchangeably throughout the manual. References to females apply to males, and vice-versa.

V. Definitions. [Italicization of the term being defined indicates that the definition may be found in 1910.147(b). In some cases, definitions in this directive provide additional guidance.]

A. *Affected Employee*. An employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout or tagout, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed. Affected or authorized employees may disable, shut down, or turn off machines or equipment. An affected employee becomes an authorized employee when that employee's duties include performing servicing or maintenance covered under the standard.

B. *Authorized Employee*. A person who locks out or tags out machines or equipment in order to perform servicing or maintenance on a machine or piece of equipment, which has a source(s) of energy that can cause injury to the employee. Furthermore, any employee who implements a lockout and/or tagout system procedural element on machines or equipment (for servicing and/or maintenance purposes) is considered an authorized employee. This includes employees who: 1) perform energy source isolation; 2) implement lockout and/or tagout on machines or equipment; 3) dissipate potential (stored) energy; 4) verify energy isolation; 5) implement actions to release LOTO; or 6) test or position machines or equipment.

C. *Capable of Being Locked Out*. An energy isolating device is capable of being locked out if it has a hasp or other means of attachment to which, or through which, a lock can be affixed, or it has a locking mechanism built into it. Other energy isolating devices are capable of being locked out if lockout can be achieved without the need to dismantle, rebuild, or replace the energy isolating device or permanently alter its energy control capability. Equipment that accepts bolted blank flanges and bolted slip blinds are considered to be *capable of being locked out*.

D. *Control Reliability*. A method of ensuring the integrity of the performance of guards, devices, or control systems (American National Standard for Machine Tools – Other B11 Machine Tool Safety Standards – Performance Criteria for the Design, Construction, Care, and Operation, ANSI B11.19-1990).

NOTE: The American National Standard for Machine Tools – Performance Criteria for Safeguarding, ANSI B11.19-2003, defines the term as *[t]he capability of the machine control system, the safeguarding, other control components and related interfacing to achieve a safe state in the event of a failure within their safety related functions*.

E. *Controller*. A device or group of devices that serves to govern in some predetermined manner, the electric power delivered to the apparatus to which it is connected. See 1910.399.

F. *Disconnecting Means.* A device, group of devices, or other means by which the conductor of a circuit can be disconnected from its source of supply. See 1910.399.

G. *Energized.* Connected to an energy source or containing residual or stored energy. Conductors and parts of electric equipment that have been de-energized, but have not been locked and tagged out in accordance with 1910.333(b), must be treated as energized parts. Likewise, conductors and parts of electric equipment that have been de-energized under procedures other than those required by 437-002-2303, 437-002-2312, and 437-002-2313, as applicable, must be treated as energized.

H. *Energy Isolating Device.* A mechanical device that, when utilized or activated, physically prevents the transmission or release of energy, including but not limited to the following:

1. A manually operated electrical circuit breaker;
2. A disconnect switch;
3. 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;
4. A line valve, bolted blank flange and bolted slip blinds;
5. A block (e.g., a safety block); and
6. Any similar device used to block or isolate energy.

Push-buttons, selector switches, safety interlocks and other control circuit type devices are NOT energy isolating devices.

NOTE: Programmable logic controllers (PLCs) are used in many machine applications, and these control circuit devices are not considered energy isolating devices for purposes of the LOTO standard. Safety functions, such as stopping or preventing hazardous energy (motion), can fail due to component failure, program errors, magnetic field interference, electrical surges, improper use or maintenance, etc. Refer to the January 25, 2008 letter to the Wm. Wrigley Jr. Company for additional details on PLC use with respect to the minor servicing exception.

I. *Exclusive Control. Under the exclusive control of the employee* means that the authorized employee has the authority to and is continuously in a position to prevent (exclude) other individuals from re-energizing the machine or equipment during his servicing or maintenance activity.

J. *Group Lockout/Tagout.* Group LOTO allows authorized individual employees to be protected from hazardous energy when they are part of a group (two or more employees) performing covered servicing or maintenance. Group LOTO is the means by which each authorized employee performing the servicing and/or maintenance exercises his or her control over the associated hazardous energy by attaching his or her personal LO or TO device onto a group LOTO mechanism. It consists of personal LOTO devices, group LOTO devices/mechanisms, and equipment LOTO devices.

K. *Group Lockout/Tagout Mechanism.* Any device or mechanism that, when used as part of a group LOTO system, permits each individual employee to use his personal lockout or tagout devices to physically secure energy isolating device(s) during the servicing or maintenance work. The use of group lockout hasps, lockboxes (containing keys or tabs from equipment locks or job tags) or similar group mechanisms, such as a master tag that procedurally controls equipment reenergization, are examples.

L. *Hazardous Energy.* Any energy, including mechanical (e.g., power transmission apparatus, counterbalances, springs, pressure, gravity), pneumatic, hydraulic, electrical, chemical, nuclear, and thermal (e.g., high or low temperature), that could cause injury to employees. Danger is only present when energy may be released in quantities or at rates that could injure employees.

NOTE: Thermal energy may be generated as a result of electrical resistance, mechanical work, radiation, or chemical reaction, such as is the case with anhydrous ammonia, chlorine, or sulfuric acid reacting with skin, lung, or eye tissue causing chemical burns.

Hazardous chemical energy, for purposes of this standard, includes chemicals (e.g., flammable and combustible liquids; flammable gases; acids and alkaline chemicals) that may thermally produce burn injury through high or low temperature.

M. *Hot Tap.* A procedure used in repair, maintenance and servicing activities, which involves welding on a piece of equipment (pipelines, vessels or tanks) under pressure, in order to install connections or appurtenances. It is commonly used to replace or add sections of pipeline without the interruption of service for air, gas, water, steam, and petrochemical distribution systems.

N. *Isolating Switch.* A switch intended for isolating an electric circuit from the source of power. It has no interrupting rating, and it is intended to be operated only after the circuit has been opened by some other means. See 1910.399.

O. *Job Lock ("Operations or Production Lock").* A device used to ensure the continuity of energy isolation during a multiple-shift operation. It is placed upon a lockbox. A key to the job-lock is controlled by each assigned primary authorized employee from each shift.

P. *Job-Tag with a Tab.* A special tag that is used for the tagout of energy isolating devices during group LOTO procedures. The tab of the tag, for example, is removed for insertion into the lockbox. The company procedure would require that the tagout job-tag cannot be removed from the energy isolating device(s) until each matching tab (from the lockbox) is rejoined with its respective tag. The removal of the tab from the lockbox must be based on the precursory step in which affirmative and physical action is taken to ensure that none of the individual authorized employees will be exposed to hazardous energy (e.g., all employees remove personal locks from the lockbox).

Q. *Lockout.* The placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed. While the term lockout includes the placement of a lockout device onto an energy isolating device [as specified in 1910.147(d)(4)(i)], the term encompasses all systematic steps taken pursuant to an established energy control procedure [as specified in 1910.147(c)(4)] to shutdown the machine and or equipment and effectively isolate hazardous energy.

R. *Lockout Device.* A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy isolating device in the safe position and prevent the energizing of a machine or equipment. Included are blank flanges and bolted slip blinds.

S. *Lockbox (Master).* The lockbox into which all of the keys and/or tabs from the lockout or tagout devices securing the machines or equipment are inserted and which would be secured by individual authorized employee lockout or tagout devices and by a "Job-Lock" (during multi-shift operations).

T. *Lockbox (Satellite).* A secondary lockbox or lockboxes to which each authorized employee affixes her personal lock or tag.

U. *Machinery and Machine Guarding (Part 1910, Subdivision O).* See 1910.211 for definitions applicable to 1910.213 through 1910.219.

V. *Master Tag.* A document used as an administrative control and accountability device. This device is normally controlled by operations department personnel and is a personnel group tagout device/mechanism if each employee personally signs on and signs off on it and if the master tag clearly identifies each authorized employee who is being protected by it.

W. *Normal Production Operations.* The utilization of a machine or equipment to perform its intended production function. The physical act or process of removing or releasing the isolation (e.g., opening electrical disconnects or valves), during the start-up process, as well as machine or equipment re-energization and/or startup, is considered a normal production operation.

X. *Personal Tagout (Accountability) Device.* Any prominent warning device is considered a "personal tagout device" and may be used with a group LOTO mechanism as long as: 1) the device identifies each authorized employee being protected; and 2) the person in charge (principal or primary authorized employee), system operator, and other relevant persons can reliably ascertain the identity of and account for each individual who is being protected by each respective energy isolating device.

Personalized tags, personal identification cards, tear-off tags, coin-like tokens, sign-in/sign-off logs, master tag signatures, and work authorization permit signatures are examples of personal accountability devices that may be used if they meet the above criteria. With respect to 1910.147(f)(3)(ii)(D), verbal accountability steps (practices) are not considered to be equivalent to each employee placing a personal (lockout or tagout) device on a group LOTO mechanism.

NOTE: The Occupational Safety and Health Commission (OSHRC) affirmed a citation relating to group LOTO holding that this requirement mandates the use of a personal tagout device in a tagging situation because the core concept of LOTO is *personal* protection. Verbal accountability methods do not afford protection equivalent to that provided by the implementation of a personal LOTO device. See *Exelon Generating Corp., LaSalle County Station*, OSHRC (Docket No. 00-1198, 2005).

Y. *Primary Authorized Employee.* The authorized employee who exercises overall responsibility for adherence to the company LOTO procedure. [See 1910.147(f)(3) and Chapter 4, Section III for workplace coordination and overall managerial procedure responsibilities.]

Z. *Principal Authorized Employee.* The authorized employee who oversees or leads a group of servicing/maintenance employees (e.g., plumbers, carpenters, electricians, metal workers, mechanics). [See 1910.147(f)(3) and Chapter 4, Section III for workplace coordination and overall managerial procedure responsibilities.]

AA. *Safeguarding.* ANSI B11.19-1990 national consensus standard defines safeguarding as the [m]ethods for protection of personnel from hazards, using guards, safety devices, or safe work procedures. The following ANSI B11.19-1990 definitions describe the various types of safeguarding.

1. *Guard*: *A barrier that prevents entry of an individual's hand or other body part into the hazardous area.*

2. *Safeguarding device: A control or attachment that:*

   a. *Restrains the operator from inadvertently reaching into the hazardous area, or*
   b. *Prevents normal or hazardous operation, if any part of an individual's body is inadvertently within the hazardous area, or*
   c. *Automatically withdraws the operator's hands, if the operator's hands are inadvertently within the hazardous area during the hazardous portion of the machine cycle, or*
   d. *Maintains the operator or the operator's hands during the hazardous portion of the machine cycle at a safe distance from the hazardous area.*

NOTE: The 1990 ANSI B11.19 term *Safeguarding Device* was modified to *Safeguarding (Protective) Device* in the revised 2003 ANSI standard. The 2003 ANSI edition defines a *safeguarding (protective) device* as: *A device that detects or prevents inadvertent access to a hazard*. Devices that detect, but do not prevent employee exposure to machine hazards (e.g., through one of the four methods in 2a through 2d above), do not comply with the machine guarding provisions contained in Subdivision O, when guards or safeguarding devices are feasible.

3. Safe work procedures: Awareness barriers, awareness signals, shields, and methods are included in this safeguarding category.

NOTE: Standing alone, safe work procedures do not constitute compliance with the Subdivision O, Machinery and Machine Guarding, when guards or safeguarding devices are feasible.

BB. *Servicing and/or maintenance*. Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning or un-jamming of machines or equipment and making adjustments or tool changes, where the employee may be exposed to the unexpected energization or start-up of the equipment or release of hazardous energy. [In Chapters 2 through 4 of the manual, the term *service* or *servicing* will be used to refer to servicing and maintenance activities when the relevant statement applies to both servicing and maintenance activities.]

NOTE: Activities where servicing and/or maintenance activities are not being performed on the associated machines or equipment are not covered by the LOTO standard. For example, some rescue activities may basically involve the removal of persons (e.g., elevator rescue) without any equipment disassembly or servicing. However, employee rescue activities [that do not involve a victim in an imminent danger activity, pursuant to OAR 437-001-0055(1)] or other servicing activities that involve disassembly or other work on the equipment would require LOTO if responder exposure to hazardous energy exists.

Also, the standard requires employers to establish an energy control program to control hazardous energy that otherwise might injure or kill employees who service or maintain machines/equipment. However, the LOTO standard does not apply to equipment or machinery that is not the subject of the servicing and maintenance activity and that functions independently from, and is not a sub-system of, the machine/equipment being serviced or maintained. If authorized employees are exposed to hazardous energy associated with such an adjacent machine/piece of equipment while performing servicing/maintenance work on an independent, unrelated machine/piece of equipment, an employer's obligations are established by Oregon Safe Employment Act or other relevant standards, such as the *Machine guarding* (Subdivision O) requirements. See *The Timken Company* (OSHRC Docket No. 97-0970, 2003).

CC. *Setting up*. Any work performed to prepare a machine or equipment to perform its normal production operation. *Setting up* is not considered utilization of a machine or equipment and is classified as *servicing and/or maintenance*, rather than *normal production operations.*

DD. *Tagout.* The placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed. While the term *tagout* includes the placement of a *tagout device* onto an *energy isolating device* [as specified in 1910.147(d)(4)(i)], the term encompasses all systematic steps taken pursuant to an established energy control procedure [as specified in 1910.147(c)(4)] to shutdown the machine and or equipment and effectively isolate hazardous energy.

EE. *Tagout device*. A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure. The purpose of the tagout device is to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

FF. *Work Authorization Permit.* A control document that authorizes specific tasks and procedures to be accomplished.

CHAPTER 2 -- ENFORCEMENT POLICIES AND PROCEDURES

I. **Compliance Officer Safety.** OR-OSHA prohibits Compliance Safety and Health Officers (CSHOs) from being exposed to hazards associated with the release of hazardous energy. CSHOs must take reasonable measures to eliminate or control exposure to hazardous energy when performing inspection activities. Exposure may be avoided by such alternative inspection techniques as: 1) interviewing employees or management representatives in a safe location, 2) photographing from a safe location, and 3) using engineering or similar drawings in lieu of obtaining direct measurements. It is of paramount importance that no CSHO be endangered at any time during an inspection and that the inspectors comply with the appropriate OSHA standards.

Only CSHOs who are trained in energy control practices and procedures may evaluate machines and equipment to determine that they are properly locked and/or tagged out in accordance with 1910.147 and 1910.333.

NOTE: The OSHA Training Institute (OTI) currently integrates many important energy control principles and CSHO safety practices in various coursework, such as is the case with the OTI *Initial Compliance Course* (#1000). Additionally, other OTI courses (e.g., Courses #1010, #1050, #2030, #3090, #3094, 3095, #3190) also include electrical energy control and LOTO requirements in this general safety curriculum.

Experienced OSHA staff may already have many OTI courses (or other training with equivalent curriculum) that cover the LOTO and electrical safety-related energy control practices; therefore, employment records and training certificates may be used to certify that training has been accomplished.

CSHOs and their supervisors should also evaluate the inspection assignment together to determine whether exposure to hazardous energy may exist during the inspection process. This evaluation is particularly important when there are unique or complex workplace circumstances or when a trained CSHO has little experience with the inspection assignment. Furthermore, facility work areas need to be evaluated (site analysis) by the trained CSHO before entering such areas to determine whether there are any potential hazardous energy exposures. If the employer's program is not in compliance (with the exception of minor paperwork deficiencies that do not present an employee hazard), the CSHO must use alternative inspection techniques.

CSHOs that perform inspection activity on employers' machines or equipment undergoing servicing and/or maintenance activities are considered, by the LOTO standard, to be *outside personnel***.** See 1910.147(f)(2). Prior to the performance of the inspection activities covered by 1910.147, CSHOs must inform the host employer of OR-OSHA's hazardous energy control procedures and safety policy (contained in this section and manual) and coordinate the LOTO procedures with the host employer. OR-OSHA personnel performing the inspection activity must ultimately understand the specific procedures to be used with the host employer. It is through strict adherence to these OR-OSHA requirements, including any restrictions and prohibitions imposed by the host, that CSHOs must control exposures to and protect themselves from the dangers associated with hazardous energy.

NOTE: Other OR-OSHA Instructions, such as A-62 for the permit required confined spaces standard and A-212, for the electric power generation, transmission and distribution standard also address CSHO safety policy.

Therefore, CSHOs must follow the LOTO standard requirements, which include the group LOTO and the verification of isolation provisions before inspecting, servicing and maintenance activities work on machinery or equipment. For example, if a CSHO performing a fatality investigation determines that it is necessary to inspect a potentially hazardous area of the bridge on an overhead crane, then the inspector would need to determine whether or not the employer's energy control procedure for the crane is compliant with the LOTO standard. The CSHO could, after determining the employer's procedure is compliant, then coordinate his activities with the host. This would, in part, entail applying his personal LOTO device on the appropriate energy isolating device(s) or group lockout mechanism and witnessing the verification that isolation and deenergization have been accomplished. After all of the LOTO control standard control measures are implemented, the CSHO may then enter the bridge area to inspect.

NOTE: At no time must any CSHO personally perform any machine/equipment shutdown, energy source isolation or servicing/maintenance work on any machine/equipment as part of the LOTO evaluation. All verification of energy isolation must be performed by the employer's authorized or primary authorized employee(s) in accordance with their energy control procedures and witnessed by the CSHO.

Additionally, if the overhead crane investigation scenario involves employee exposure to unguarded live electric circuits, such as an unguarded live electric bus, then the electric utilization equipment must be de-energized (e.g., lockout and tagging by a qualified employee) in accordance with the *Selection and use of work practices*, 1910.333. This standard applies to work on or near exposed energized electrical parts when CSHOs are close enough to expose themselves to an electrical hazard. CSHOs must not approach or work near any circuits and/or equipment that are not properly deenergized.

In summary, CSHOs must use alternative inspection techniques whenever possible and they must not knowingly place themselves in the danger zones of any machines/equipment. OR-OSHA personnel may not approach the servicing/maintenance work area if it is not possible to determine the zone of danger. However, CSHOs may implement machine LOTO if an employer's energy control program is in complete compliance with relevant OSHA standards, with the exception of minor paperwork deficiencies that do not present an employee hazard. As part of this LOTO, OR-OSHA personnel must receive the appropriate site specific training on the energy source types, hazards and applicable energy control and isolation procedures so as to acquire the requisite knowledge and skills to safely inspect the servicing/maintenance activity.

II. Inspection Guidelines. The standard incorporates performance provisions that allow employers flexibility in developing LOTO programs suitable for their particular facilities and the particular machines being serviced. The following inspection policy provides guidance regarding the evaluation of an employer's hazardous energy control program.

A. Performance of Servicing or Maintenance Operations. The CSHO must determine whether general industry servicing and maintenance operations are performed by employees and/or outside personnel. The CSHO must further determine whether the servicing and/or maintenance operations are covered by 1910.147 or by other hazardous energy control or employee safeguarding specified by other standards as discussed in Section IV.

B. Employer Responsibility. In accordance with the *grand-fathering* provision of the standard, the employer is responsible for having isolation devices on machines or equipment designed to accept a lockout device. See 1910.147(c)(2)(iii) and the March 1, 1990 effective date. OR-OSHA will not enforce the standard with respect to the designer/manufacturer of the machine or equipment, except to the extent that a designer/manufacturer has an obligation, as an employer, to provide protection for its employees as required by the LOTO standard.

C. Evaluations of Compliance. Compliance with 1910.147 (LOTO) and related hazardous energy control standards must be evaluated during all programmed and programmed-related general industry inspections where energy control is applicable under the focus of the inspection. The review of the records must include attention to injuries related to servicing and maintenance operations. All programmed inspections must be performed in accordance with the *Field Inspection Reference Manual* (the FIRM), and other inspection policies and procedures.

Unprogrammed and unprogrammed-related inspections in response to alleged hazardous working conditions involving the LOTO and related hazardous energy control standards must be performed in accordance with the FIRM policy and procedures. Evaluation of these standards must be conducted whenever the circumstances of the unprogrammed inspection warrant (e.g., imminent dangers, fatalities/catastrophes, complaints, referrals) or whenever hazards involving hazardous energy are in plain view.

NOTE: *OSHA Instruction, A-164, Electrical Safety-Related Work Practices – Inspection Procedures and Interpretative Guidelines* (dated July 1, 1991) contains additional policy and guidance on the enforcement of 1910.331 through 1910.335. These electrical safety-related work practices standards have provisions to achieve maximum safety by de-energizing energized parts and, secondly, when lockout and tagging is used, by ensuring that the deenergized state is maintained. Also, *OSHA Instruction, A-212, Enforcement of the Electric Power Generation, Transmission and Distribution Standard* (dated June 18, 2003) contains additional policy and guidance for hazardous energy control practices related to operations and maintenance work covered by Subdivision 2/RR.

OR-OSHA may include these energy control compliance evaluations as part of an unprogrammed or unprogrammed-related inspection assignment at their discretion based upon prior experience or current knowledge of a particular establishment. Inspections under this directive may be combined, as appropriate, with inspections conducted pursuant to other inspection programs. This directive is designed to supplement and not supersede the FIRM or any other OR-OSHA scheduling policy or program.

D. Documentation and Screening Guidance. The CSHO must evaluate the employer's compliance with the specific requirements of the standard. In the event deficiencies are identified, the CSHO must document non-compliance in accordance with established policy (per the FIRM). The following screening guidance, together with the interpretive policy contained in this directive, provides a general framework to assist the evaluator during inspections:

1. Documentation. At a minimum, ask the employer for documentation including: procedures for the control of hazardous energy; certification of employee training; and the certification of periodic inspection.

2. 1910.147(c)(4) Requirements. The CSHO must evaluate the energy control procedure, as required by 1910.147(c)(4). If the employer does not have a written energy control procedure, analyze the eight-point documentation exception, as detailed in the 1910.147(c)(4)(i) note, to determine whether a documented energy control procedure is required. The results of these analyses should be placed in the inspection case file. Whenever possible, the CSHO should observe and evaluate actual servicing or maintenance activities to determine compliance with the LOTO standard and the adequacy of the employer's established procedures for the control of hazardous energy. Refer to additional guidance in this instruction for guidance and assistance in the evaluation of the employer's energy control procedure(s).

3. Training Program Evaluation. Evaluate the employer's training program for "authorized," "affected," and "other" employees. Interview a representative sampling of selected employees as part of this evaluation [1910.147(c)(7)].

    a. Evaluate the effectiveness of the training program by verifying that authorized employees recognize and understand:

        i. All applicable hazardous energy sources;
        ii. Type and magnitude of energy found in the workplace;
        iii. Means and methods of isolating and/or controlling energy; and

            NOTE: If the employer uses tagout devices on lockable energy isolating devices, CSHOs need to carefully evaluate the *Full employee protection* (*Tags Plus*), 1910.147(c)(3), provisions to determine whether the tagout program provides an equivalent level of safety to a lockout program. For additional information, refer to Chapter 3, Section VII of this document.

        iv. Means of verification of effective energy control and the purpose of the procedure to be used.

    b. Verify that affected employees have been instructed in the purpose and use of the energy control procedure(s).

    c. Verify that all other employees who work in the area where the energy control procedure(s) are utilized are instructed about the procedure and the prohibition against attempting to restart or reenergize machines or equipment that is locked or tagged out.

    d. When the employer's procedure(s) permit the use of tagout, the training of authorized, affected, and other employees also shall include the following information:

        i. Tags are essentially warning devices and do not provide the physical restraint on energy isolating devices that is provided by a lock;

            NOTE: Employee training on tagout system energy control methods must include, if relevant, the *Full employee protection* (*Tags Plus*) technique(s) that are being used to programmatically bridge the safety gap since tagout devices are not equivalent to lockout devices.

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

NOTE: Employees also must receive training on the required procedural steps for the removal of a personal LOTO device, if an employer permits another employee to remove an authorized employee's lockout or tagout device (as detailed in the 1910.147(e)(3) exception).

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

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

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

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

4. Enforcement. Evaluate the effectiveness of the employer's enforcement of the energy control procedure(s). [See 1910.147(c)(4)(ii) and Section III.]

5. Periodic Inspection Requirements. Evaluate compliance with the requirements for periodic inspections of energy control procedures and, if conducted, determine whether any deviations or inadequacies discovered by the inspections were corrected. The evaluation needs to determine that the person performing the periodic inspection is an authorized employee (other than the one(s) utilizing the procedure being inspected) and that these inspections are adequate to ascertain whether:

   a. The steps in the energy control procedure are being followed;
   b. The employees involved know their responsibilities under the procedure; and
   c. The procedure is adequate to provide the necessary protection and what changes, if any, are needed.

6. Retraining Requirements. Evaluate the employer's compliance with any retraining requirements that were identified during either the periodic inspection of energy control procedures or whenever the employer has reason to believe that there are problems with an employee's knowledge of the energy control procedure or with its implementation. Additionally, retraining must be provided for all authorized and affected employees whenever there is a change in their job assignment, a change in the machines, equipment, or processes that presents a new hazard, or when there is a change in the energy control procedure.

   The CSHO must determine whether this retraining has reestablished employee proficiency and whether new or revised control methods and procedures have been implemented. Certification of training and retraining must be checked to ensure that the training included all of the elements of the energy control procedure which are directly relevant to the duties of the employee.

7. Additional Lockout/Tagout Requirements. Evaluate the following LOTO requirements as appropriate, in accordance with the guidance provided in this instruction:

   a. Testing and repositioning of machines, equipment, and components thereof [See Section IV.A; Chapter 3, Section XII; and 1910.147(f)(1)];
   b. Group Lockout or Tagout [See Chapter 3, Section XIV; Chapter 4; and 1910.147(f)(3)]; and
   c. Shift or personnel change [See Chapter 3, Section XV and 1910.147(f)(4)].

E. Outside Personnel. When an outside employer (e.g., contractors; employees from a temporary employment agency) is engaged in servicing and maintenance activities subject to the requirements of 1910.147 within another employer's facility, the CSHO should evaluate both employers' compliance with the LOTO standard's requirements. [See Chapter 3, Section XIII and 1910.147(f)(2).]

F. Compliance Assistance Flowcharts. Chapter 3 (Section II.E) contains a compliance assistance diagram designed to aid CSHOs in evaluating the effectiveness of an employer's LOTO program. This flow diagram is presented solely as an aid and does not constitute the exclusive or definitive means of complying with the standard in any particular situation.

III. Citation Guidance.

A. General. Citations for violations of the *Control of hazardous energy (lockout/tagout)* standard shall be issued in accordance with the *Field Inspection Reference Manual (FIRM),* Chapters III and IV. Citations alleging violations of 1910.147(a) and (b) must not be issued under any circumstances.

Because the standard focuses on the programmatic approach to hazardous energy control, CSHOs are expected to carefully review the employer's energy control procedure(s) and the associated documentation (e.g., hazard analyses, if performed; machine or equipment instructions/diagrams; training and periodic inspection certifications). The extent of discrepancies in the program (procedures; training; periodic inspections) element documentation and implementation should be noted. Deficiencies in either program content or implementation may be cited, but the basis for any citation must be explicitly substantiated in the case file.

On multi-employer worksites, both the host employer and outside contractors may be citable for a hazardous condition(s) involving 1910.147 (and other related standards) violations because of the flexible, performance-oriented nature of the standard. Host and outside (contractor) employers, depending upon the established energy control responsibilities (e.g., by contract or by actual practice), may be a creating, controlling, correcting or exposing employer. CSHOs must evaluate each employer's established energy control responsibilities and determine whether each employer has exercised reasonable care in meeting its statutory obligation to comply with the OR-OSHA standards in accordance with the *Multi-Employer Citation Policy, A-257.*

NOTE: In *IBP, Inc. v. Herman*, 144 F.3d 861 (D.C. 1998), the Court of Appeals for the District of Columbia Circuit ruled that a host employer was not liable for the lockout/tagout violations of an independent contractor because, apart from pointing out the violations to the contractor, the host's control over those violations was limited to the cancellation of the contract. Proposed multi-employer citations should be approved through OR-OSHA's Administrator.

Where an employer has not established an energy control program (which consists of an energy control procedure, employee training, and periodic inspection), care must be taken (in accordance with the FIRM policy) to fairly address the omissions and to avoid citation duplication. A Field Manager may elect to cite 1910.147(c)(1) for the failure to establish an overall energy control program (or a specific program element) and also cite the individual LOTO standard requirements as long as the alleged deficiencies are not duplicative in nature. In other words, the separate requirement to establish a program is different than the implementation of prescribed components of that program.

If an employer has done little or nothing to comply with the LOTO standard, program or program element citations for violations of the standard may be issued as separate items, with separate penalties.

Some of the LOTO standard provisions assume that a program/procedure is in place. It is not appropriate for OR-OSHA to cite provisions related to program/procedural issues when no program/procedure exists. For example, it would not be appropriate to cite an employer for failing to train employees about an energy control program when no such program was developed or for failing to periodically inspect energy control procedures when procedures -- either informally (in practice) or formally (documented) -- were not developed.

In this situation, a Field Manager may cite an employer for failing to develop an energy control procedure, and for the failure to provide employee training on the knowledge and skill deficiencies associated with energy control measures for the machine being serviced and/or maintained -- pursuant to 1910.147(c)(4)(i) and (c)(7)(i).

In section (c)(4)(i) of the LOTO standard, employers are required to develop, document, and utilize procedures for the control of potentially hazardous energy and, pursuant to section (c)(4)(ii), these procedures must, in part, clearly and specifically:

1. Outline the steps to be followed;
2. Techniques to be used; and
3. Actions to be taken by the employer to ensure that the control measures are utilized by employees.

In other words, section (c)(4)(i) may be cited for procedural development, documentation and use issues; whereas, section (c)(4)(ii) shall be cited for procedural content and quality problems – e.g., for the failure to have clear and specific steps to be followed in order to control hazardous energy. Regardless of the standard cited, the alleged violation description (AVD) must identify the particular energy control procedure issue(s) that corresponds to the relevant subsection of (c)(4)(ii). For example, the AVD for a 1910.147(c)(4)(ii)(D) alleged violation would briefly state how the verification requirements of that particular standard were not met by the employer.

The energy control procedure provisions, together with the 1910.147(d) *Application of control* requirements, contain related employer requirements for implementing energy control procedures. However, the regulatory text language of paragraph (d) refers to the requirement for the employer to have an *established procedure*; therefore, Field Managers must not cite 1910.147(d) or (d)(1) through (d)(6) issues if the employer does not have an established procedure. An employer would be considered as having an *established procedure* if they formally or informally developed or implemented energy control practices, even if the procedures were not in total compliance with the procedure requirements contained in the LOTO standard.

NOTE: Some procedures are exempted from the procedure documentation requirement, so it is possible to have an established procedure that is not in writing, provided that each of the eight conditions is met. See 1910.147(c)(4)(i) note.

In addressing the application of the energy control elements, paragraph (d) requires the employer to perform six LOTO system procedural actions in a prescribed sequence. When the violation for a single machine or piece of equipment involves a failure to implement a step in an established procedure, a Field Manager may elect to cite alleged violations individually or group 1910.147(c)(4)(i) for the failure to utilize the procedure and 1910.147(d) [or the specific subsection of paragraph (d)] in accordance with its regulatory text.

In the event both paragraphs are cited for an implementation issue involving the same machine or equipment, the Field Manager should normally group the violations into a single item. For example, a single citation may be issued for 1910.147(c)(4)(i) for the failure to utilize a procedure, with respect to machine shut down, or either 1910.147(d) or 1910.147(d)(2) for the failure to shut down the machine in accordance with the established procedures or they may be grouped into a single violation item. In cases where more than one machine/equipment instance is documented, separate violations may be appropriate based on the nature of the violations.

In other instances where an employer fails to implement more than one procedural element (e.g., failure to shut down a machine, failure to isolate energy, failure to apply LOTO devices) in accordance with the *Application of control*, paragraph (d), requirements, the Field Manager may consider issuing the following violation(s):

1. Cite the 1910.147(c)(4)(i) provision alleging that the established procedure(s) was not utilized to control hazardous energy;
2. Cite paragraph (d) alleging that some or all of the required procedure elements and actions were not performed in the required sequence;
3. Cite the first control step deficiency in the *Control of application* procedural action chronology: usually one of the steps detailed in 1910.147(d)(2) through (d)(6) – e.g., citing 1910.147(d)(3) failure to isolate the equipment from the energy source;
4. Group the first paragraph (d) deficiency in the chronology with the subsequent procedural action deficiencies together as a single violation – e.g. grouping 1910.147 (d)(3) and (d)(4)(i) violations for the failure to isolate the equipment from the energy source and failure to apply LOTO devices to the energy isolating device(s).

In instances where the energy control procedure was found to be inadequate and where portions of the established procedure were not adequately implemented, the Field Manager may utilize their prosecutorial discretion and cite, as appropriate, any or all portions of section (c)(4) and/or paragraph (d) for the various allegations [e.g., section (c)(4)(ii) for specific procedure element deficiencies and paragraph (d) for the failure to shutdown a machine in accordance with the established procedure].

The above situations and citation policy do not, however, represent all of the possible energy control violation possibilities. LOTO violations may involve numerous machines and pieces of equipment, which could result in various combinations and groupings of violations. Field Managers must exercise good judgment and discretion by citing, combining and grouping violations in accordance with the general principles of the FIRM.

See Section III.D of this chapter for *Citation Examples* and Chapter 3, Section II.C for additional citation policy.

B. Classification of Violations. Generally, a violation of 1910.147 could result in employee exposure to hazardous energy. These exposures may result in death or serious physical harm to employees; such violations shall normally be classified as *serious.* Paperwork deficiencies in the energy control program should be addressed in accordance with Program Directive A-216, *Citation Policy for Paperwork and Written Program Requirement Violations.*

C. Citations in the Alternative. In cases in which it is not obvious whether the general industry or construction standards apply, a citation for both general industry and construction violations may be issued, *in the alternative*, to address a hazardous energy control deficiency associated with the servicing/maintenance of a machine or piece of equipment. In other construction industry scenarios, a LOTO standard violation(s) may be issued "in the alternative" with a general duty clause violation(s) in the event the *Safety and Health Regulations for Construction* (Part 1926) do not address an energy hazard associated with a specific servicing/maintenance activity.

Additionally, there may be situations where it is not sufficiently clear whether an activity (e.g., machine inspection) constitutes a servicing and/or maintenance activity or a normal production operation (e.g., product quality control inspection). For example, the evidence from a fatality investigation, where the inspector was crushed by a product conveyor line, may be insufficient to determine definitively whether the employee was inspecting a conveyor line repair or simply inspecting product on the conveyor line. Assuming the investigation facts are legally sufficient, a LOTO standard violation(s) and the specific Subdivision O provision(s) may be cited in the alternative because the employer either violated the machine LOTO provisions for maintenance/inspection activities or machine guarding provisions relating to normal production operations.

D. Citation Examples. The following examples are intended for CSHO guidance purposes and do not reflect every situation and possibility associated with noncompliance with 1910.147 and related energy control standards. The citation policy contained in *Field Inspection Reference Manual (FIRM)*, must be followed.

Example # 1 - A CSHO observed employees cleaning unguarded machinery rollers (contrary to established and documented company procedure) and these employees were exposed to moving machine parts and in-going nip point hazards created by the operating high-speed rollers. Furthermore, the cleaning activity did not meet all of the elements contained in the minor servicing exception. This activity is a LOTO standard violation and not a machine guarding violation (covered by the 1910.212 standard) because cleaning is a servicing activity.

NOTE: The applicability of 1910.147 versus Subdivision O standards directly relates to the type of work activity being performed and not to the means of hazard abatement (i.e., LOTO versus machine guarding).

The Field Manager may consider issuing the following violation item(s) for this employee exposure to hazardous mechanical energy:

Item #1 - 1910.147(c)(4)(i): Procedures were not developed, documented and utilized for the control of potentially hazardous energy when employees were engaged in the activities covered by this section:

a) Machine #1 – The employer developed a written energy control procedure [include title of the procedure] for the cleaning of the machine's high speed rollers. However, supervisors did not enforce the energy control procedure as operators routinely cleaned the high speed roller during normal production operations. This cleaning practice exposed employees to moving machine parts and in-going nip point hazards created by the moving rollers.

OR

Item #1– 1910.147(d): The established procedure for the application of energy control (the energy control procedure) was not done in sequence as required by 1910.147(d)(1) through (d)(6):

a) Machine #1 – Employees were exposed to machine hazards associated moving machine parts and in-going nip points while they cleaned unguarded, high speed rollers during the normal production mode of operation. The employer failed to implement energy control application steps as the machine was not shut down or turned off to perform the servicing work [per the 1910.147(d)(2) requirements]. As a result, the remaining applicable energy control elements, involving machine isolation [(d)(3)], LOTO device application [(d)(4)], dissipation of residual energy [(d)(5)(i)], and verification of isolation [(d)(6)], were not implemented to protect employees from machine servicing hazards.

OR

Item #1– 1910.147(d)(2): The machine or equipment was not turned off or shut down using the employer’s energy control procedures required by this standard:

a) Machine #1 – The employer failed to shut down or turn off the machine to perform servicing in accordance with their established procedure, thereby exposing employees to the hazards of moving machine parts and in-going nip points while they cleaned unguarded rollers during the normal production mode of operation. As a

result, the remaining applicable energy control elements, involving machine isolation [(d)(3)], LOTO device application [(d)(4)], stored energy [(d)(5), if applicable], and verification of isolation [(d)(6)], were not implemented to safeguard employees from the machine servicing hazards.

ABATEMENT NOTE [Optional]: The machine guarding standards, in 1910, Subdivision O, may be used for abatement purposes provided that the machine guarding techniques (i.e., use of machine guards) used prevent employee exposure to hazardous energy (e.g., in-going roller nip points).

Example # 2 - Employees unsuccessfully attempted to clean out a chemical process knockout pot which became inoperable due to equipment plugging problems. The pressurized vessel was not de-energized, pursuant to the established procedures, during the attempted maintenance/cleanout of the knockout pot. Additionally, several isolation points were not identified in the documented procedure. Furthermore, the procedure's methods to dissipate residual chemical energy and to verify that de-energization was accomplished were determined to be inadequate. The failure to implement these procedures directly resulted in the unexpected and violent release of hazardous energy when employees attempted to open the pressurized vessel flange.

The Field Manager may consider issuing the following standard violation items because both the company's procedure and control actions were deemed noncompliant:

> Item #1 - 1910.147(c)(4)(ii): The energy control procedures did not clearly and specifically outline the scope, purpose, authorization, rules, and techniques to be utilized for the control of hazardous energy, including, but not limited to Items A-D of this section:
>
> a) Process Unit – The cleanout procedure, for the knockout pot, failed to clearly identify all of the specific steps to be followed by employees to isolate and disable the pressure vessel in order to safely de-energize the equipment and control the hazardous chemical energy. The procedure also lacked specific steps to relieve hazardous residual chemical energy contained in the vessel prior to equipment opening and specific verification steps were not prescribed to determine the effectiveness of the energy control measures.
>
> ABATEMENT NOTE: The procedure must contain information which authorized employees must know to safely control hazardous energy. Overgeneralization can result in a document, which has little or no utility to the employee who must follow the procedure. However, while the procedure is required to be written in detail, this does not mean that a separate procedure must be written for each and every machine or piece of equipment. Similar machines and/or equipment (those using the same type and magnitude energy) that have the same or similar types of controls can be covered with a single procedure.
>
> AND/OR
>
> Item #2 - 1910.147(d): The established procedure for the application of energy control (the energy control procedures) did not cover the following elements or actions and was not done in sequence as required by 1910.147(d)(1) through (d)(6):

a) Process Unit - The attempted cleanout of the knockout pot and related piping resulted in the violent release of hazardous chemical energy because the company's procedure for shutdown was not followed. Specifically, the following control measure elements and actions were not sequentially performed in accordance with the established company procedure:

1. Employees were not knowledgeable about the magnitude of the energy inside the knockout pot and the means to control the energy as required by 1910.147(d)(1). For example, the various maintenance crews were not aware of the appropriate knockout pot energy isolation measures that were identified in the company's energy control procedure.

2. An orderly shutdown to avoid increased hazards, as required by 1910.147(d)(2), was not performed because the company's general procedure was not completely implemented by personnel. Management was aware that isolation and drain valves could not be opened or closed per the procedure and no effort was made to remedy the problems so an orderly and safe shutdown could be accomplished.

3. All energy isolating devices that were needed to control the hazardous energy for the knockout pot, as required by 1910.147(d)(3), were not operated in such a manner as to isolate the equipment from the energy sources. Therefore, LOTO devices could not be affixed in accordance with 1910.147(d)(4).

4. Residual energy was not relieved or otherwise rendered safe following the application of tagout devices for the knockout pot’s energy isolating valves in accordance with 1910.147(d)(5)(i).

5. Prior to starting work on the knockout pot, authorized employees did not verify, in accordance with 1910.147(d)(6), that isolation and de-energization of the pressure vessel had been accomplished.

OR

Item #2 - 1910.147(d)(2): An orderly shutdown of the machine or equipment was not utilized to avoid any additional or increased hazard(s) to employees as a result of equipment de-energization:

a) Process Unit - The attempted cleanout of the knockout pot and related piping resulted in the violent release of hazardous chemical energy because the company's procedure for shutdown was not followed. Specifically, an orderly and safe shut down was not performed because the company's energy control procedure was not implemented by personnel. Management was aware that isolation and drain valves could not be opened or closed per the procedure and no remedial action was taken to remedy the hazardous practice. As a result, the remaining applicable energy control elements, involving machine isolation [(d)(3)], LOTO device application [(d)(4)], stored energy [(d)(5)], and verification of isolation [(d)(6)], were not implemented to safeguard employees from the machine servicing hazards.

IV. Alternative Methods and Consensus Standards.

A. General. The LOTO standard addresses the safety of employees engaged in servicing and maintenance activities in general industry workplaces. The core of the LOTO standard, which permits employees to service and/or maintain machines or equipment safely, is the shutdown and de-energization of production process and the isolation of energy source(s). This is accomplished through the standard's application of hazardous energy control procedures. However, in promulgating the LOTO standard, OR-OSHA did recognize circumstances in which discrete servicing and maintenance activities would be performed without locking or tagging out the machinery or equipment.

One such circumstance is detailed in 1910.147(f)(1), which recognizes that LOTO devices often must be temporarily removed for discrete periods to permit testing or positioning; however, the standard does not allow the employer or employee(s) to disregard the requirement for LOTO during other portions of the servicing or maintenance operation. Refer to Chapter 3, Section XII for additional information.

Also, the LOTO and other general industry standards (as emphasized throughout this OR-OSHA directive) are intended to supplement each other and other methods. For example, machine guarding may be an effective alternative to LOTO if the alternative eliminates employee exposure to the hazardous energy.

As a general principle, the LOTO standard does not apply to servicing and maintenance activities when employees are not exposed to hazardous energy. Therefore, employees can be protected from these severe workplace injuries and fatality incidents by:

1. LOTO – i.e., 1910.147;
2. Complying with the minor servicing exception to the LOTO standard – i.e., the note contained in 1910.147(a)(2)(ii);
3. Utilizing the cord and plug connected equipment or hot tap exemptions – i.e., 1910.147(a)(2)(iii)(A) and (a)(2)(iii)(B);
4. Effective machine guarding, in compliance with Subdivision O, that eliminates or prevents employee exposure from the hazardous energy associated with the machines or equipment;
5. Final actions granting LOTO standard variances (e.g., energy isolating device equivalency); or
6. Other applicable portions of Part 1910 (e.g., guarding and LOTO contained in Subdivision R special industries standards, Subdivision 2/RR, electrical lockout and tagging requirements contained in 1910.333) that prevent employee exposure to hazardous energy.

NOTE: It is important to note, however, that some types of machine guarding methods do not adequately protect employees from energy hazards for all types of servicing and maintenance work.

B. Minor Servicing Exception to the Lockout/Tagout Standard. Servicing and maintenance activities are permitted without machine or equipment LOTO pursuant to the *minor servicing exception* -- 1910.147(a)(2)(ii) note. Minor servicing activities, which take place during normal production operations and which are routine, repetitive, and integral to the use of machine/equipment for production, are not covered by the LOTO standard if alternative methods provide effective employee protection from hazards associated with the control of hazardous energy (e.g., unexpected start-up). Compliance with the machine guarding requirements of Subdivision O is an example of such alternative measures. Refer to Chapter 3, Section IV, for additional policy guidance.

C. 1910, Subdivision O, *Machinery and Machine Guarding.* Machine guarding often becomes an integral and essential component of an overall energy control procedure and, many times, an important economical alternative to LOTO. An energy control procedure should be based upon a reliable hazard analysis that determines hazardous energy exposure so that hazards can be effectively controlled. This will provide effective employee protection during machine operation and component testing and positioning tasks, as well as during servicing and maintenance activities, and will help an employer comply with OR-OSHA's performance-oriented machine guarding and LOTO standards.

It is important to emphasize that the machine guarding requirements of Part 1910, Subdivision O standards complement the requirements for LOTO. In some instances, an employer may avoid the requirements of the LOTO standard, if he eliminates exposure to servicing and maintenance hazards by using machine guarding techniques compliant with those standards.

For example, the changing of dies on a full- or part-revolution mechanical power press requires the employer to establish a die-setting procedure that employs point-of-operation safeguarding method(s), such as the safe usage of an *Inch* or *Jog* safety device for die set-up purposes together with LOTO. See 1910.217(d)(9)(i). These devices safely position the mechanical power press slide utilizing a point-of-operation safeguarding technique. Thus, an energy control procedure for these types of presses would need to integrate both point-of-operation safeguarding method(s) for slide positioning as well as LOTO procedures for die setting operation -- pursuant to 1910.147(f)(1).

NOTE: For additional guidance regarding the mechanical power press provisions, see 1910.217 and Program Directive A-291.

It is also important to note that some types of machine safety devices (e.g., safeguarding devices) do not adequately protect employees from energy hazards for all types of servicing and maintenance work. For example, light curtain safety devices are commonly used to prevent operators from having any part of their body in the danger zone during the operating cycle during the machine's normal production mode of operation only. However, in some cases, these light curtains are designed such that they are not operable when a press is placed in an inch mode of operation. In one particular case, an amputation incident resulted from unexpected machine start-up because an employee incorrectly relied on a light curtain for his protection while he was performing servicing activities on a machine operating in the inch mode.

Other safeguarding devices, such as two-hand control devices and safety mat devices, when properly designed and applied, safeguard machine hazard areas during normal production, testing, and positioning operations as they utilize control circuitry to prevent employees from having any part of their body in the danger zone during the press's operating cycle. However, control circuit devices are not energy isolating devices and, as illustrated in this section, some safeguarding techniques (described in national consensus standards) do not adequately protect employees from hazardous energy exposures for all servicing and maintenance activities.

The following sections provide OR-OSHA staff with machine guarding guidance and additional examples:

1. Subdivision O Standards. The machine guarding standards contained in this Subdivision provide the principal, though not exclusive, machine guarding requirements. The following machine guarding standards (with each source document) apply, with limited exception, when machines are being used for normal production operations:

    a. 1910.212 [41 CFR 50-204.5] -- *General requirements for all machines*
    b. 1910.213 [ANSI O1.1-1954 (R1961)] -- *Woodworking machinery requirements*
    c. 1910.214 [ANSI O1.1-1954 (R1961)] -- *Cooperage machinery*
    d. 1910.215 [ANSI B7.1-1970] -- *Abrasive wheel machinery*
    e. 1910.216 [ANSI B28.1-1967] -- *Mills and calenders in the rubber and plastics industries*
    f. 1910.217 [ANSI B11.1-1971] -- *Mechanical power presses*
    g. 1910.218 [ANSI B24.1-1971] -- *Forging machines*
    h. 1910.219 [ANSI B15.1-1953(P1958)] -- *Mechanical power-transmission apparatus*

    NOTE: These standards contain some servicing, maintenance and LOTO provisions that are intended to supplement the 1910.147 requirements. Refer to Chapter 3, Section II.C, and 1910.147(a)(3)(ii) for additional information.

    The general machine guarding requirements contained in 1910.212(a)(1) are performance-oriented and require one or more methods of machine guarding to effectively protect the operator(s) and other employees in the area around the machine from hazards when a machine or piece of equipment is being used to perform its intended production function. Examples of guarding methods include: barrier guards, two-hand tripping devices, electronic safety devices, etc. Likewise, to the extent that they eliminate or prevent employee exposure to hazardous energy, the use of machine guarding methods (e.g., barrier guards, enclosure guards) may be used as alternatives to LOTO during servicing and/or maintenance activities.

    In terms of point of operation requirements for machines, 1910.212(a)(3)(ii) requires point of operation danger zone guarding in conformity with any appropriate or applicable standard that has been adopted as or incorporated by reference into an OR-OSHA standard. In the absence of such standards, the guarding device must be so designed and constructed so as to prevent (and not just warn or signal employees of the impending hazard) the operator from having any part of his or her body in the danger zone during the operating cycle.

NOTE: *Appropriate* or *applicable standards*, as used in the context of 1910.212, are references to those private consensus standards that were adopted and used as source standards or incorporated by reference in the OR-OSHA standards and 1910.6 for the specific standards incorporated by reference in this Part 1910.

The remaining standards in Subdivision O include definitions, machine guarding, and related requirements for different kinds of machinery and power transmission apparatus. Other OR-OSHA standards, such as, but not limited to, the vertical standards for textiles, bakery equipment, and telecommunications, also address additional machine guarding requirements for these specific industries.

2. Examples. To illustrate the relationship or complementary nature of these LOTO and machine guarding standards, the following brief examples are provided:

   a. An employer who requires employees to perform servicing and/or maintenance while a machine or equipment is operating in the production mode must provide employee protection. Operations, such as lubricating, draining sumps, servicing filters, making simple adjustments, and inspecting for leaks and/or malfunction, are examples of routine operations that often can be accomplished with effective production-mode machine guarding as addressed in Subdivision O. The LOTO standard does not apply if employee exposure to hazardous energy is eliminated through compliance with the Subdivision O, machine guarding, requirements.

      In contrast, the replacement of machine or process equipment components such as valves, gauges, linkages or support structure is not considered a normal routine maintenance function that can be safely accomplished during machine or equipment operation. Such maintenance requires LOTO.

   b. The changing of dies on a hydraulic power press involves a sequence of steps that, in part, position the press slide, remove and secure dies for die changing purposes. In order to provide optimum employee protection, the LOTO standard works in conjunction with the machine guarding (Subdivision O) standards. Compliance with Subdivision O, such as using an inch safety device, is required during power press test/positioning activities.

      However, the use of an *inch* mechanism, for hydraulic power press die-set energy control steps does not effectively and reliably control all hazardous energy exposures to die-setters when their body parts are in, on, or in close proximity to hazardous energy associated with the press. Prior to placing their hands in, on or in close proximity to the potentially hazardous area, employees must, in accordance with the LOTO standard, disable and isolate the working area of the press as an integral step in the overall press energy control procedure.

For example, if employees need to place their hands/arms in the press working area (the space between the bolster plate and the ram/slide) to perform the servicing and/or maintenance activity (such as adjusting, cleaning or repairing dies), then additional energy control precautions (e.g., using properly applied safety blocks or slide-lock system; LOTO the press disconnect switch if re-energization presents a hazard) will be necessary because the *inch* or *jog* safety device will not protect employees from ram movement due to potential mechanical energy (resultant from the ram/slide position and associated gravitational force), press component or control system malfunction, or press activation by others. Refer to the April 22, 2005, letter to Lockton Companies of St. Louis and OR-OSHA Directive PD A-263 on slide locks for additional details.

NOTE: The installation and removal of dies involves potential hazardous situations for die-setter employees because a *trapping space* exists between the top die (when the die shoes are together) and face of the slide or, in some instances, the space between the dies (if the die shoes are fastened to the bolster plate and slide). However, during the securing and unfastening of dies, the slide (with the die shoes together) is usually in the lowest (180 degree) position. Die-setter injury may still result from the sudden dropping of the upper die shoe when freed from the slide (due to incomplete or inadequate shoe attachment to the slide) if an energized inch control is activated (e.g., due to human error; by dropping a part onto an unguarded foot control treadle).

c. Inch and jog devices have been included in the design of machines or equipment used by the printing (printing presses), textile (e.g., looms), and metal stamping (e.g., power presses) industries in order to safely perform set-up and to address maintenance problems associated with the straightening or feeding of material through their processes. The use of properly designed and applied control circuitry (such as the use of two-hand activation controls that are designed to control reliability standards and are mounted at a predetermined safety distance from the danger zone) for the testing or positioning of machine/equipment components, in conjunction with LOTO, prevent employee exposure to the hazard associated with the movement of machine/equipment components. See 1910.147(f)(1). These control methods protect employees through compliance with Subdivision O and the LOTO standards.

d. In the printing industry, some *make-ready* activities on energized presses are performed through the use of barrier guarding (compliant with Subdivision O) to protect employees from in-going point hazards associated with the press rollers. This machine guarding technique is a feasible alternative to LOTO as the roller guard eliminates exposure to hazardous energy protecting employees from the energy hazards associated with presses servicing and/or maintenance activities.

Furthermore, some operations, such as blanket-cleaning, are performed on printing presses while the machine is operated in a "slow run" mode. In this mode, barrier guards that fully extend across the entire smooth surface of the rolls and meet the requirements of Subdivision O, protect employees from all ingoing nip and other machine hazards, eliminating the potential for employee exposure. Refer to the April 7, 2004 letter to Printing Industries of America, Inc. for details.

e. In a similar situation as above, a nip point guard may be used to guard the ingoing nip point hazard on a three-roller printing ink mill during the wash-up operation. The cleaning task is, by definition, a *Servicing and/or maintenance* activity, and the equipment must be LOTO to protect the operator from hazardous (mechanical) energy. However, this machine guarding technique may be alternatively used in lieu of LOTO if the nip point guard effectively prevents the cleaning cloth from getting in between the rollers and possibly drawing in the operator's fingers or hand into the danger zone. See *OSHA Instruction STD 01-12-023*, dated July 12, 1994, for additional enforcement guidance.

f. Knife blades on a trimmer unit in a binding and finishing production line had to be changed on a monthly basis – a non-routine set-up activity that does not occur during the normal production operations. Based on the hazard analysis, it is feasible to change the blade in accordance with the LOTO requirements and to utilize both the energy control procedures and supplemental employee protection during the blade adjustment portion of the task by using a plexi-glass machine guard. The transparent guard enables the operator to safely adjust and test the blades using a hand-crank-wheel mechanism when the machine must be energized. The use of this barrier guard (compliant with Subdivision O), in conjunction with the LOTO standard's positioning provisions, contained in paragraph 1910.147(f)(1), provide optimum employee protection during this potentially hazardous set-up activity. Refer to the April 7, 2004 letter to Printing Industries of America, Inc. for details.

g. In a machine shop, milling machine normal production operations are covered by Subdivision O machine guarding requirements and the LOTO standard does not apply if the guarding method eliminates exposure by physically keeping the employee's body away from the point of operation and other hazardous areas of the machine. Refer to Chapter 3, Section IV for additional guidance on milling machine minor servicing activities.

Other practices, such as reaching around guards during press roller cleaning or conveyor un-jamming while the equipment is energized, are examples of servicing and/or maintenance activities that expose employees to hazardous mechanical energy. Under no circumstances is any part of an employee's body ever permitted to be exposed within a *hazardous area*, such as the point-of-operation or in-going nip point area, during servicing and/or maintenance activities while the machine is running or energized.

NOTE: For purposes of this standard, employees working on energized machines or equipment that meet each and every element of the minor servicing exception criteria (including the utilization of *measures which provide effective protection*) contained in 1910.147(a)(2)(ii), are not considered to be exposed to a *hazardous area*.

D. Consensus Standards. OR-OSHA recognizes the valuable contributions of national consensus standards, and in many respects, these standards offer useful guidance for employers and employees attempting to control hazardous energy. However, the OSH Act contemplates a distinction between the national consensus standard process and the process of OR-OSHA rulemaking. While the former often produces information useful in the latter, it is not automatically equivalent.

OR-OSHA may treat certain violations, which have no direct or immediate relationship to safety and health, as minimal (de minimis), requiring no penalty or abatement. OR-OSHA's enforcement policy provides that a violation may be de minimis, if an employer complies with a proposed standard or amendment or a consensus standard rather than the standard in effect at the time of inspection and if the employer's action clearly provides equal or greater employee protection. See the FIRM, *Field Inspection Reference Manual*, Chapter III, Paragraph (C)(f)(1), (2), and (3). In applying this principle, OR-OSHA takes heed of its rulemaking findings.

The following relevant national consensus standard descriptions address the control of hazardous energy and recognized machine safeguarding performance requirements and OR-OSHA's related enforcement policy:

1. *Control of Hazardous Energy – Lockout/Tagout And Alternative Methods*, ANSI Z244.1-2003. This consensus standard on LOTO and alternative methods offers useful guidance for employers and employees attempting to control hazardous energy. However, OR-OSHA has not determined that, in all cases, compliance with specific provisions of the ANSI Z244.1-2003 Standard and its annexes would constitute compliance with the relevant OR-OSHA standards.

   To a considerable extent, the OR-OSHA Lockout/Tagout Standard is a performance standard, which establishes general employer obligations, but leaves employers latitude to develop and implement specific methods for meeting those obligations. Where this is the case, the detailed discussion in the ANSI Z244.1-2003 Standard often can assist employers in developing specific methods to meet their obligations under the OR-OSHA Lockout/Tagout Standard.

   For example, the OR-OSHA Lockout/Tagout Standard establishes specific minimum criteria relevant to all energy control procedures. In Annex C, the ANSI Z244.1-2003 Standard details a sample energy control procedure for a blasting cabinet and dust extractor. While OR-OSHA cannot ascertain whether the sample procedure provides the breadth and specificity mandated in 1910.147(c)(4)(ii) without more information about the actual machinery and the manner in which servicing and maintenance would be performed, this sample procedure may provide valuable conceptual assistance to an employer who is developing energy control procedures specific to its machinery/equipment as prescribed by the OR-OSHA Lockout/Tagout Standard.

   In addition, the sample lockout/tagout placards in Annex D are good examples of supplemental tools that provide critical information specific to particular machines and equipment. An employer who chooses to develop a single, generic energy control procedure can supplement its generic procedure with similar placards to comply with 1910.147(c)(4)(ii).

   OR-OSHA has not comprehensively compared each provision of the ANSI Z244.1-2003 Standard with the parallel provisions in OR-OSHA standards. However, in several important respects, the ANSI standard appears to sanction practices that may provide less employee protection than that provided by compliance with the relevant OR-OSHA provisions. For example, the consensus standard employs a decision matrix that allows employers to use alternative protective methods in situations where OR-OSHA standards require the implementation of machine guarding or lockout/tagout.

In addition, the ANSI standard permits the use of tagout programs if they provide *effective* employee protection, while the OR-OSHA Lockout/Tagout Standard allows the use of a tagout program only where the employer demonstrates it provides *Full employee protection* -- i.e., a level of safety equivalent to that obtained by using a lockout program. Further, the *Hazardous energy control procedures*, *Communication and training*, and *Program review* sections of the ANSI Standard, while detailed and conceptually valuable, do not appear to mandate certain discrete practices that are prescribed in parallel sections of OR-OSHA's Lockout/Tagout Standard.

When an OR-OSHA standard prescribes a practice, design, or method that provides a requisite level of employee protection, employers may not adopt an alternative approach that provides a lesser level of employee protection.

2. Safeguarding When Referenced by the Other B11 Machine Tool Safety Standards – Performance Criteria for the Design, Construction, Care, and Operation – ANSI B11.19-1990. The purpose of this national consensus standard is to establish the performance requirements for the design, construction, care, and operation of safeguarding used to protect operators and others from machine tool hazards.

   NOTE: *Safeguarding*, was defined in this 1990 standard, as *[m]ethods for protection of personnel from hazards, using guards, safety devices, or safe work procedures.* These safeguards may or may not protect employees adequately from all types of hazardous energy associated with servicing or maintaining a particular machine or piece of equipment. For example, if an employee needs to place their hands/arms in a part revolution mechanical power press working area to perform the repair or cleaning activity, then additional energy control precautions will be necessary because the two-hand control safeguarding device will not protect employees from ram movement due to potential mechanical energy (resultant from the ram/slide position due to gravitational force), press component malfunction, or press activation by others.

   Safeguarding devices (e.g., presence-sensing safeguarding devices) that rely on control circuitry and are used for employee protection purposes may not be used in lieu of LOTO during machine servicing/maintenance activities because control circuit devices are not, by definition, energy isolating devices. See 1910.147(b).

   As a result of a legal settlement with the National Association of Manufacturers (NAM), OSHA incorporated a reference to this particular 1990 consensus standard into the *Normal Production Operations* section (Appendix C, Section A) of OSHA Instruction, STD 1-7.3, 1910.147, *The Control of Hazardous Energy (Lockout/Tagout) -- Inspection Procedures and Interpretive Guidance*, dated September 11, 1990 (cancelled).

   NOTE: The intent of the ANSI B11.19-1990 national consensus standard is to provide performance criteria for the safeguarding chosen by the user as referenced in the other B11 safety standards. However, the selection and use of properly applied B11 safeguarding for machines, which fall outside the scope of the B11 machine tools standards, may provide employers with valuable concepts and techniques that prevent employee exposure to hazards.

This appendix provided guidelines to assist Compliance Safety and Health Officers (CSHOs) during evaluations of employer operations, and the 1990 edition of this ANSI B11.19 consensus standard is referenced with regard to *minor servicing activities*.

Pursuant to the note for the *Exception to paragraph (a)(2)(ii),* Appendix C of *OSHA Instruction STD 1-7.3* specified that the ANSI B11.19-1990 criteria provide *[s]everal alternative means of safeguarding the hazardous portions of machines and equipment* and that, when properly applied, may be used as *alternative measures that provide effective protection*. Although the standard is not all inclusive, it describes effective safeguarding alternatives for the protection of employees. Some described safeguards include: interlocked barrier guards; presence sensing devices; and various devices under the exclusive control of the employee. Refer to Chapter 3, Section IV, for additional policy guidance for this exception.

This machine tools consensus standard was revised, reissued in 2003, and renamed as the *American National Standard for Machine Tools – Performance Criteria for Safeguarding -- ANSI B11.19-2003*. This national consensus standard contains requirements for the design, construction, installation, operation, and maintenance of the safeguarding for machine tools. The types of safeguarding methods contained in ANSI B11.19-2003 include: 1) *guards*, 2) *safeguarding devices*, 3) *awareness devices*, 4) *safeguarding (work) methods*, and 5) *safe work procedures*.

In terms of *machine guarding methods (barrier guards, safety devices)* and compliance with Subdivision O, the guarding method, where feasible, must be a well designed and constructed guard or device that prevents employee exposure to the hazardous machine area or *danger zone*. See 1910.212(a).

The following ANSI B11.19-1990 safeguarding techniques are compliant with the OR-OSHA Subdivision O requirements, for normal production operations, as they either: 1) prevent employees from placing their hands or body parts into the hazardous machine area; or 2) prevent or stop hazardous motion of the machine tool, if the employee is exposed to the hazard; or 3) withdraw the operator's hands or body parts before a hazard exists:

a. Barrier guards: fixed, adjustable, and interlocked;
b. Automatic movable barrier devices;
c. Two-hand operating lever, trip and control devices;
d. Single control safeguarding devices;
e. Presence-sensing safeguarding devices: electro-optical, RF, and area scanning;
f. Pull back (pull out) and restraint devices;
g. Safety mat devices.

Caution must be exercised as machine safeguarding methods may not be acceptable alternatives to LOTO if they do not eliminate or prevent employee exposure to energy hazards during the servicing and maintenance work. In terms of machine normal production operations, OR-OSHA will consider adherence with the requirements for the first two categories of safeguarding methods, listed in the ANSI B11.19-1990 standard, for *guards* and the above listed *safeguarding devices*, as being primary safeguarding methods compliant with Subdivision O. The feasibility determination as to which safeguarding application is appropriate is made with respect to the energy hazards associated with a particular servicing or maintenance task on a machine-by-machine basis.

The three other ANSI B11.19 safeguarding methods (awareness devices, safeguarding (work) methods, safe work procedures), included in the 2003 standard, provide a lesser degree of employee protection and are considered to be secondary control measures during normal production operations. These methods, by design, do not prevent employees from placing or having any part of their bodies in the hazardous machine areas. Additionally, safeguarding devices, such as probe detection devices and safety edge devices (aka *bump switches*) provide a lesser degree of (secondary) protection as they do not, in all cases, eliminate employee exposure to injury from the machine hazardous energy.

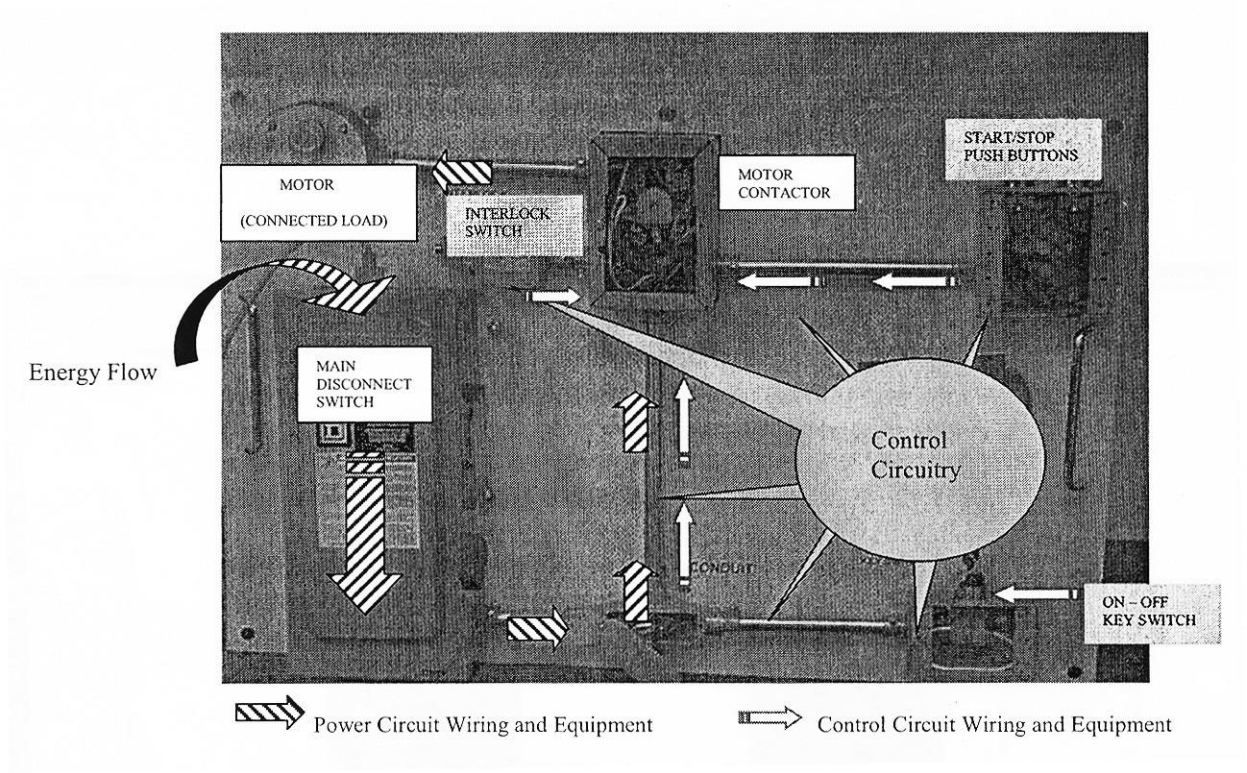
Secondary control measures, which provide less employee protection, are acceptable and compliant with the Subdivision O requirements only when the primary machine guarding methods (barrier guards, safety devices) cannot be installed due to reasons of impossibility or greater hazard. [See Section VI of this chapter on affirmative defenses for additional details.] Where it is feasible to employ the primary safeguarding methods, secondary control methods may supplement the primary controls; however, these secondary measures must not be used in lieu of machine guarding methods required by Subdivision O.

NOTE: Section 12 of the ANSI B11.19-2003 standard does not classify complimentary equipment (e.g., work-holding equipment; hand tools; stop and emergency stop devices) as safeguarding devices because they do not prevent or detect inadvertent access to a hazard. The use of complimentary equipment is vital to hazard mitigation, but the sole use of this equipment does not constitute compliance with the Subdivision O requirements.

The employer has the burden to show that it is impossible to use any of the primary safeguarding methods (or that the safeguarding presents a greater hazard); however, CSHOs should include information useful to refute possible affirmative defenses in their case file documentation. See Section VI of this Chapter for additional information on affirmative defenses.

E. Energy Isolating Device Equivalency. Paragraph 1910.147(c)(1) requires that before any employee performs servicing or maintenance on a machine or equipment where the unexpected energizing, start-up, or release of stored energy could occur and cause injury, the machine or equipment shall be isolated from the energy source, and rendered inoperative. Machines and equipment are isolated from energy sources by energy isolating devices. The standard prohibits the use of push buttons, selector switches, and other control circuit type devices as energy isolating devices. Thus, pursuant to the standard, such mechanisms cannot be used to control hazardous energy. See the definitions for *Energy isolating device and Controller* contained in Chapter 1, Section VII.

The following electric circuit illustration consists of power and control circuits. The motor system, in this example, consists of a power circuit which distributes power (electric energy) from the source (main disconnect) to the motor (connected load) and a control circuit to control the distribution of power through the use of a motor controller (motor contactor), system interlock device, on/off key switch, and start/stop push buttons.



Motor system components may be, in practice, hundreds of feet apart from each other. Thus, the electrical enclosures and conduit may also be subjected to and affected by physical damage, vibration and potentially corrosive and invasive environments.

The following case studies illustrate the reasons why LOTO of a power circuit is significantly safer and more reliable than control circuit protective measures:

1. Case #1: Locking of a Push Button: Some employers rely on this control circuit protective method (e.g., by placing a lockable cover over a controller's stop/start button; tagging the control panel) to provide employee protection. However, the following seven (7) situations can cause unexpected motor energization or startup if this control circuit method is used:

    a. Another employee enters the motor controller (motor starter) enclosure and manually closes the relay;
    b. A malfunction of the push button;
    c. A relay or motor controller failure (e.g., defective spring; welded contacts). For example, a machine jam occurs causing higher current in the motor circuit, resulting in the *freeze-up* of the controller relay contact parts because the current creates arcing, which in turn welds shut the relay's plunger-coil mechanism. This could be particularly hazardous if an employee is relying on control circuits to clear jams as the energized machine could start up and injure the employee;
    d. A loose wire contacts the conduit or enclosure;
    e. Two wires short out inside a damaged conduit (e.g., vibration causes wires to rub and wear through the wire's insulation resulting in an electric short and bridging of the control circuit);
    f. Water, dirt, metal particles or other conductive foreign debris enters the control circuit enclosure causing the switch to operate because the material sufficiently bridges and closes the circuit, allowing current flow; or
    g. Ice, grease, dirt, wood, metal particles or other debris causes a push type control mechanism to stick in the closed position, allowing current to flow.

    Thus, OR-OSHA has determined locking (and/or tagging) the push button for a control circuit is not as safe as the LOTO of a power circuit energy isolating (disconnect) device.

2. Case #2: Trusting the Limit Switch: Limit switches stop a motor when you operate a gate or remove a guard on a machine or piece of equipment. These devices prevent push buttons from energizing the circuit, but they will not prevent the motor from starting if any voltage is present in the power circuit. A motor can start regardless of what is done in the control circuit, and a motor can be started in at least the following ways:

    a. Closing the relay or motor controller (motor starter);
    b. Shorting out the wiring in the conduit/enclosure; or
    c. Shorting out the wire against the conduit/enclosure.

These case studies identify just some of the shortcomings and associated hazards of relying on control circuitry as a primary method to control hazardous energy. A switch or other device in a control circuit is not an energy isolating device and interrupting the power circuit at the motor isolating (disconnect) switch is the safest and most reliable way to control energy associated with the motor.

However, there will be times when an exception to LOTO will be permitted, for discrete periods, due to the need for the employer to have the power circuit energized. In a limited minor servicing exception, contained in the 1910.147(a)(2)(ii) note, an employer must still provide effective alternative protection in lieu of energy isolation. Also, OR-OSHA allows the removal of LOTO devices, in accordance with the sequence of actions specified in 1910.147(f)(1), when there is a need to test or position the machine, equipment or system

components. Employers must provide effective protection from the hazardous energy during the time that it takes to complete this temporary measure for a particular system test or positioning task. See also Section IV.B of this chapter and Chapter 3, Sections IV and XII for additional guidance.

Additionally, OSHA issued a January 5, 1998, letter of interpretation to the Procter and Gamble Company which accepted their specific *safety disconnect system* (inherently fail-safe system) as equivalent to an energy isolating device. The equivalency determination was based upon the specific process machine facts and a failure analysis report that concluded that their inherently fail-safe system reliably prevented wired load circuits to (functionally interconnected) process machines from being energized by an electrical source. Thus, the Procter and Gamble Company's fail-safe disconnect system must be used in accordance with all design parameters, instructions, and limitations contained in the original report.

Although this thorough system design review demonstrated equivalency, the variance procedures [pursuant to OAR 437-001-0400] must be followed for future determinations, based on a case-by-case analysis, because control circuitry is explicitly rejected in the standard's definition of an *energy isolating device*. In the event that an employer elects to apply for a variance for the use of control circuitry in lieu of an energy isolating device for work that does not fall within the minor servicing exception, the employer may contact OR-OSHA.

F. Other Abatement Methods. Sometimes employees are performing servicing and/or maintenance work where other preventive measures would adequately protect them from exposure to hazardous energy. As previously described, 1910.147 applies in these situations; however, the application of alternative means of abatement eliminates the need for disabling machines or equipment and implementing an energy control procedure. For example, one employer had maintenance employees clean an open top-mixing vat that contained a "screwlike" cutting blade. The employees accessed and cleaned the equipment through the use of an unguarded catwalk that was located above the vat. Tragically, a cleaning employee fell into the vat during the cleaning process.

In this instance, one means to prevent exposure, would be the installation of a standard catwalk guardrail system in accordance with the *Walking and Working Surfaces*, Subdivision D requirements. This example illustrates how a single abatement measure (alternative protective method) would keep employees' bodies out of the danger zones, thus negating the need for energy control requirements since the employees no longer could be exposed to hazardous energy. Obviously, if the employees are required to bypass the standard guardrail system or otherwise expose themselves to the hazardous energy (in this case the revolving cutting blade), then the LOTO standard requirements must to be implemented.

In another example, dry-cleaning employees disassembled machines that contained steam-heated components, which posed serious thermal energy (burn) hazards. The LOTO standard applies because the thermal energy may injure employees.

V. Multi-employer Scenario. A contractor employer performing maintenance work on a boiler pipeline fails to verify that all of the residual energy in the line has been safely relieved because she believes the host employer effectively de-energized the unit. The contractor employees are injured as a result of opening the flange, and the contractor blames the host employer for its failure to adequately control the hazardous energy.

The CSHO needs to thoroughly document the facts, in the case file, to determine whether the 1910.147(f)(2) outside personnel provisions were met and to determine whether the agreed upon energy control responsibilities (e.g., contractual responsibilities) of each party were met. Both the host and contractor employers have independent obligations to provide protection under this performance-oriented standard for their respective employees. In this scenario, the CSHO should determine which employer(s) had the responsibility to verify energy isolation based upon each employer's respective energy control procedure.

The host employer often will have greater familiarity with the energy control procedures used at the host facility; however, at 1910.147(f)(2)(i), the standard requires the host and contract employers to inform each other about their respective energy control procedures. Such coordination is necessary to ensure that both sets of employees will be protected from the hazardous energy. The contractor must take reasonable steps consistent with its authority to protect its employees if the contractor knows, or has reason to know, that the host's energy control procedures are deficient or otherwise insufficient to provide the requisite protection to its employees.

NOTE: The guidance provided in PD A-257, *Multi-Employer Citation Policy*, must be used to determine host employer and contractor compliance with the LOTO standard. In all cases, the decision to issue 1910.147 citations to the host or contractor employer should be based on all of the relevant facts and the established policy for exposing, creating, correcting, and controlling employers.

In *IBP, Inc. v. Herman*, 144 F.3d 861 (D.C. 1998), the Court of Appeals for the District of Columbia Circuit ruled that a host employer was not liable for the lockout/tagout violations of an independent contractor because, apart from pointing out the violations to the contractor, the host's control over those violations was limited to the cancellation of the contract.

VI. **<u>Affirmative Defenses.</u>** An affirmative defense is any matter that, if established by the employer, will excuse the employer from a violation that has otherwise been established by the Secretary of Labor. OR-OSHA must be prepared to respond whenever an employer is likely to raise an argument supporting such a defense, and CSHOs should include documentation information useful to refute possible affirmative defenses in their case file documentation. [*Field Inspection Reference Manual (FIRM)*, Chapter III(c)(8).] The following are some examples of LOTO-related affirmative defenses that may be encountered:

A. <u>Greater Hazard.</u> During the course of a federal OSHA inspection, a CSHO discovers that the employer is using freeze plug technology (in accordance with good engineering practice and the manufacturer's recommended guidelines) to isolate a section of pipeline containing a hazardous substance in order to perform a repair. [*Freeze Plug (Stop) Technology*, as described by ANSI Z244.1-2003, is a non-intrusive method for isolation of piping systems (containing water/chemicals with suitable freeze points) through line freezing methodology.] The freeze plug is not an energy isolating device, as defined in 1910.147(b), but the employer convincingly demonstrates that it is a greater hazard to shut down/start up the process in order to repair the pipe. Under the circumstances specific to the process, the Area Director agreed with the defense and no citation is issued.

NOTE: As there is a modification to the pipe in this scenario that would permit the installation of an energy isolation device (EID) or devices, the employer would be required, pursuant to 1910.147(c)(2)(iii) and 1910.147(d)(3), to ensure that sufficient EIDs (e.g., valves), which are capable of accepting a lockout device, are physically located to isolate the pipeline from the hazardous substance. Thus, a freeze plug would not be necessary for future isolation purposes because the incorporation of an EID(s) would permit sufficient process isolation capability to allow for the safe isolation of hazardous energy.

Refer to Section III of this chapter and the *Field Inspection Reference Manual (FIRM)* for policy guidance.

B. Impossibility. There may be scenarios where an employer, based upon a feasibility issue, cannot isolate hazardous energy sources when servicing and maintenance is performed during normal production operations. The impossibility defense would apply if: 1) LOTO was functionally impossible or would prevent the performance of work, and 2) there are no alternative means of employee protection. However, the impossibility defense does not relieve an employer from its obligation to provide a safe workplace to the extent possible by taking alternative steps to prevent employee injury.

For example, assume that the only alternative to performing servicing and/or maintenance work safely would be the complete system shutdown and disabling of a process in accordance with the LOTO standard. The fact that a shut down would be time consuming, costly or inconvenient would usually not excuse the employer from meeting its obligation to ensure safe and healthful working conditions in accordance with the Oregon Safe Employment Act.

C. Unpreventable Employee Misconduct and Isolated Instance. During a federal OSHA inspection, a CSHO observes an employee changing the die in an injection molding machine after the employee has pressed the stop button without locking out the machine in accordance with the company's established and compliant energy control procedure. Upon further investigation, it was discovered that this unsafe action occurred just minutes prior to the CSHO observation, and the condition was unknown to the employer.

Interviews reveal that other employees consistently follow the die set procedures by locking out the machine in accordance with the established procedure. The company had a safety program, which included regular supervision of machine-specific energy control procedures, effective training, and uniform safety rule enforcement. At the informal settlement conference, the employer alleges that this inappropriate behavior constituted unpreventable employee misconduct, and the Area Director withdraws the citation for the alleged 1910.147(d)(4)(i) violation because the:

1. Employer did not know, or have a reason to know, of the violative condition; and
2. Established work procedures/rules were designed to prevent the violation and adequately communicated to the employees and supervisors; and the
3. Employer had instituted a safety and health management program to discover violations of work procedures/rules together with the uniform enforcement of those work procedures/rules when they were violated.

CHAPTER 3 -- INSPECTION GUIDANCE

The following guidance, relative to specific provisions of 1910.147, is provided to assist Compliance Safety and Health Officers (CSHOs) in conducting inspections where the standard may be applicable:

I. Purpose of the Standard. The purpose of this standard is to reduce the number of fatalities and injuries resulting from the failure to use practices and procedures necessary for the control of hazardous energy. This standard requires employers to establish an energy control program and to utilize energy control procedures to shut down or disable machines, isolate hazardous energy, and affix appropriate lockout or tagout devices to energy isolating devices prior to beginning servicing or maintenance work. These actions, if properly designed and implemented, will prevent the unexpected energization, start-up, or release of stored energy and prevent injury to employees.

The standard's scope, application, and purpose paragraphs [1910.147(a)] address a fundamental presumption underlying the standard -- that machines and equipment will be shutdown and disabled in accordance with the applicable energy control procedure before employees begin servicing and maintenance activities. Although some have contended that the standard does not apply when an employee is aware of the continuing presence of hazardous energy, this assertion is completely at odds with the language, purpose, and spirit of the standard. Quite simply, the LOTO standard is violated when an employee is, or may be, exposed to hazardous energy that has not been isolated, even if the employee knows that the energy has not been controlled and continues to constitute a hazard. Just as an employer cannot rely on an employee's recognition of the hazard to avoid an obligation to guard machinery during normal operations, an employer cannot rely on an employee's recognition of hazardous energy to avoid an obligation to shut down/disable the machine and isolate hazardous energy when employees service or maintain machinery. In both cases, reliance solely on employee awareness or knowledge of the presence of hazardous energy provides inadequate protection. Under no circumstances is any part of an employee's body ever permitted to be exposed within a *hazardous area*, such as the point-of-operation or in-going nip point area, during servicing and/or maintenance activities while the machine is running or energized. Employers cannot evade their obligation under the LOTO standard by permitting or requiring employees to perform servicing and maintenance work on machines or equipment that are running or energized. See *Burkes Mechanical, Inc.*, 21 BNA OSHC 2136, 2139 n.4 (Docket No. 04-0475, 2007) and *General Motors Corp., CPCG Oklahoma City Plant* (Docket Nos. 91-2834E and 91-2950).

NOTE: For purposes of this standard, employees working in energized machines or equipment that meet each element of the *minor servicing exception* criteria (including the utilization of *measures which provide effective alternative protection*) contained in 1910.147(a)(2)(ii) are not considered to be exposed to a *hazardous area*.

II. Scope and Application of the Standard.

A. Unexpected Energization, Unexpected Start-up, and Release of Stored Energy. The title of the standard is the *Control of hazardous energy (lockout/tagout),* and the LOTO standard covers both forms (potential and kinetic) of hazardous energy. The regulation applies to all types of energy (e.g., electrical, mechanical, hydraulic, chemical, thermal, etc.). By establishing a program and procedures to control each type of hazardous energy, the standard protects employees from unexpected energization, start-up, or release of stored energy (potential energy) hazards.

NOTE: Section 1910.147(a)(1)(i) addresses the potential energy hazards associated with unexpected energization or start up of machines or equipment, or the release of stored energy. The LOTO standard also applies when servicing and maintenance activities take place during normal production operations, if either of the circumstances in 1910.147(a)(2)(ii)(A) or (B) apply, and if the minor servicing exception is inapplicable. The predominant form of energy associated with normal production operation of a machine or piece of equipment is sometimes referred to as *kinetic energy*.

The purpose of the *Control of hazardous energy (lockout/tagout)* standard, according to 1910.147(a)(3), is to:

> *… require employers to establish a program and utilize procedures for affixing appropriate lockout or tagout devices to energy isolating devices and to otherwise disable machines or pieces of equipment to prevent unexpected energization, start-up or release of stored energy in order to prevent injury to employees*.

The standard protects employees by requiring the de-energization of machines or equipment and locking or tagging them out before the servicing or maintenance work is performed. Pursuant to the standard, the hazardous energy sources are effectively controlled through an energy control (LOTO) program, which includes the effective disabling and isolation of machines or equipment to prevent the release of hazardous energy during servicing and/or maintenance activities.

The LOTO provisions give each authorized employee personal control over the hazardous energy sources to which they otherwise would be exposed. Servicing and maintenance can begin only after each authorized employee has placed her own LOTO device on the energy isolation device(s) or equivalent energy control mechanism. It is only when each authorized employee removes her personal LOTO device that the machine can be re-energized and started-up. It is the control that each employee maintains over the hazardous energy through her personal LOTO device that prevents the unexpected energization or start-up of the machine on which she is working – i.e., the phrase *unexpected energization* reflects the perspective of authorized employees who control hazardous energy exposure through personal LOTO devices, and any re-energization or start-up is considered to be unexpected unless each authorized employee has authorized such re-energization and start-up by removing her personal LOTO device from the energy isolation device or equivalent energy control mechanism. The term *unexpected* refers to any energization or start-up that is not sanctioned (through the removal of personal LOTO devices) by each authorized employee engaged in the servicing/maintenance activity. In promulgating the standard, OSHA did not intend to permit warning devices, which are designed to give employees notice of re-energization or start-up and intended to provide time to escape machine danger zones, to be used in lieu of energy isolation and personal LOTO devices.

NOTE: For a more detailed discussion of the regulatory provisions evidencing the Agency's intent that LOTO devices would be the means to protect employees from unexpected energization see Chapter 4 of this manual.

Indeed, the exclusive use of warning devices subverts the intent of the standard by removing control over the hazardous energy from individual authorized employees and by placing the burden on exposed employees to become cognizant of and to recognize the significance of warnings, so that they can attempt to escape danger zones before they are injured. OSHA considered this approach to be impractical and dangerous if applied to workplaces throughout the nation. Thus, in promulgating the LOTO standard, the agency sought to prevent unexpected energization by establishing a requirement that employers follow energy control procedures that prohibit re-energization and start-up of machinery before each authorized employee has removed his personal LOTO devices.

In promulgating the standard, it was OSHA's intent to protect employees effectively from all forms of hazardous energy by isolating machines from their respective energy sources during servicing and/or maintenance and providing individual authorized employees with control over energy isolation devices, and this intent is expressed in the *Scope, application, and purpose* paragraph, 1910.147(a), as well as throughout the preamble to the Final Rule. However, the Occupational Safety and Health Review Commission (OSHRC) and United States Court of Appeals for the Sixth Circuit have held that the standard did not apply in a situation where warning devices allowed adequate time for employees to move out of the danger zone and avoid employee injury. See *General Motors Corp., Delco Chassis Div., 17 BNA OSHC 1217 (Nos. 91-2973, 91-3116, 91-3117, 1995), aff'd., 89 F.3d 313 (6th Cir. 1996).*

GMC Summary: The OSHRC found that to service or maintain the three cited machines, an employee had to pass through electronically interlocked gates that immediately deactivated the machines when opened. The Commission further found that once deactivated, an eight to twelve step process had to be followed to restart each of the machines and that, either by audible or visual signals or the presence of company employees in the immediate work area, this multi-step process would have alerted employees servicing the machines that they were about to start-up. Given the advance notice provided by the start-up warning sequences, the OSHRC reasoned that the standard did not apply because the energization would not be *unexpected*. The Commission held that the Secretary must establish that a cited machine or piece of equipment presents the hazard of unexpected energization or start-up. The United States Court of Appeals for the Sixth Circuit affirmed the Commission's holding.

Inspection strategy: While OSHA believes that the *GMC* decisions fundamentally misconstrue the LOTO standard, and the Agency may challenge this precedent in a future proceeding, the following policy and guidance is provided to assist Compliance Safety and Health Officers (CSHOs) in their inspection activity in light of the existing precedent.

The *GMC Delco* decisions addressed the relatively uncommon situation in which a multi-step start-up procedure, time delays, and audible warnings were designed to enable employees to avoid injury even when the machine was started during the middle of a servicing procedure. In most situations where the LOTO standard applies, enforcement will not be affected by the *GMC Delco* decisions because the start-up mechanisms will not be designed and implemented to permit all employees to escape injury in all situations in which a machine or piece of equipment is re-energized or started while employees are

performing servicing and/or maintenance activities. That was the case in *Secretary v. General Motors Corp. CPCG Oklahoma City*, OSHRC 91-2834E and 91-295 (OSHRC 2007), where the Commission held that the standard applied where equipment had been deactivated, but not locked out, during servicing. The Commission explained that the switches to operate the equipment were generally accessible, and GMC did not show that, once the switches were flipped, activation would not be immediate, or would follow some adequate warning.

In addition, the *GMC Delco* decisions do not apply when an employer fails to turn the equipment off in the first place, and then claims that activation could not be unexpected because the employees knew the equipment was still operating. For example, in *Secretary v. Burkes Mechanical*, 21 BNA OSHC 2136, 2139 n.4 (Docket No. 04-0475, 2007), the Commission did not accept an employer's contention that the standard did not apply because the employees knew that the conveyor they were servicing was running. It explained that the standard specifically applies to servicing during normal production operations, and allowing the equipment to operate during servicing presented exactly the type of hazard the standard is intended to address. See Section II.B of this Chapter.

If an employer claims that the *GMC Delco* decision is applicable to its operation, or if the CSHO is aware that the employer is relying on warning or protective devices in lieu of lockout and tagout procedures, the case-specific facts must be thoroughly evaluated and documented to determine the adequacy and reliability of the particular safety feature(s). Areas of inquiry shall include both: 1) characteristics of the equipment, such as how it is intended to operate or whether safety devices could be overcome by equipment failure or environmental factors; and, 2) human factors, such as inadequate employee training or particular characteristics of an individual employee that would reduce the effectiveness of safety devices. The following factors should be used to assess whether particular warning device(s) are adequate and reliable enough to allow all employees to escape all types of hazardous energy in all circumstances that may occur:

1. The particular configuration and operation of the equipment.

2. The nature of the servicing operations which put employees at risk, i.e., the particular procedures that the employees are using, the time during which servicing operations are performed, and the place where the servicing operations performed -- in, on, or around the machine or equipment.

3. The ability of the servicing employees to move quickly out of the way of hazardous machine movement if other employees prematurely started the equipment – i.e., consider the amount of time between the warning signal and the machine's start-up in relation to the amount of time needed by all employees to escape or move to safety as well as the possibility of an employee slipping or getting caught when trying to exit the hazardous area.

4. The ease of operating the machine's safety devices and whether the safety features easily could be circumvented by employees.

5. The reliability of the safety features including whether mechanical failure can defeat their function.

6. The likelihood that tools or equipment left behind (in a rapid escape scenario) could fly out and strike an employee or other wise cause injury.

7. The adequacy of the instructions that are provided to employees regarding the safety features. Employees also should be questioned as to their knowledge and understanding of these instructions.

8. The enforcement and supervisory oversight of the energy control procedures and work practices. For example, are supervisors, managers, and employees held accountable for their safety performance?

9. Facts peculiar to individuals, which might have an effect on the adequacy or reliability of the safety features. For example, an employee's ability to hear and recognize an audible warning signal in a work environment will depend on factors such as the background noise levels, the strength and pitch of the warning signal, the employee's position relative to the source of the warning signal and other noise sources in the area, and the particular employee's hearing acuity.

10. The signaling systems must be effective in warning employees who are exposed to hazardous energy during maintenance and servicing operations. If the employer relies on visual signals, attention will have to be paid to the direction the employee is facing, any obstructions between the employee and the persons or moving parts that the employee must be able to see, any reason why the employee's attention might be directed elsewhere, the lighting conditions in the area, and possible deficiencies in the employee's eyesight. For example, a nearsighted employee may be able to service nearby parts without being able to clearly see movements that may be some distance away. Visual signals that are sufficient for an employee with 20-20 vision may be inadequate for other employees.

11. Near miss data and injury experience due to inadequacies in or deviations from the energy control procedures and practices.

These factors, together with any other pertinent information, must be carefully evaluated and documented. In situations where warning or protective devices are in use and an analysis indicates that they are not effective in all situations, a citation should be issued after consultation with the OR-OSHA Administrator. In addition, because the standard requires the use of personal LOTO devices to protect employees from hazardous energy, and because the failure to use personal LOTO devices deprives authorized employees of their control over the hazardous energy, a citation may be issued for a violation of the standard, even if it appears that other warning or protective devices provide a significant level of protection against hazardous energy.

B. Normal Production Operations.

Normal production operations occur during the utilization of a machine or piece of equipment to perform its intended production functions. The Subdivision O, *Machinery and Machine Guarding*, requirements of 1910 apply to these operations. Thus, Subdivision O complements the LOTO standard requirements.

Activities that are necessary to prepare or maintain a machine or piece of equipment are not considered utilization and are considered servicing and/or maintenance activities. Some of these workplace activities may include constructing, installing, setting up, modifying, maintaining, lubricating, cleaning, un-jamming, making minor adjustments, and tool changes.

Safeguarding of servicing and maintenance employees during normal production operations can be ensured either by:

1. Effective machine/equipment safeguarding in compliance with Subdivision O; or

2. Compliance with 1910.147 in situations where normal production operations safeguards are rendered ineffective or do not protect the employees from exposure to hazardous energy during servicing and maintenance operations.

If a servicing or maintenance activity takes place as part of the normal production operation, the employee performing the servicing or maintenance may be subjected to hazards not normally associated with the traditional production process. Although the machine guarding provisions in Subdivision O of 1910 cover normal production operations, employees engaged in servicing or maintenance during normal production operations must follow LOTO program requirements if they:

1. Remove or bypass machine guards or other safety devices;

2. Place any part of their bodies in or near a machine's point of operation; or

3. Place any part of their bodies in a danger zone associated with machine operations. See 1910.147(a)(2)(ii)(A) and (B).

If the servicing or maintenance is performed during normal production operations and none of the conditions stated above exist, a violation of 1910.147 does not exist. [Refer to the guidance in Section IV of this chapter on the minor servicing exception to 1910.147(a)(2)(ii).]

NOTE: The applicability of the standard (1910.147 versus Subdivision O standards) directly relates to the type of work being performed (servicing and/or maintenance versus normal production operations) and not to the means of abatement (LOTO versus safeguarding). For example, cleaning the rollers of an unguarded press, where the employee is exposed to in-going nip point hazards, is a LOTO standard violation and not a machine guarding violation because cleaning is a servicing activity. See 1910.147(a)(2)(ii)(B). However, compliance officers can not cite an employer for LOTO violations when effective machine guarding techniques are used to eliminate the hazardous (mechanical) energy employee exposures.

The Compliance Assistance Flowcharts, Figures 3-1 and 3-2, may be consulted for analysis purposes. Also, Section IV of this chapter should be consulted for a description of the minor servicing exception.

Furthermore, there are some tasks, such as machine or equipment inspection, which may either constitute "servicing and/or maintenance" or "normal production operation" activities depending upon the specific circumstances of the work tasks. The purpose or function of the activity determines which standard applies. If the inspection activity is conducted to determine product quality or it is functionally related to the product, then it is a normal production operation. Conversely, if the inspection is performed to troubleshoot a mechanical problem or determine the adequacy of an equipment or machine repair, then the inspection is a "servicing and/or maintenance" activity that is addressed by the LOTO standard.

NOTE: Due to changing job responsibilities in the American workplace today, some production employees' (e.g., machine operators, process operators) duties are expanding so that their work tasks may include servicing and/or maintenance activities that are subject to the requirements of the LOTO standard.

C. Lockout/Tagout's Relationship to Other OSHA Standards.

1. Supplemental Aspect. The *Control of hazardous energy (lockout/tagout)* standard makes clear in 1910.147(a)(3)(ii) that it is not intended to replace other existing standard provisions for LOTO, but to supplement and support these provisions by requiring that employers establish an energy control procedure and train employees in the energy control program as detailed in 1910.147. Various OR-OSHA standards impose lockout-related requirements, but do not address LOTO issues or methodology in any detail. For example, some OR-OSHA standards require equipment to have the capability of being locked out, while other OR-OSHA standards mandate the specific use of lockout, tagout or other energy control devices for certain machines, equipment or industries.

NOTE: This means that, when another Part 1910 standard requires the use of lockout or tagout, that standard should be cited when a violation is found. The 1910.147 procedural and training requirements also apply, however, and should be cited when appropriate. If the other Part 1910 requirement requires specific control measures, such as the use of lockout only, then the 1910.147 lockout procedures and lockout-related training would need to be implemented in conjunction with the lockout measures contained in the other Part 1910 standard.

Any provision of the LOTO standard may be cited, as appropriate, when the vertical standard specifies only that the machine or equipment must have the capability of being locked out because the provision does not, in fact, require the use of LOTO.

The following list indicates a number of OR-OSHA standards that currently have LOTO related requirements. The list does not necessarily include all 1910 standards that have LOTO provisions:

a) 1910.119(f)(4), Process Safety Management of Highly Hazardous Chemicals

b) 1910.146(d)(3) and 1910.146(c)(7), Permit Required Confined Spaces

c) 437-002-0227(q)(4), Powered Industrial Trucks

d) 1910.179(g)(5)(i), (ii), & (iii), 1910.179(l)(2)(i)(B), (C) & (D), Overhead and Gantry Cranes

e) 1910.181(f)(2)(i)(C) & (D), Derricks

f) 1910.213(a)(10), 1910.213(b)(5), Woodworking Machinery

g) 1910.217(b)(8)(i), 1910.217(d)(9)(iv), Mechanical Power Presses

h) 1910.218(a)(3)(iii) & (iv), 1910.218(d)(2), 1910.218(e)(1)(ii) & (iii), 1910.218(f)(1)(i), (ii), & (iii), 1910.218(f)(2)(i) & (ii), 1910.218(h)(2), 1910.218(h)(5), 1910.218(i)(1), 1910.218(i)(2), 1910.218(j)(1), Forging Machines

i) 1910.244(a)(2)(iii), Other Portable Tools and Equipment, Jacks

j) 1910.253(b)(5)(iii)(D), Oxygen-Fuel Gas Welding and Cutting

k) 1910.254(c)(3)(i), 1910.254(d)(5), Arc Welding and Cutting

l) 1910.255(a)(1), 1910.255(b)(2) & (3), Resistance Welding

m) 437-002-0312(3)(e), (6)(m)(C), (8)(r)(A) & (B), (11)(d)(C), (11)(e)(C), (11)(h)(A), (12)(b)(B); 437-002-0312 Appendix A, B, Pulp, Paper, and Paperboard Mills

n) 1910.262(c)(1), 1910.262(n)(2), 1910.262(p)(1), 1910.262(q)(2), Textiles

o) 1910.263(l)(3)(iii)(B), 1910.263(l)(8)(iii), Bakery Equipment

p) 1910.265(c)(13), 1910.265(c)(26)(v), Sawmills

q) 1910.268(m)(7), Telecommunications

r) 1910.272(e)(1)(ii), 1910.272(g)(1)(ii), 1910.272(h)(2)(i), 1910.272(m)(4), Grain Handling

s) 1910.305(j)(4)(ii)(A), 1910.305(j)(4)(ii)(C)(1), Wiring Methods, Components, and Equipment for General Use

2. Relationship between the *Control of hazardous energy* (LOTO) standard and the *Permit-required confined spaces (PRCS)*, 1910.146, standard. The PRCS and the LOTO standards are generic and interrelated standards, and both standards may, depending upon the circumstances, apply to the isolation of hazardous energy for a PRCS. The application of the LOTO standard, with respect to PRCS, is governed by 1910.147(a)(3)(ii), which provides that, when other standards require LOTO, the procedural and training provisions of the LOTO standard must be used and supplemented to effectively control hazardous energy. Therefore, for any particular PRCS, the question will be whether the 1910.146 standard requires LOTO to isolate hazardous energy.

The answer to this question depends on the type(s) of hazardous energy that must be isolated, whether LOTO provides isolation (offering complete employee protection), and whether the 1910.146 requires the use of LOTO. Pursuant to the 1910.146 standard (including its final rule preamble), electromechanical types of hazards, associated with a PRCS, must be isolated in accordance with the LOTO standard (or guarded in accordance with *Machine guarding*, Subdivision O, requirements). Failure to follow the procedural and training requirements of the LOTO standard should be cited as 1910.147 violations related to the isolation of electro-mechanical hazards.

The PRCS standard does not, however, allow LOTO for flowable material isolation. This is because compliance with 1910.147 does not, in all cases, adequately isolate hazards created by materials such as steam, flammable gases, flammable and combustible liquids. In a permit-required confined space, hazards associated with flowable materials will be considered isolated only by the use of the following techniques: blanking or blinding; misaligning or removing sections of lines, pipes or duct; and use of a double block and bleed system. A double block and bleed isolation system, for example, usually utilizes the closure of two valves, the opening of a bleeder valve, and the application of LOTO devices (offering complete employee protection); whereas an employer can comply with 1910.147(d)(3) and 1910.147(d)(4) of the LOTO standard by simply closing and LOTO of a single valve (which could create atmospheric hazards due to the leakage of a single valve).

3. Relationship between the *Control of hazardous energy* (LOTO) standard and 1910, Subdivision S. Employee exposure to electrical hazards (e.g., shock, arc flash burn, thermal burn, blast) from work on, near, or with conductors or equipment in electric utilization installations, which are covered by Subdivision S, *Electrical*, is excluded from coverage by the LOTO standard. Subdivision S provisions have their own lockout and tagging requirements for controlling hazardous electrical energy. However, an employer may utilize hazardous energy control program paragraphs 1910.147(c) through (f) to comply with the electrical lockout and tagging requirements set forth in 1910.333(b)(2), provided that the energy control procedures:

   a) Address the electrical safety hazards of Subdivision S;
   b) Incorporate the application of locks and tags pursuant to 1910.333(b)(2)(iii)(D); and
   c) Incorporate the specific electrical verification provision requiring a qualified person to use (after checking the instrument for proper operation) a test instrument to verify circuit and equipment de-energization -- pursuant to 1910.333(b)(2)(iv)(B).

   Employee exposure to non-electrical hazards from electrically powered machines or equipment (electric utilization systems) is covered by 1910.147. For example, 1910.147 applies to a rotary valve un-jamming task, even if the valve's energy source is electrical, since employees are exposed to mechanical hazards.

4. Relationship between the *Control of hazardous energy* (LOTO) standard and the *Telecommunications*, 1910.268, standard. The 1910.268 standard contains provisions setting forth requirements specific to work performed in the telecommunications industry.

NOTE: Radio and television broadcasting systems and transmitting towers for cellular telephones, personal communication services, pagers, cordless telephones, radio communications for police and fire departments, amateur radio, microwave point-to-point radio links and satellite communications are some of the applications of radio frequency electro-magnetic fields used for telecommunications. Radio frequency energy may cause damage to a biological system, and it is considered *hazardous energy* when it has the capability to cause injury to employees performing telecommunication system servicing and/or maintenance work. For additional information, refer to the FCC, Office of Engineering and Technology's web site [e.g., OET Bulletin #56] regarding the hazards of radio frequency electromagnetic fields at http://www.fcc.gov/oet/rfsafety.

Section 1910.268 addresses three situations requiring some form of hazardous energy control:

1. Radio transmitting station (3-30 MHz) antenna work – pursuant to 1910.268(m)(7);

2. Microwave transmission (1 GHz to 300 GHz, inclusively) work – pursuant to 1910.268(p) and (s)(29); and

3. Other types of telecommunications (at all other telecommunication frequencies) work.

The radio transmitting station provisions, addressed in 1910.268(m)(7)(i) through (vi), require specific radio-frequency energy control measures for antenna work. This section contains hazardous energy control steps for radiofrequency energy (3-30 MHz) associated with broadcasting equipment and specific communication requirements that must take place between the rigger-in-charge and the transmitting technician. This prescribed control procedure also includes requirements for transmitter shutdown, the use of danger tags, antenna grounding, testing, and other safe work practices, including steps to re-energize the system and return the job back to the transmitter technician in charge of the work.

In addition, the standard's general training provision, 1910.268(c), also applies to hazardous energy control involving the radio antenna work described above. These training provisions require employers to ensure that employees are trained (either on-the-job or classroom) in the various precautions and safe practices described in the telecommunications standard.

In terms of the application of 1910.147 to radio station antenna energy control procedures and training requirements, the applicable provisions of 1910.268 are supplemented and supported by the procedural and training requirements of the LOTO standard to the extent that they are not regulated by the specific energy control provisions of the 1910.268. See 1910.147(a)(3)(ii). For example, the telecommunications standard's training certification provisions contained in paragraph 1910.268(c) prevail over the LOTO standard's training certification requirements contained in 1910.147(c)(7)(iv) as both standards address the same issue.

NOTE: Paragraph (c) of the telecommunications standard provides a training exception in cases where an employer can demonstrate that an employee has already been trained in the precautions and safe practices required by 1910.268 prior to his employment. For example, if an employer demonstrates through employment records that the employee met the required training, then a training certification is not required because the employer did not need to perform the training.

With respect to microwave electro-magnetic energy communication systems operations, 1910.268(p)(1) through (p)(3) allow for the control of hazardous energy without LOTO; therefore, LOTO is not required, and the 1910.147 standard does not apply.

With respect to all other types of telecommunication work aside from the radio transmitting station (3-30 MHz) antenna work and the microwave transmission (1 GHz to 300 GHz, inclusively) work described above, 1910.147 would apply exclusively as the 1910.268 standard does not address hazardous energy control practices for these work activities.

5. Relationship between the *Control of hazardous energy* (LOTO) standard and the *Electric Power Generation, Transmission, and Distribution* Subdivision 2/RR. Installations that are under the exclusive control of electric utilities, and equivalent installations in industrial environments, are covered by the *Electric power generation, transmission, and distribution* standard and not by the LOTO standard. Installations in electric power generation facilities that are not an integral part of, or inextricably commingled with, power generation processes or equipment are covered, as appropriate, under 1910.147 and Subdivision S standards. See 437-002-2303.

6. Relationship between the *Control of hazardous energy* (LOTO) and the *Grain handling facilities*, 1910.272, standards. The grain handling facilities standard contains provisions setting forth safety, fire, and explosion protection requirements specific to work performed in the grain handling facilities. The following industry-specific regulations apply to work conditions and hazardous energy control practices that are specific to grain handling operations:

    a. Training [1910.272(e)(1)(ii)];
    b. Specific energy control actions [1910.272(g)(1)(ii)]; and
    c. Lock and tag procedure implementation [1910.272(m)(4)].

    The provisions of this grain handling standard apply in addition to any other applicable requirements of Division 2. In terms of the application of 1910.147, these particular grain handling provisions are supplemented and supported by the procedural and training requirements of the LOTO standard to the extent that they are not regulated by the specific hazardous energy control provisions of the listed 1910.272 standards. See 1910.147(a)(3)(ii) and 1910.272(a).

    For example, the more stringent requirement to implement procedures for tags and locks, contained in 1910.272(m)(4), prevails over the LOTO standard's paragraph (c)(4)(i) requirement to utilize an energy control procedure when employees are engaged in activities covered by 1910.147. [The LOTO standard permits an employer to establish a lockout program or, conditionally, an equally protective tagout

program.] However, the supplementary hazardous energy control procedure provisions, contained in 1910.147(c)(4)(i) and (ii), to develop and document procedures with sufficient detail and adequate guidance on how to safely utilize control measures still apply because these procedures are not addressed by the grain handling standard.

7. General Industry Workplaces. The standard applies to all general industry workplaces in which servicing and/or maintenance activities take place because the risks associated with hazardous energy are so pervasive and arise during such a wide variety of activities. Accordingly, the standard's coverage is expressed on a general industry-wide basis rather than on an industry-by-industry basis. The control of hazardous energy standard addresses machines and equipment that may expose employees to injury during servicing and/or maintenance activities.

   Some machines and equipment covered by the control of hazardous energy standard include:

   a) Amusement and recreational service machinery and equipment, including large rides and other amusement (e.g., bowling machines) equipment;
   b) Apparel manufacturing machinery and equipment, including industrial sewing machines;
   c) Automotive repair, service, and garage machinery and equipment, including automobiles, trucks, material handling equipment, tire repair machines, hoisting equipment, automotive lifts;
   d) Chemical process systems and piping networks;
   e) Communications industry machines and equipment, including telecommunication towers;
   f) Elevators, escalators and passenger conveyors;
   g) Fire alarm and extinguishing systems and their components;
   h) Food store machinery and equipment, including packaging machinery, conveyors, meat cutting and bakery equipment;
   i) Gas and sanitary service machinery and equipment, including water, steam, irrigation, and sewage pipelines;
   j) Heating, ventilating and air conditioning systems;
   k) High intensity electromagnetic field machinery and equipment (regulated by 1910.97, *Non-ionizing radiation*);
   l) Ionizing radiation machinery and equipment (regulated by 1910.1096);
   m) Laundry and dry cleaning machinery and equipment;
   n) Manufactured home builder - manufacturing activities;
   o) Pipelines transporting hazardous substances;
   p) Railroad machinery and equipment, including railroad cars;
   q) Transportation machinery and equipment, including airplanes, helicopters, mobile passenger loading tunnels, and baggage handling equipment, including conveyors; and
   r) Trucking and warehousing, including freight elevators, trucks, material handling equipment, and cranes.

NOTE: Some of the listed machines and equipment may not be subject to the LOTO standard requirements if they are pre-empted [in accordance with Section 4(b)(1) of the Occupational Safety and Health Act] by other Federal regulations, such as regulations promulgated and enforced by the Department of Transportation Office of Pipeline Safety, and Federal Aviation Administration. For specific information on DOT regulations and related information, enforcement personnel may refer to http://www.phmsa.dot.gov/pipeline and http://www.faa.gov web sites.

8. Chemical Process and Piping Systems. The *Control of hazardous energy (lockout/tagout)* standard regulates the servicing and/or maintenance of chemical process systems, and associated piping, even though the energy sources (e.g., chemical and thermal energy) and control methods used in process hazards management are somewhat different from those encountered with machinery and mechanical equipment.

   Typically, the procedural steps required for safe performance of process system and piping network maintenance or servicing are: 1) deactivation, 2) removal of contents, 3) isolation, 4) decontamination, 5) restraining, 6) verification, 7) control, and 8) communication. The primary difference, relative to typical machinery energy control practice, is the means used to isolate (e.g., blank flanges, slip blinds) the energy in the process and piping network system.

   NOTE: Bolted blank flanges, slide gates, or slip blinds are considered piping energy isolating devices and also are acceptable as lockout devices if they are used as part of a standard, documented procedure. If bolted flanges or slip blinds are used, the equipment must be shutdown in an orderly fashion so as not to create additional or increased hazards to employees. For example, without proper isolation and de-pressurization of the hazardous energy, employees opening pipelines to install blinds may be exposed to pressure-related and/or fire-safety hazards.

   Additionally, these devices must meet the other requirements of the standard for lockout devices (e.g., they must be durable, standardized, substantial, and identifiable).

   The deactivation of a process system is equivalent to equipment shutdown. Similarly, removing the contents of the piping system and isolation of the energy source is equivalent to isolation and lockout or tagout of a machine or equipment, and the use of decontamination and restraining in piping systems is equivalent to the restraining or dissipating of stored energy in machines or equipment. Finally, verifying effective isolation is essential for both chemical process and piping network systems and other machines or equipment.

D. Standard Exemptions. The LOTO standard does not apply to:

1. Installations under the exclusive control of electric utilities, and equivalent industrial installations, that generate, transmit, and distribute electric power, including related equipment for communication or metering. However, installations in electric power generation facilities that are not an integral part of, or inextricably commingled with, power generation processes or equipment are covered, as appropriate, under 1910.147 and Subdivision S standards. See Section II.C.5 of this chapter;

2. Exposure to electrical hazards from work on, near, or with conductors or equipment in electric utilization installations, which is covered by Subdivision S of this part. See Section II.C.3 of this chapter;

3. Oil and gas well drilling and servicing installations;

NOTE: Oil and gas production facilities are not included in the oil and gas well drilling and servicing exception because drilling and servicing activities are distinct from production operations. Drilling and servicing covers activities related to the initial drilling of a well and later, maintenance work necessary to maintain or enhance production. Oil well drilling and servicing includes the following activities:

a) Actual drilling and associated activities of the well;
b) Well completion activities (i.e., activities and methods necessary to prepare a well for the production of oil and gas);
c) Well servicing (i.e., the maintenance work performed on an oil or gas well to improve or maintain the production from a formation already producing. Usually it involves repairs to the pump, rods, gas-lift valves, tubing, packers and so forth); and
d) *Work-over* activities (i.e., the performance of one or more of a variety of remedial operations on a producing oil well to try to increase production). Examples of *work-over* operations include deepening, plugging back, pulling and resetting liners, squeeze cementing and so on.

Production, on the other hand, is a phase of well operations that deals with bringing well fluids to the surface, separating them, and then storing, gauging and otherwise preparing the product for distribution. This production phase occurs after a well has been drilled, completed, and placed into operation, or after it has been returned to operation following *work-over* or servicing. A completed well can include a *Christmas tree* (control valves, pressure gauges and choke assemblies to control the flow of oil and gas), which is attached at the top of the well and it is the point where the potential coverage of LOTO begins.

4. Cord- and plug-connected electric equipment (e.g., industrial sewing machines) when unplugging the equipment from the energy source completely controls the hazardous energy and when the plug is under the exclusive control of the employee performing the servicing and/or maintenance. This exclusion applies to portable electric tools, as well as to cord- and plug-connected equipment which is intended for use at stationary or fixed locations; and

NOTE: The D.C. Court of Appeals upheld the Secretary's interpretation of the "cord-and-plug" exemption to OSHA's lockout/tagout standard. Because employees serviced cord-and-plug connected equipment that was not unplugged during the servicing, "the Commission did not err in finding the exemption inapplicable." The Secretary interprets the exemption as applying to work on cord-and-plug equipment only if the equipment is unplugged and the plug is in the exclusive control of the servicing employee. See *Tops Markets, Inc.*, (OSHRC Docket No. 94-2527, 1997) for background information.

5. Hot tap operations on pressurized pipelines that distribute substances like gas, steam, water, or petroleum products, if the employer shows that: 1) continuity of service is essential; 2) shutdown of the system is impractical; and 3) documented procedures are followed and special equipment is used that provides proven, effective employee protection.

E. Compliance Assistance Flowcharts. The *Figure 3-1* flowchart illustrates the compliance relationship among the following standards that protect employees from hazardous energy: 1) the *Control of Hazardous Energy (Lockout/Tagout)* standard; 2) *Subdivision O, Machinery and Machine Guarding*, standards*;* and 3) *Subdivision S, Electrical – Safety-Related Work Practices* (ESRWPs), standards. This flow diagram addresses machine or equipment energy sources where the energy may injure employees (hazardous energy) and shows whether the electrical safety-related work practices (e.g., 1910.332, 1910.333, 1910.335), machine guarding (e.g., 1910.212, 1910.213, 1910.217, 1910.219), and/or LOTO (1910.147) standards apply.

NOTE: OR-OSHA has established, in its Subdivision S standards, a threshold value of 50 volts that requires electric equipment or circuits to be de-energized when employees perform work near or on exposed energized circuit parts. However, other hazards may exist with low voltage electric energy. This 50-volt electric shock threshold does not pertain to the application of 1910.147, and the LOTO standard would apply to electrical sources (not covered by Subdivision S or Subdivision 2/RR) at any voltage whenever there is sufficient energy present to injure employees.

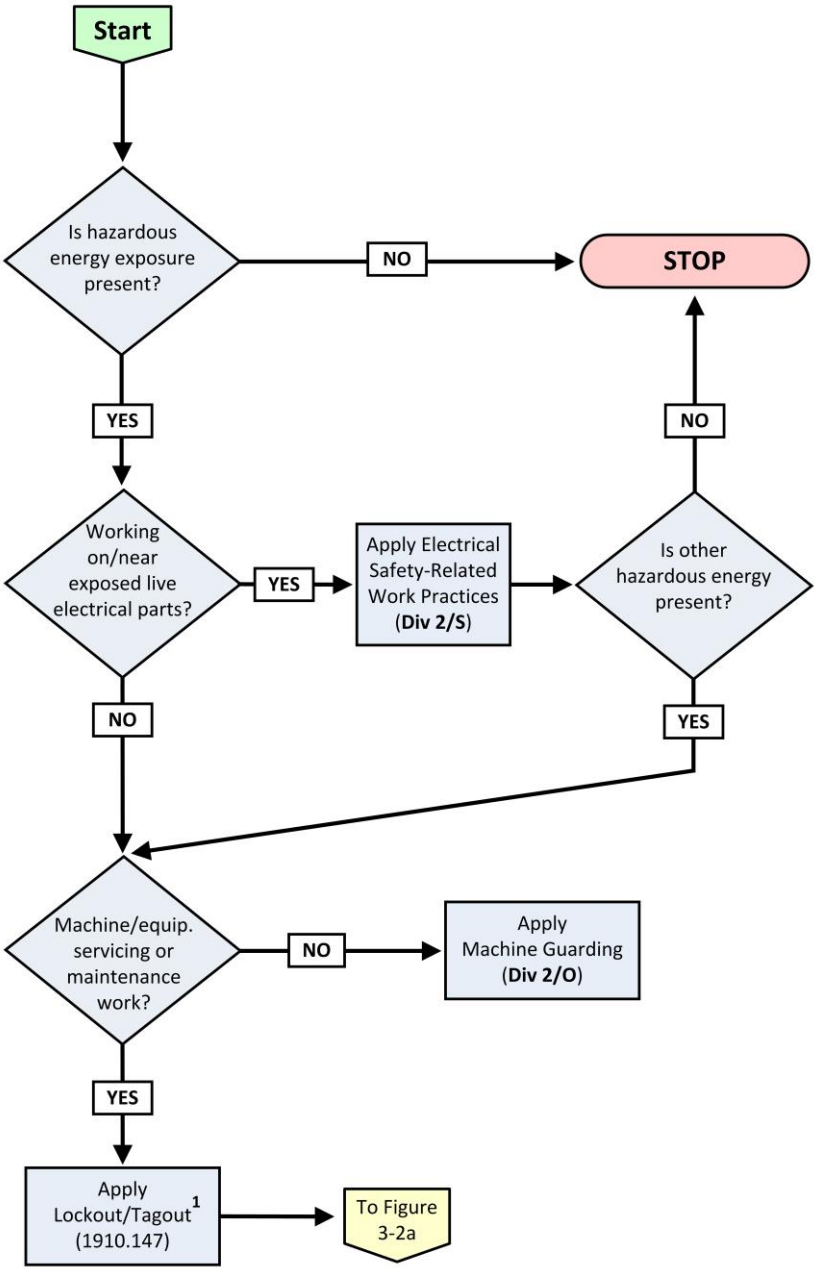
For example, low voltage industrial batteries have exploded when they were not properly isolated from systems during maintenance activities. Low voltage equipment that is not covered by Subdivision S (such as an automotive wiring system) has caused thermal hazards and burns due to heat generation from electrical resistance, while other low voltage equipment has provided enough energy to ignite vapor clouds during maintenance work on equipment containing flammable substances.

To further aid in complying with the LOTO standard, the *Implementation of Lockout/Tagout* functional flow diagram, Figure 3-2, may be consulted.

NOTE: In situations where hazardous energy is not adequately controlled, an employer must identify the control problem and correct the hazard prior to the performance of servicing and maintenance work on the machine or equipment. As such, an employer needs to systematically analyze whether there were any deviations from or inadequacies in their energy control program and take appropriate action to resolve the problem.

These compliance assistance tools do not constitute exclusive or definitive means of complying with the standard in any particular situation and are presented solely as an aid. As explained in this scope and application section, these flowcharts do not address energy control provisions in other OR-OSHA standards that complement/supplement the requirements in 1910.147. Also, the LOTO implementation diagram (Figure 3-2) does not include the additional requirements in paragraph 1910.147(f).

Figure 3-1: LOTO vs. Machine Guarding vs. Electrical Safety-Related Work Practices[1]



[1]This flow diagram does not address energy sources covered by Subdivision 2/RR requirements and it does not contain the exemptions, including the minor servicing exception, to the LOTO standard [See 1910.147(a)].

Figure 3 - 2a: Implementation of Lockout/Tagout (Part 1)

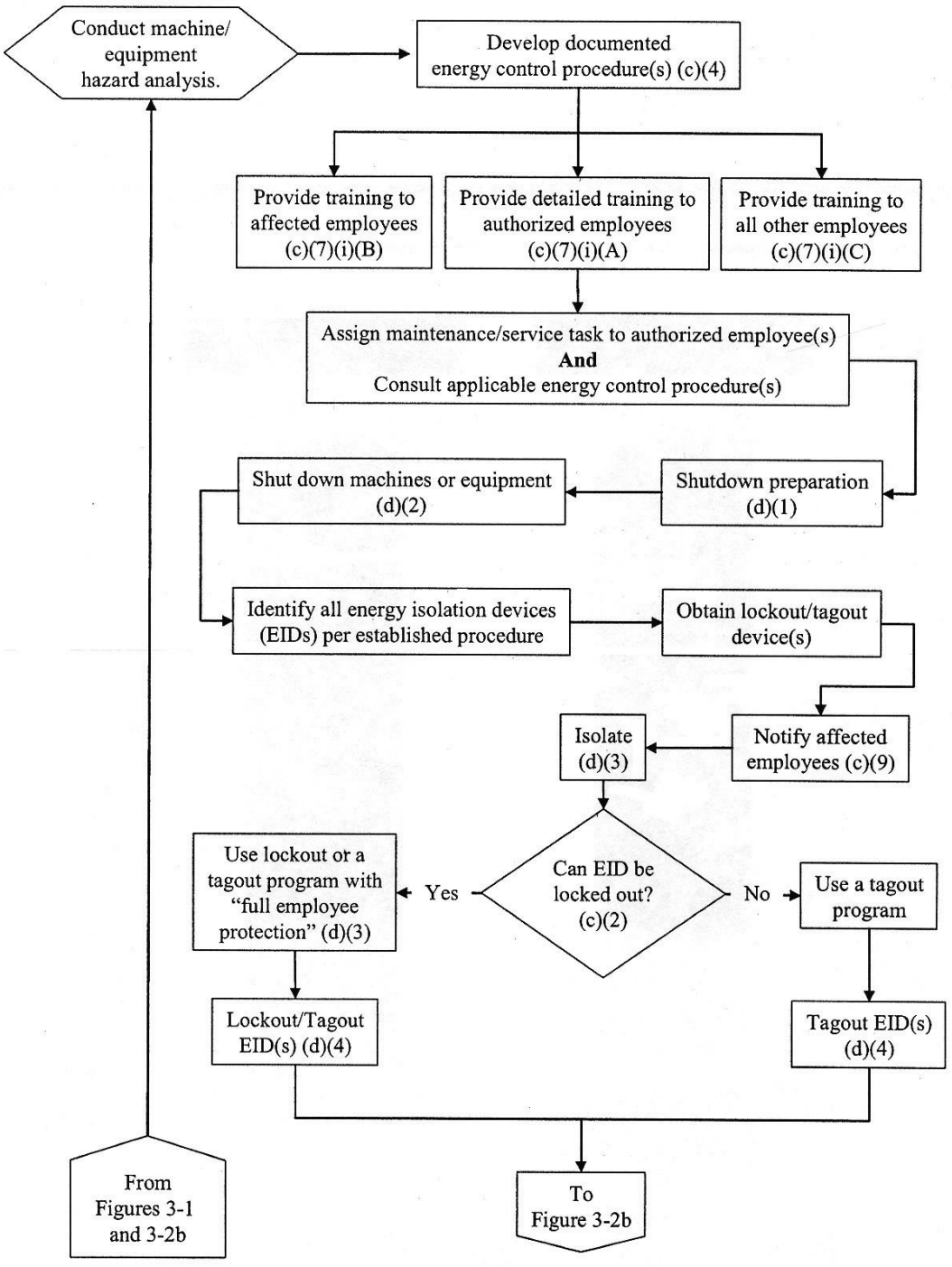
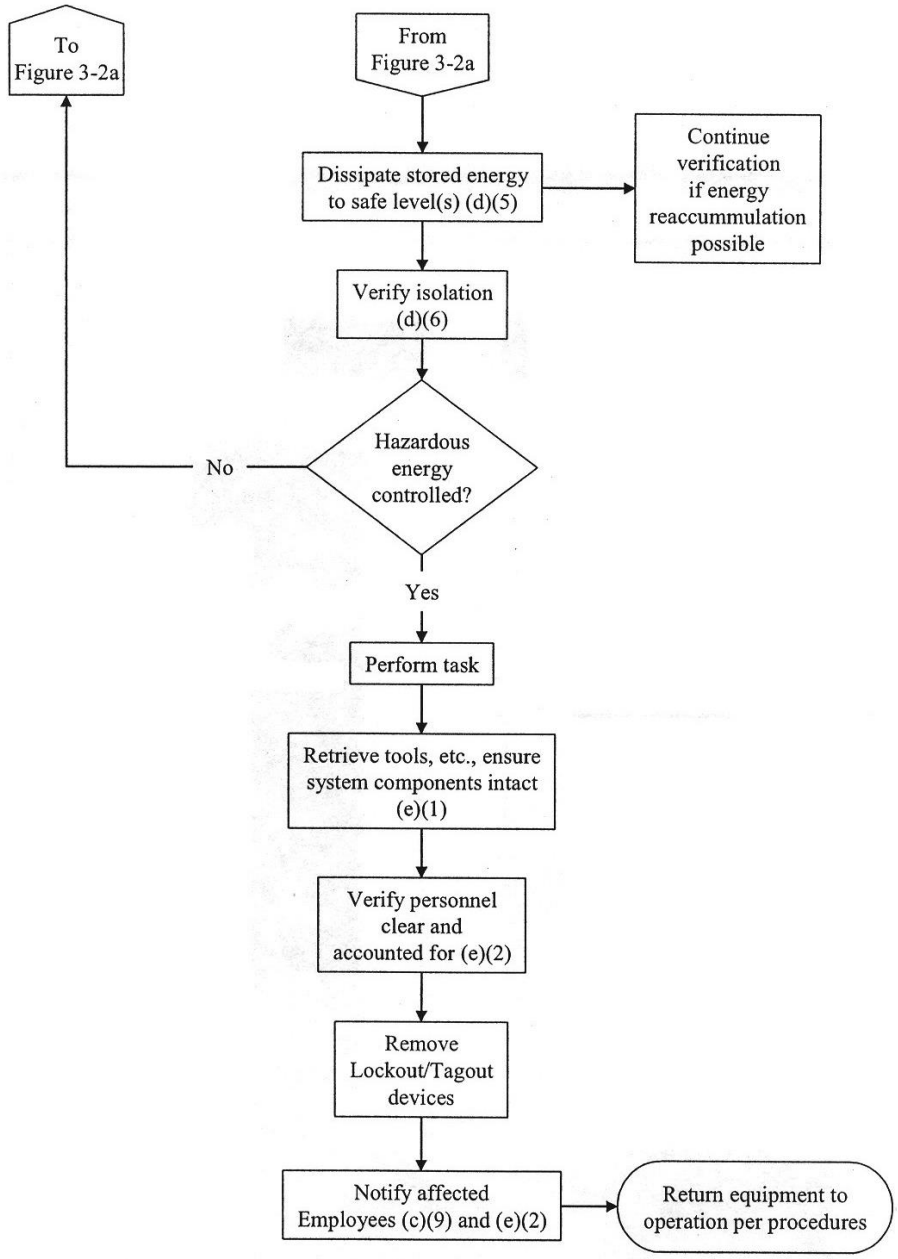


Figure 3-2b: Implementation of Lockout/Tagout (Part 2)



This flow diagram does not constitute the exclusive or definitive means of complying with the standard in any particular situation. It is presented solely as an aid. Also, it does not include paragraph (f) *Additional requirements*.

III. Vehicle Hazardous Energy Control.

A. Background. Serious injuries and death have occurred and continue to occur from inadequate hazardous energy control during vehicle servicing and maintenance activities. In 1991, the U.S. Court of Appeals for the District of Columbia remanded the LOTO standard to OSHA for further consideration of the ways in which the final rule applies to all general industry workplaces. OSHA, in the March 30, 1993 Federal Register (Vol. 58, No. 59), reaffirmed and further explained the reasons for applying the standard to vehicle servicing and maintenance. The scope and application sections of the preamble to the hazardous energy control standard provide that the LOTO standard applies to all "general industry workplaces." The standard's coverage includes vehicles, such as, but not limited to, automobiles, trucks, tractors, refrigeration transport vehicles, and material handling equipment.

B. Hazardous Energy. Generally speaking, for purposes of vehicle servicing and maintenance, hazardous energy refers to: mechanical motion; potential energy due to pressure, gravity, or springs; battery-generated electrical energy; thermal energy, including chemical energy; and other forms of energy, which can cause injury to employees working in, on, or around machines or equipment. Any vehicle [e.g., internal combustion engines such as gasoline, natural gas and diesel powered vehicles; electric-powered vehicles; hybrid (gasoline/electric) vehicles] may contain the following types of hazardous energy, such as, but not limited to:

1. Chemical energy due to contact with battery acid, coolant, lubricants;
2. Electric battery shock, arc, and burn hazards;
3. Explosion hazards associated with air bags;
4. Fire and explosion hazards associated with the fuel and fluid systems;
5. Gravitational energy (mechanical) hazards caused by elevated vehicles (e.g., unsafe use of automotive lift equipment) or vehicle components (e.g., unsupported elevated dump truck beds; unsupported elevated forklift carriage assembly);
6. Hot or cryogenic fluid, and surface (thermal) hazards;
7. Hydraulic hazards associated with fluid pressure and fluid loss (e.g., causing a carrier bed to drop);
8. Mechanical hazards associated with disc brake spring and tire components;
9. Mechanical motions due to moving power transmission components;
10. Premise wiring electric hazards associated with battery recharging (which are addressed by the *Subdivision S - Electrical* standards); and
11. Mechanical hazards associated with unexpected start-up or unexpected energization of vehicles or vehicle components.

C. Energy Control Program. The 1910.147 standard requires an employer to develop an energy control program that is tailored to the workplace and will protect employees performing servicing and maintenance tasks from the release of hazardous energy. The performance-oriented language allows employers flexibility to design and implement the required energy control procedures, employee training requirements, and inspection requirements to fit the individual conditions present in their workplaces. The selection of the specific method of control must reflect a thorough evaluation of the extent of exposure to the hazard; the risk of injury associated with the particular machine/equipment; and the feasibility of applying a particular method of control.

Due to the nature and unique aspects of vehicle maintenance and servicing activities, the control of hazardous energy final rule's preamble recognizes feasible measures to prevent an engine from being started. OR-OSHA references situations, involving vehicles, such as automobiles, buses, and over-the-road trucks, where the removal of the ignition key ensures that the engine can not be started. However, this simple control step of removing the ignition key may not, in all cases, adequately control other types of vehicle hazardous energy, such as is the case with the positioning of the vehicle or its components (e.g., buckets, blades, vehicle body parts). These and other hazards require careful evaluation and selection of additional hazard-specific control measures. See the LOTO standard's Final Rule, 54 Fed. Reg. 36657 (1989), for details.

NOTE: It should be noted that turning off the engine with and removing the car key is not, strictly speaking, the same as applying a lockout or tagout device to an energy isolating device (EID) because neither the ignition switch, nor the key, are EIDs. See 1910.147(b) and (d)(3) for the energy isolating device definition and application of control provisions. Based upon the above preamble discussion, OR-OSHA allows such alternative vehicle control measures in these limited circumstances only when the key removal fully ensures employee protection.

As mentioned, given the unique circumstances associated with vehicle servicing and maintenance, turning off the engine and removing the ignition key may provide a significant degree of protection in many situations in which an employee is performing vehicle repair or maintenance. The authorized employee performing the repair or maintenance must retain sole control of the key (assuming the keyed switch is the only means of vehicle start-up). An additional precaution for the employee retaining the key would be to lock the doors. Although this control practice reasonably protects employees from inadvertent startup of the vehicle's engine, it may not adequately control other energy sources that are independent of the ignition key subsystem.

These exclusive control practices, if incorporated into the energy control program, are feasible measures that significantly reduce the risk of exposure to the hazardous energy associated with the start-up of an internal combustion vehicle engine in situations in which a single individual is performing the servicing and/or maintenance work. However, although turning off the engine and retaining exclusive control of the ignition key may provide significant protection in some instances, there may be circumstances where there are other keys and/or other employees involved in the work activity. In situations such as these or when the work itself may activate the ignition circuit, additional measures are necessary to protect employees from hazardous energy exposures.

For example, employees have been struck by and even run over by vehicles when the technician "shorted out" the ignition circuit, causing the vehicle to unexpectedly move. In another example, potential unexpected start-up hazards exist with older diesel engines because they could be "jump-started" by putting the vehicle in gear (without setting the brakes) and then simply pushing/rocking ("budging") the vehicle enough to start it (with or without the ignition on). Thus, it is very important that the selected control measure(s) effectively protect exposed employees from all types of hazardous energy.

D. Manufacturers' Servicing and Maintenance Guidelines. It is essential for employers to consult with and incorporate specific vehicle manufacturer servicing and maintenance guidelines (e.g., operating manuals and bulletins) and other relevant materials to establish the hazardous energy control procedures. These manuals and materials often provide specific step-by-step instructions on how to safely perform servicing or maintenance tasks. [Refer to Section IX of this chapter for additional guidance regarding the use of generic energy control procedures and supplemental means, such as checklists and manufacturers' guidelines.] For example, the removal of an ignition key is not sufficient to protect employees from devices that may operate or activate independently of the ignition system. Thus, it may be necessary to disconnect the battery cable for some repair tasks, such as working on some cooling fans, which automatically start up even after the key has been removed. Likewise, air bags may inadvertently deploy and cause employee injury if the system is not properly controlled and residual energy dissipated before servicing or maintenance begins.

NOTE: Employers, who meet manufacturers' servicing and maintenance guidelines, may be cited for a 1910.147 violation(s) if the manufacturer guidelines inadequately control the vehicle's energy sources and employee exposure exists to hazardous energy.

E. "Troubleshooting," Testing, and Component Positioning. There are circumstances when it is necessary to re-energize the vehicle or a component thereof to accomplish a particular task (e.g., diagnostic testing; maintenance troubleshooting; vehicle or component positioning). OR-OSHA allows energization for testing or positioning purposes, as specified in 1910.147(f)(1), only for the limited time during which it is necessary to test or reposition the vehicle or component.

During these transition periods, employee exposure to hazards is high and a procedure needs to be developed to define the sequence of actions to accomplish the task safely. Under no circumstances is any part of an employee's body ever permitted to be exposed within a *hazardous area*, such as the point-of-operation or in-going nip point area, during servicing and/or maintenance activities while the machine is running or energized.

The use of supplemental safeguarding actions, such as personal protective equipment to protect against hot surfaces, use of a tarp(s) to shield a hot surface(s) or in-going nip point(s), safe work positioning, etc., must be used in conjunction with established procedures to protect the employee.

F. References. Chapter 5 contains some useful references for the control of hazardous energy for vehicles that may be useful to Compliance Safety and Health Officers (CSHOs) in evaluating vehicle hazardous energy control.

IV. **Minor Servicing Exception to the Lockout/Tagout Standard.** Activities such as lubrication, cleaning, un-jamming, servicing of machines or equipment, and making adjustments or tool changes are covered by the LOTO standard, if employees may be exposed to hazardous energy. However, some activities properly are classified as "servicing and/or maintenance" activities, but they are minor in nature and performed during normal production operations. Operations such as lubricating, draining sumps, servicing filters, making simple adjustments, and inspecting for leaks and/or malfunction are examples of routine servicing and maintenance activities, which often can be accomplished safely with effective production-mode safeguards, such as machine guarding methods consistent with the provisions of 1910, Subdivision O. These servicing tasks do not require extensive disassembly of the machinery/equipment.

Minor tool changes and adjustments, and other minor servicing operations**,** which take place during normal production operations, are not covered by this standard if they are routine, repetitive, and integral to the use of machines or equipment for production, and if work is performed using alternative protective measures which provide effective employee protection. See the 1910.147(a)(2)(ii) note. LOTO is not required when each of these elements exists and employees may perform servicing and maintenance activities with the machine or equipment energized.

However, activities requiring machine or equipment shutoff and disassembly, such as changing a machine tool or cutting blade, usually take place outside of the normal production process and require energy isolating device LOTO in accordance with 1910.147. For example, the changing of an abrasive grinding wheel takes place outside of the normal production process: the machine is turned off, grinding operations stop, a guard is removed, and the wheel retainer nut is loosen and removed. Therefore, the 1910.147(a)(2)(ii) minor servicing exception does not apply to this operation.

NOTE: OSHA issued a citation alleging a serious violation of 1910.147(c)(1) because an employer did not lockout or tagout the slotter section of a printer/slotter machine. Adjustments to both the printer section and the slotter section had to be made for each order. The average number of orders run per day was three or four and each order change required set-up adjustments taking between 15 and 45 minutes to complete.

The Occupational Safety and Health Review Commission (OSHRC) rejected an employer's assertion that set-up activities associated with this equipment constituted minor servicing within the scope of the 1910.147(a)(2)(ii) exception. While not reaching the questions of whether the activities were *minor* [as are included in this exception] or whether the alternative protection was effective, the Commission concluded that adjustments made while the machine was being set-up were not adjustments made during *normal production operations*.

The Commission stated that work performed before the normal production operation is not covered by the exception. The Commission further concluded that setting up does not occur during normal production operations, and therefore, setting up, by definition, cannot fall within the exception to 1910.147(a)(2)(ii). See Westvaco Corporation, 16 BNA OSHC 1374 (Docket No. 90-1341, 1993).

Furthermore, the replacement of machine or equipment components -- such as belts, valves, gauges, linkages, support structure, etc. -- normally is not considered a routine maintenance function that can be safely accomplished when a machine or piece of equipment is operating. These types of activities need to be performed in accordance with the requirements of the LOTO standard. In addition, any servicing and/or maintenance activity, which takes place during the machine's or equipment's normal production operation, is covered by the LOTO standard if employee exposure to hazardous energy (e.g., employee bypasses a guard; placement of a body part into a machine danger zone) exists. See 1910.147(a)(2)(ii)(A) and (B).

In short, the general rule is that *servicing and/or maintenance* must be performed under LOTO requirements. However, the LOTO standard is not intended to cover certain minor servicing activities, which are necessary to carry out the production process, provided that all of the criteria detailed in the exception are met. Nonetheless, the exclusion from LOTO does not mean that the employer can avoid providing employee protection even though employees carry out these minor servicing tasks with the machine or equipment energized. Rather, in order to take advantage of the limited exception, an employer must provide effective alternative protection in lieu of LOTO.

NOTE: The American National Standard on the *Control of Hazardous Energy - Lockout/Tagout And Alternative Methods* (ANSI/ASSE Z244.1-2003; *Foreword*), *recognize[s] the broader universe of hazardous energy control*, *… [and] addresses the need for greater flexibility through the use of alternative methods based on risk assessment and application of the hazard control technology.* This standard employs a decision matrix (*Figure 1*) and policy (e.g., Section 5.3.10: *Special applications*; Section 5.4: *Alternative methods*) that allow employers to use alternative protective methods in situations where OR-OSHA standards require employers to lockout or tagout an energy isolation device. When an OR-OSHA standard prescribes a practice, design, or method that provides a requisite level of employee protection, employers may not adopt an alternative approach (e.g., use of control circuitry when the standard requires the use of an energy isolation device) that provides a lower level of employee protection. The ANSI Z244.1-2003 standard does not affect the employer's obligation to comply with all provisions of the LOTO and related hazardous energy control standards, including the obligation to use energy isolation devices, unless the standards permit alternative methods to control hazardous energy.

The first set of criteria for determining the application of the minor servicing exception is whether the activity must take place during, and is inherent to, normal production operations. These servicing activities must be necessary to allow production to proceed without interruption. Additionally, the minor servicing activity must be:

A. Routine: The activity must be performed as part of a regular and prescribed course of procedure and be performed in accordance with established practices.

B. Repetitive: The activity must be repeated regularly as part of the production process or cycle.

C. Integral: The activity must be inherent to the production process.

The employer must also demonstrate that the alternative measures provide effective protection from the hazardous energy. Most importantly, this exception applies only if each and every element of the exception is met.

Several alternative means for providing effective protection from the hazardous portion of machines and equipment are presented by the national consensus standard, ANSI B11.19-1990, which addresses performance criteria for the design, construction, care, and operation for machine tool safeguarding. The *Performance Criteria for Safeguarding*, ANSI B11.19-2003, consensus standard for machine tools, superseded the 1990 edition, and it also contains requirements for the design, construction, installation, operation, and maintenance of the safeguarding used to eliminate or control hazards to individuals associated with machine tools. Although these standards are not all-inclusive, they describe effective safeguarding alternatives for the protection of employees. Some of these described safeguards include:

A. Interlocked barrier guards,

B. Presence sensing devices, and

C. Various devices under the exclusive control of the employee.

Such guards or safety devices, when properly applied, may be used in clearing minor jams and performing other minor servicing functions, which occur during normal production operations and which meet the 1910.147(a)(2)(ii) exception criteria. During minor servicing, an employer is considered to have met the requirement for providing effective alternative protection by the use of special tools or guarding (safeguarding) techniques that effectively prevent employee exposure to hazardous energy.

NOTE: In order for the control measure to be considered an effective and properly applied technique, the selection and use of alternative method(s) must be based on generally accepted good engineering practices (e.g., applicable manufacturers' design, maintenance, inspection, testing and operation recommendations; prior operating experience; reliability data). As an example of recognized and generally accepted good engineering practice, barrier guard interlock devices are specifically designed (e.g., increased reliability of operation; anti-bypass capabilities) and constructed for use in safeguarding applications. The improper application of a safety interlock component on a machine or piece of equipment would not constitute recognized good engineering practice and would not constitute effective alternative protection.

To better illustrate effective alternative protection based on recognized good engineering practices, a circuit that meets the control reliability and control-component-failure-protection requirements of the American National Standards Institute standard, ANSI B11.19-1990 [*for Machine Tools – Safeguarding When Referenced by the Other B11 Machine Tool Safety Standards – Performance Criteria for the Design, Construction, Care, and Operation*], would provide alternative safeguarding measures with respect to the minor servicing exception if these devices are under the exclusive control of the employee performing the *minor servicing*. It is important to apply this safeguard through a hazard analysis process on a case-by-case basis in order to ensure that it, in fact, provides equivalent and effective employee protection.

For example, in order for the clearing of a conveyor package jam to meet the criteria for the "minor servicing" exception, an employer must adopt alternative measures that provide effective protection in order to avoid the requirements contained in 1910.147. A CSHO should consider all of the steps taken by an employer to provide alternative, *effective* protection (e.g., training, disciplinary provisions, engineering controls, start-up alarms/delays, administrative provisions, near miss and related-injury data, etc.) in order to ascertain whether the alternative, including all of its steps, reliably prevents an employee from being injured by hazardous energy when performing servicing and maintenance activities under the "minor servicing" exception.

NOTE: Generally, the party claiming benefit of an exception bears the burden of proving that the scenario falls within that exception. See *Falcon Steel Co*., 16 BNA OSHC 1179 (No. 89-2883, 1990). Thus, an employer who is claiming that a machine servicing activity is exempted by the minor servicing exception must demonstrate that they meet each and every element of this exception.

If the CSHO documents a LOTO violation and believes that the employer's minor servicing exception assessment is in error, then she needs to develop a list of specific inadequacies associated with one or more elements of the exception. This will allow OR-OSHA to be able to refute an employer's contention that the LOTO standard does not apply because of the 1910.147(a)(2)(ii) exception. One way for a CSHO to confirm that the minor servicing exception is inapplicable is to document specific facts (e.g., injury experience) showing that the alternative work procedure does not provide *effective* employee protection in that: 1) a possibility for employee injury exists; and/or 2) employees have been injured. This evidence should be developed in conjunction with evidence demonstrating that the energy to which employees are exposed is *hazardous*.

To further illustrate the alternative methods of protection, with respect to the minor servicing exception, the following examples are provided. Each of the following examples addresses only the effectiveness of alternative protection and presumes the existence of all other elements in the minor servicing exception.

A. Some tool changes and adjustments, such as changing a mixing blade on a vertical mixer or a drill bit on a single-spindle drill press or a carbide cutting tool on a single-spindle automatic screw machine, are permitted to be performed without LOTO if the machine's electrical disconnects or control (e.g., on/off buttons or emergency stops) switches:

1. Are properly designed and applied in accordance with recognized and good engineering practice; and
2. Control all the hazardous energy and are placed in an *off* position; and
3. Are under the exclusive control of the employee performing the task.

NOTE: The use of control circuit devices does not, in all cases, protect employees from stored or residual energy hazards. Also, for purposes of this exception, control circuit devices may not provide alternative effective protection if any of the above criteria are not met or if injury experience exists confirming the procedure's inadequacies.

B. A simple task on an automatic chucking machine, for example, may involve adjusting coolant flow or resetting the tool holder to a position that would result in a dimensionally accurate finished work piece. In these and other similar cases where the employee must negate the effectiveness of the safeguards or otherwise expose himself to the hazardous energy, the machine operator must shut off the switch and have exclusive control of the *on/off* switch or local disconnect switch.

C. Vertical and horizontal milling machine operators perform minor tool changes and minor adjustments (e.g., minor belt drive adjustments; moving the coolant hose assembly close to the point of operation) that are integral to the production process by pushing the machine's stop button (without disconnecting the power supply to the machine) and perform the task in the close proximity of the start button. All that is required to restart the machine is to push a guarded start button; however, an operator has exclusive control of this shut off control circuit because he could easily see another person approaching the control panel and prevent her from operating the control. In this scenario, milling machine operators who shut off the machine and exercise exclusive control over this control circuit would not need to implement LOTO. However, the minor servicing would be covered by the LOTO standard if the alternative work method becomes ineffective (i.e., there is no alternative employee protection) and exposes employees to machine hazards.

In a similar example, if it becomes necessary to adjust the movement of a long-bed milling machine worktable and the isolating hydraulic cut-off valve is not in the exclusive control of the person making the adjustment, or this requires the employee to negate the effectiveness of the safeguards so that the employee is exposed to the hazard of the machine (i.e., there is no alternative protection), the LOTO standard applies. However, if this step is performed without the employee having to remove or bypass any safeguards or otherwise expose her body to the hazardous area of the machine, the LOTO standard does not apply. Refer to the August 24, 2005 letter to Lockton Companies of St. Louis for additional detail.

D. Blow mold machine operators perform minor un-jamming tasks, during normal production operations, at the machine's trimmer unit on a routine and repetitive basis to remove stuck plastic containers. This operator shuts the machines off with the control circuit switch (stop button) and she opens an interlocked plexiglass barrier guard to gain access to the trimmer's point-of-operation area. The employer utilizes a guard system, designed by the manufacturer in accordance with recognized and generally accepted good engineering practices, that causes the mechanical interlock switch to break the electric circuit when the guard is moved for employee access purposes and shuts down the machine. Within the context of the minor servicing exception, the described and properly applied interlocked plexi-glass guard system, together with the operator's exclusive control of the control circuit devices, constitute *alternative measures which constitute effective protection*.

E. The removal of a part that is stuck (jammed) in a plastic injection molding machine may not require de-energization and LOTO of the entire machine. Once the machine has completed a cycle and is shut-off (using the stop push button), opening the interlocked sliding operator gate guard prevents the machine from cycling until the operator repositions the guard and intentionally starts up the machine. Similarly, when an operator stops a machine by using the stop/start controller, the use of interlocked movable guards, which prevent activation of the machine while the guard is not in place, provides effective alternative protection as long as:

1. The employee is positioned such that the interlock operator-gate and rear-gate guards provide the employee(s) with sufficient protection (e.g., an interlock gate guard is not adequate protection if the employee's entire body is inside the guard area);

2. Injection molding machine safety systems are designed, inspected, tested, maintained, and operated in accordance with recognized and generally accepted good engineering practices (e.g., per the manufacturer's instruction); and

3. Means of control of the machine remain in the exclusive control of the person afforded the protection.

These precautions are necessary to ensure that the gate guards do not accidentally close causing the machine to start-up while the employee is inside the machine and to ensure that no other person can restart the machine without the knowledge and consent of the person performing the minor servicing.

Alternatively, LOTO would be required if the stuck part or other condition creates a situation where each and every element of the minor servicing exception cannot be met. For example, a mold may open too soon or a stuck plastic part may melt or the part may become stuck such that LOTO is required because "other-than-minor" cleaning (e.g., prying, pulling, scrapping, and/or chipping) or even machine component (e.g., die) disassembly, must be performed. These types of activities are not minor in nature.

F. In the printing industry, which employs printing presses, binding and finishing equipment, the following tasks were identified as examples of minor servicing activities commonly performed during normal production operations:

1. Clearing of certain types of paper jams;

2. Minor cleaning, lubricating, and adjusting operations;

3. Certain plate and blanket changing tasks; and

4. In some cases, paper webbing and paper roll changing.

NOTE: As described in the 1910.147(a)(2)(ii), employers can use effective alternatives to lockout/tagout only in the limited circumstances outlined in the exception. Not all *make-ready* activities in the printing industry meet each element specified in the minor servicing exception. For example, some inch buttons on the inch-safe-service systems are located so that an employee can inch the press rolls and simultaneously access the unguarded danger area at the roller's ingoing nip point. Thus, this alternative method would not constitute effective employee protection and lockout/tagout provisions would apply in this scenario.

The *inch-safe-service technique,* used in conjunction with the main drive control, appeared to provide effective alternative protection for these minor servicing activities. This technique is consistent with the use of controls specified in the American National Standards B65.1 (1985) and B65.2 (1988) for web and sheet fed printing presses for which, as a minimum, a stop/safe/ready function must be available at the designated control stations. On presses attended by more than one employee, or when it is possible for one employee to enter the frame or to be obscured from view of another employee, other reliable and effective protective mechanisms also must be employed in conjunction with work procedures and training to achieve effective alternative protection to LOTO.

Refer to the September 16, 1992 and April 7, 2004 letters to the Printing Industries of America, Inc. for additional details.

G. The automotive industry designs some processes with *Monitored Power System* (MPS) control systems meeting the control reliability and control component failure protection requirements of the American National Standards for machine tools (ANSI B11.19-1990) and manufacturing systems/cells (ANSI B11.20-1991). Although control circuits are not *energy isolating devices*, as defined by the standard, the use of MPS which meet the above referenced ANSI standards would provide effective safeguarding alternative methods, which constitute effective alternative protection. Thus, such an MPS may be used to protect employees who are performing minor tool changes and adjustments, and other minor servicing activities, which take place during normal production operations, provided that other remaining elements of 1910.147(a)(2)(ii) exception are met. Refer to the December 16, 1999 letter to the UAW/General Motors Department for additional details.

V. Protective Materials and Hardware. Paragraphs 1910.147(c)(5)(i) and (ii) describe protective materials and hardware (e.g., locks, chains, tags and their means of attachment) required under the LOTO standard. The standard also requires that, when lockout or tagout devices are used, they must be the only devices used in conjunction with energy isolating devices to control hazardous energy. They must be provided by the employer, be singularly identified, and not be used for other purposes. In addition, they must meet the following criteria.

A. Durable. LOTO devices must be durable enough to withstand conditions in the workplace environment. Tagout devices must not deteriorate or become illegible, even when used in conjunction with corrosive components such as acid or alkali chemicals or in wet environments.

B. Standardized. LOTO devices must be standardized according to color, shape, or size. Tagout devices also must be standardized according to print and format. Tags must be legible and understandable by all employees. Tags must warn against hazardous conditions if the machine is energized, and offer employees clear instruction such as: "Do Not Start," "Do Not Open," "Do Not Close," "Do Not Energize," or "Do Not Operate."

C. Substantial. Protective materials and hardware must be substantial enough to minimize the likelihood of early or accidental removal. Other than using a key or combination to remove a lock, employees must be able to remove locks only by using excessive force with special tools, such as bolt cutters or other metal-cutting tools.

Additionally, the lockout device must be substantial enough to prevent removal without the use of unusual techniques. For example, the use of nylon cable ties would not be an appropriate substitute for more traditional and substantial lockout devices, such as the use of locks and chains to hold a valve in the safe position. While a cable tie is a positive means of holding the energy isolating device in a safe position, nylon ties are generally removable through the use of common cutting tools (e.g., pocket knives, side cutters, or scissors) or by releasing the pawl mechanism with a device such as screwdriver; neither of which constitutes an "unusual technique," as required by the standard.

NOTE: An employer using machines capable of being locked-out could, however, use the cable ties as part of a tagout system consistent with 1910.147(c)(5), as long as the use of the tagout system provided *full employee protection*, (e.g., double-block and bleed arrangement with a tag, using a nylon cable tie as a means of attachment) as set forth in 1910.147(c)(3).

Tag attachments, used to attach the tag, must be non-reusable, self-locking, and non-releasable, with a minimum unlocking strength of 50 pounds. Tags must be attachable by hand, and the device for attaching the tag should be a one-piece nylon cable tie or its equivalent so it can withstand all environments and conditions.

D. Labeling. LOTO devices must be labeled to identify the specific employees who are authorized to apply and remove them. As a result, the authorized employee who is identified will be given greater assurance that other employees know of her involvement in the work activity and that only she will be allowed to remove the device(s). This user identification provision also provides an additional degree of accountability to the overall program. It enables the employer to inspect the application of energy control procedures and to determine which employees are properly implementing the procedure. If lockout and tagout devices are not being properly attached, for example, identification on the devices will enable the employer to locate the non-complying employee(s) and correct the problem promptly.

VI. Energy Isolating Devices. The entire LOTO standard is predicated on the practices and procedures that are necessary to disable and isolate machines or equipment from hazardous energy. The employer's primary tool for providing protection under the standard is the energy isolating device, which is the mechanical device that physically prevents the transmission or release of hazardous energy. [See 1910.147(b) and Chapter 1, Section IX.H for the definition.]

NOTE: With respect to the definition of *Energy isolating devices*, not all line valves effectively and reliably prevent the transmission or release of hazardous energy. Manufacturer valve design information and application recommendations may aid Compliance Safety and Health Officers (CSHOs) in determining whether a specific line valve installation meets the performance-oriented requirements for energy isolating devices with respect to recognized good engineering practice.

Excess flow valves, excess flow check valves, and check valves are examples of some types of line valve designs that do not, in all cases, effectively and reliably isolate hazardous energy (e.g., check valves can open and close automatically with changes in line pressure, check valves may leak materials due to mechanical problems like sticking in the open position, etc.). Further, energy isolating devices installed after January 2, 1990 must be designed to accept a lockout device and, in some cases (e.g., excess flow valves without manual shutoff valves), these types of valves are not capable of being locked out. See 1910.147(b) and (c)(2)(iii).

There are two categories of energy isolating devices: those capable of being locked out and those that are not. When the system is capable of being locked out, the more reliable means to isolate energy is to use lockout devices to hold the energy isolating device in a safe position, rather than using a prominent warning (tagout) device. The tagout device alerts employees to the hazard of re-energization and states that employees may not operate the machinery to which it is attached until the tag is removed in accordance with an established procedure, but it provides less protection (than a lockout device) against premature/improper removal.

A. Capable of Being Locked Out. If an energy isolating device can be locked out, the employer must use a lockout program unless the employer develops, documents, and utilizes a tagout program that provides employees with a level of safety equivalent to that of a lockout program. (See Chapter 3 Section VII for details.) An energy isolating device is considered "capable of being locked out" if it meets one of the following requirements:

1. Is designed with a hasp or other part to which a lock can be attached (e.g., a lockable electric disconnect switch);

2. Has a locking mechanism built into it; or

3. Can be locked without dismantling, rebuilding, or replacing the energy isolating device or permanently altering its energy control capability (such as using a lock/chain assembly on a pipeline valve, a lockable valve cover, circuit breaker lockout, or fuse block-out devices).

Equipment that accepts bolted blank flanges and bolted slip blinds are considered to be *capable of being locked out.*

B. Not Capable of Being Locked Out. Sometimes it is not possible to lock out the energy isolating device associated with the machinery. In that case, authorized employees must securely fasten a tagout device as close as safely possible to the energy isolating device in a position where it will be immediately obvious to anyone attempting to operate the device. The employer also must meet all of the tagout provisions of the standard.

Equipment or machines ordered or purchased after January 2, 1990, and older equipment which undergoes extensive replacement, repair, renovation, or modification must be provided with lockout capability, if such a design is feasible. It is anticipated that the designing of lockout capability will encourage employers to utilize lockout devices in their energy control programs, rather than relying on tagout. Although there is no requirement in the standard to retrofit pre-1990 machines or equipment that have not undergone the described restoration, an employer nevertheless may choose to modify or replace the applicable energy isolating device(s) to make it capable of being locked out.

NOTE: OR-OSHA does not enforce the standard with respect to the designer/manufacturer of the machine or equipment. However, when the designer/manufacturer is functioning as an employer, the designer/manufacturer has the same obligations as other employers to provide the protections for its own employees that are required by the LOTO standard.

VII. Lockout vs. Tagout. The physical protection offered by the use of a lock, when supported by the information provided on a tag used in conjunction with the lock, provides the greatest assurance of employee protection from the release of hazardous energy. Lockout and/or tagout devices used to protect employees from hazardous energy must be implemented as part of a comprehensive program of energy control.

The following descriptions address the employer's options and limitations with regard to the use of lockout versus tagout programs.

A. Tagout. Tagout must be used where the energy control device cannot accept a lock. In this situation, the employer's energy control program for these unlockable pieces of equipment and machines must utilize a tagout program that complies with all tagout-related provisions of the standard.

NOTE: Refer to the preceding *Capable of Being Locked Out* discussion, which explains that some isolating devices may be locked out through external means, such as by using circuit breaker lockout devices or attaching a chain and lock assembly to lockout valves.

The 1910.147(c)(3) *Full Employee Protection* requirements do not apply to equipment or machines with non-lockable isolating devices.

Because a tagout program does not involve positive restraints on energy control devices, it requires constant vigilance to ensure that: 1) the tags are properly applied [See 1910.147(d)(4)(iii)]; 2) the tags remain affixed throughout the duration of the servicing or maintenance job; and 3) no employee violates the tag by re-energizing the machine or equipment, either intentionally or inadvertently, before the tag is removed.

FACE Report No. 94-10: *Journeyman Wireman Electrocuted After Contacting Energized Switchgear Components at Power Plant – West Virginia* [http://www.cdc.gov/niosh/face/In-house/full9410.html]. A 53-year-old journeyman wireman was electrocuted when he contacted two energized, 6.9 -kilovolt bus† terminals. The victim and two coworkers (all contract employees) were installing electrical components of a sulfur dioxide emission control system in a 14-compartment switch house.

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

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

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

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

As the accident description indicates, tagout devices do not serve as positive restraints and only warn employees that the machines or equipment are not to be re-energized. The additional tagout device requirements in the standard are based on the fact that the effective use of tagout relies on the involvement of all employees in the facility and on employee knowledge, including employees' respect for the tagout device limitations. [See 1910.147(c)(6)(i)(D) and 1910.147(c)(7)(ii)(A-F), respectively.]

Nonetheless, employee safety does not reside in a specific device, whether a tag or lock; instead, safety lies in a comprehensive program that includes the use of controls, good procedures and careful training combined with the assurance of accountability. If these principles are in place and the employer complies with the other tagout-related requirements of the standard, a system that uses tags will adequately protect employees.

B. Lockout and *Full Employee Protection* [*Tags Plus*]. Lockout is a more effective means of ensuring the de-energization of equipment; it is the preferred method because lockout-based safety programs are less susceptible to human error, and tagout devices have inherent physical limitations.

Therefore, if the energy isolating device is capable of being locked out, the standard requires lockout unless the employer can demonstrate that a tagout system will provide *Full Employee Protection* ("Tags Plus") -- i.e., a level of protection that is equivalent to that provided by lockout. See 1910.147(c)(2)(ii). In order for the employer to demonstrate that a tagout program is as protective as a lockout program for a lockable piece of equipment or machine, that employer will need to show additional elements which *bridge the gap* between lockout and tagout. It is permissible for employers to implement a tagout program provided that all applicable *full employee protection* requirements are met.

The term *Full Employee Protection* is set forth in 1910.147(c)(3), and it requires compliance with all tagout-related provisions of the standard, which includes attaching the tagout device at the same location that the lockout device would have been attached. Also, as explained in the preceding section on “Tagout,” inherent tagout program limitations necessitate the implementation of additional program and specification requirements when an employer opts to use a tagout program instead of a lockout program.

A key element in demonstrating that the tagout program provides equivalent protection to a lockout program is the standard's provision that the tagout program provide at least one additional safety measure. In other words, at least one added safety measure must be used in addition to tagging the energy isolation device to prevent unexpected re-energization. This independent, additional measure is designed to protect an employee from injury or death through the inadvertent activation of an energy isolating device associated with human error, inadvertent contact, the loss or detachment of a tag, or from any other limitation of tags. Such additional safety measures might include the:

1. Closure of a second in-line valve (e.g., double block and bleed);

2. Removal of a valve handle to minimize the possibility that machines or equipment might be inadvertently energized or started;

3. Removal of an additional isolating circuit element (e.g., fuse);

4. Opening of an extra disconnecting device (e.g., disconnecting switch; circuit breaker);

5. Opening and then racking out a circuit breaker;

6. Grounding of an electrical circuit, if the grounding practice would protect the employee if the tagged isolating device were operated; or

7. Locking, blocking, or barricading a controlling switch.

Any additional control measure ("Tags Plus") must be integrated into an energy control program through sound hazard-specific analyses on a case-by-case basis. For example, the blocking of a control switch as an additional measure to tagging an electrical disconnect may be an effective second layer of protection for preventing the mechanical activation of a machine, but this block may be an inadequate "Tags Plus" measure for the same machine's hydraulic or pneumatic hazardous energy sources.

These independent control measures, when effectively incorporated into the employer's energy control program and enforced through regular supervision, provide employees with an independent, redundant control measure. In short, this additional control measure provides the authorized employee using a tagout program with a "second layer of protection" in the event the tagout device for the primary isolating device is defeated.

NOTE: While describing additional protective means similar to those listed in 1910.147(c)(3)(ii), the American National Standard on the *Control of Hazardous energy – Lockout/Tagout And Alternative Methods (ANSI/ASSE Z244.1-2003;* Section 5.3.1*)* requires the user to demonstrate that the TO program provides *an effective level of safety* whereas paragraph (c)(3) requires the employer to *demonstrate that the tagout program will provide a level of safety equivalent to that obtained by using a lockout program* (emphasis added).

VIII. Notification of Affected Employees. Lack of information regarding the status of the machine or equipment could endanger both the servicing or maintenance employees and the employees who re-energize, operate or work around the machines or equipment. Whenever LOTO control might directly affect another employee's work activities, paragraph (c)(9) requires the employer or authorized employee to notify the affected employees prior to applying, and after removing (but before a machine or piece of equipment is started), a lockout or tagout device from a machine or piece of equipment's energy isolating device(s).

Such notification informs affected employees of the impending interruption of the normal production operation and reinforces the importance of the restrictions imposed on them by the energy-control program. In addition, this essential program requirement ensures that employees do not unknowingly attempt to reactivate a machine or piece of equipment after an authorized employee has isolated its energy source and rendered it inoperative. Conversely, employees need to know when control measures have been removed. This notification of employees, after removing a LOTO device from an energy isolating device(s), alerts them that the machine and equipment are capable of being started-up or operated. Without this information, employees might mistakenly believe that a system is safe to continue working around when, in fact, it is not.

IX. Energy Control Procedures. Energy control procedures are the cornerstone of the LOTO standard because they provide employees the guidance necessary to effectively and safely control hazardous energy when they service or maintain machinery or equipment. The requirement to develop procedures is performance-oriented, but ultimately the procedures must explain what employees must know and state what steps employees must take to effectively and safely control hazardous energy during the servicing/maintenance activities.

It is essential for Compliance Safety and Health Officers (CSHOs) to evaluate an employer's energy control procedures to determine whether each procedure provides enough detailed information and guidance for an authorized employee to understand how to safely and effectively utilize energy control measures when servicing each machine covered by the procedure. If an associated hazard is discovered because the energy control procedure provides insufficient

information (e.g., procedure over-generalization), then the CSHO must document the alleged 1910.147 violations in accordance with Chapter 2, Section III of this policy manual. The following policy and guidance are provided to help CSHOs evaluate employers' energy control procedures.

NOTE: Energy control procedures and employee training are distinct and independent elements in an employer's energy control program. Section 1910.147(c)(4)'s minimum requirements for procedural detail and specificity may not be diminished by employee training programs that exceed the requirements of 1910.147(c)(7). In short, additional training does not supplement and correct an inadequate procedure. Regardless of the amount and type of employee training, a procedure must provide sufficient detail and specificity to permit an authorized employee to safely and effectively utilize energy control measures to service/maintain each machine or piece of equipment covered within the scope of the procedure.

Paragraph (c)(4) provides that employers must develop, document, and utilize procedures for the control of potentially hazardous energy, and that the procedures must clearly and specifically outline the steps to be followed, techniques to be used, and measures to be applied by the employer to ensure that the procedure is used.

Specifically, 1910.147(c)(4)(i) states:

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

A procedure, at a minimum, must contain enough detail for authorized employees to have a clear understanding of the energy control measures so that they may follow the procedural steps associated with a machine LOTO to effectively control all types and forms of hazardous energy. Due to the number of variables in controlling hazardous energy and the need for employees to follow the specified control steps, a documented (written) energy control procedure is necessary in most situations. However, there are limited situations, specified in the paragraph 1910.147(c)(4)(i) exception note, where the procedure documentation is not necessary for a specific machine or piece of equipment. This exception is intended to apply to situations in which the LOTO process can take place without detailed interactions of energy sources, machines/equipment, and employees.

For example, a motor in a shop may be wired to an electrical disconnect. The authorized employee can isolate the motor from the electric energy source and lock it out, using her personal lockout device on the disconnect switch in accordance with the procedures set forth in the standard. If this scenario meets each of the following elements, which are contained in the documentation exception, the procedure would need to be developed and utilized, but it would not need to be documented:

A. There is a single source of hazardous energy that can be easily identified and isolated, and there is no potential for stored or residual energy in the machine;

B. The isolation and locking out of that single energy source will totally de-energize and deactivate the machine;

C. A full lockout of the energy source is achieved by a single lockout device, which is under the exclusive control of the authorized employee performing the servicing; and

D. The servicing, while the machine is locked out, cannot expose other employees to hazards.

However, procedure documentation becomes necessary if an accident involving hazardous energy occurs (in utilizing this exception) because such an occurrence indicates the need for more formal treatment of the energy control procedure.

NOTE: The *Hazardous energy control procedures* section of the American National Standard on the *Control of Hazardous Energy - Lockout/Tagout And Alternative Methods* (ANSI/ASSE Z244.1-2003; Section 5.3.1.1), which contemplates an exemption from the obligation to develop written energy control procedures, differs from the OR-OSHA exemption [note to 1910.147(c)(4)(i)]. The consensus standard does not affect the requirement that an employer meet each of the eight conditions listed in the note to 1910.147(c)(4)(i) to take advantage of the exception to document an energy control procedure.

In order to ensure that employers develop energy control procedures with sufficient specificity to permit employees to effectively and safely control hazardous energy, paragraph (c)(4)(ii) of the standard defines the minimum elements for the procedure. The energy control procedures must clearly and specifically outline the scope, purpose, authorization, rules, and techniques that will be used to control hazardous energy sources, as well as the means that will be used to enforce compliance. At a minimum, these procedures must also include the following elements:

A. A specific statement of the intended use of the procedures;

B. The specific procedural steps for shutting down, isolating, blocking and securing machines or equipment to control hazardous energy [See also 1910.147(d)(2), (d)(3) and (d)(5)];

NOTE: It is imperative that the employee who is to perform the servicing (who must utilize the energy control procedure) understands the hazards of the work and knows how to control the hazardous energy. It is for this reason that paragraph (d)(1) requires that, before the machine is even turned off, the authorized employee must have the knowledge of the type and magnitude of energy, the hazards associated with the energy to be controlled, and the method or means to be used to control the energy.

C. The specific procedural steps for the placement, removal (including, if contemplated by the employer and permitted by 1910.147(e)(3), the specific procedure for the LOTO device removal by someone other than the authorized employee who applied it), and transfer of lockout or tagout devices and the responsibility for them [See also 1910.147(d)(4), (e), (f)(3) and (f)(4)]; and

NOTE: CSHO's must cite the 1910.147(f)(1) sequence of step requirements, and not the paragraph (c)(4) provisions, when an employer fails to develop or utilize procedures to safely test or position machine/equipment component(s) in conjunction with servicing and maintenance activities.

D. The specific requirements for testing a machine to determine and verify the effectiveness of LOTO devices and other control measures [See also 1910.147(d)(6)].

NOTE: The ANSI Z244.1-2003 standard's provisions for hazardous energy control procedures contain procedure element criteria that, while conceptually valuable, do not explicitly mandate all of the minimum requirements that are prescribed in 1910.147(c)(4)(ii). While the consensus standard and annexes provide valuable guidance and tools (e.g., sample energy control procedures; sample lockout/tagout placarding methods) to assist employers in developing specific methods to meet their procedural obligation under the LOTO standard, employers ultimately must develop energy control procedures that conform to the provisions of 1910.147(c)(4)(ii).

OR-OSHA used the word ***specific*** in the standard to describe the elements of the procedure. This was done to emphasize the need for detailed procedures because over-generalization does not provide authorized employees sufficient information to effectively control the hazardous energy to which they are exposed. The amount of detail in an employer's procedure will depend upon the complexity of the machine or piece of equipment and the information that the authorized employee must know to safely control the hazardous energy for the machine throughout the course of the servicing operation.

Thus, a written energy control procedure need not be complicated and detailed, if the system to be controlled is not complex or does not require unusual control measures. For example, a written procedure could be very simple if there is a machine with a single energy source that must be serviced and the means to shut down and isolate the machine is uncomplicated and apparent – e.g., pushing a stop button, notifying affected employees of the LOTO, opening and locking out an electric switch (which is at the machine), and pressing the start button to verify machine isolation (assuming a residual energy hazard is not present).

NOTE: It should be noted that a small business does not necessarily have simple energy control issues. Complex machinery and equipment can be found in workplaces with few employees, especially in highly-automated operations. From the standpoint of safety, there is no basis for concluding that a small employer is inherently less likely to need a detailed written procedure than a large employer. Thus, the performance oriented requirements for written procedures are appropriate for all employers, regardless of size.

In some instances where control measures are not readily apparent or require specific instruction, the energy control procedure may need to specify the types, location and/or operating instructions for the machine operating controls or it may need to specify the types, location and/or operating instruction for energy isolating devices in order to ensure that employees have the information necessary to safely turn off and effectively deenergize a machine.

NOTE: Any method of identification (e.g., by machine type and location or by machine type and model number) that enables an authorized employee to determine which energy control instructions, operating controls and energy isolating devices apply to a particular machine or piece of equipment is acceptable.

To assist employers and employees in complying with the procedural requirements, OSHA developed a non-mandatory *Typical Minimal Lockout Procedure* guideline in *Appendix A* of the standard. The compliance assistance tool provides employers with guidelines for a simple energy control procedure for use in both lockout and/or tagout applications. This flexible template may be used when there are limited numbers or types of machines or where there is a single power source. The user would simply need to fill in the blanks with the machine-specific data – pursuant to 1910.147(c)(4).

NOTE: Nothing in the appendix adds to or detracts from any of the requirements of the standard.

For more complex systems, a more comprehensive procedure(s) will need to be developed, documented, and utilized. The appendix may be used as a guide to develop a more complex control procedure, and the sample lockout procedure can be applied to many different workplace situations with minor adaptations or changes.

NOTE: OSHA issued a citation to an employer alleging a serious violation of the LOTO standard stating that the employer did not develop energy control procedures meeting the 1910.147(c)(4)(ii) requirements. The employer's procedure, according to the Occupational Safety and Health Review Commission, appeared to be derived from Appendix A to 1910.147; however, company officials failed to fill in any of the blanks in the Appendix A procedure. The decision explains that in order for this form to be effective, the employer must provide specific, relevant information, including the:

1. Names of affected employees;
2. Types and magnitude of energy;
3. Hazards;
4. Methods to control the energy;
5. Types and locations of machine or equipment operating controls;
6. Types and locations of energy isolating devices;
7. Types of stored energy and methods to dissipate or strain energy; and
8. Method of verifying isolation of the equipment.

The Commission held that the employer's general procedure was unacceptable because it fell far short of the standard's requirements and provided no information about the employer's individual machines that would enable an employee to lock out a machine safely. The purpose of the energy control procedure is to guide an employee through the lockout process. Thus, the Commission affirmed the violation of 1910.147(c)(4)(ii). See *Drexel Chemical Co.* (OSHRC Docket No. 94-1460, 1997) for additional information on the decision. The Commission reaffirmed this position in *General Motors Corp., CPCG Oklahoma City Plant*, (Docket Nos. 91-2834E and 91-2950, 2007).

Although the standard requires the procedure to be written in detail, this does not mean that a separate procedure must be written for each and every machine or piece of equipment. Similar machines and/or equipment (such as those using the same type and magnitude of energy), which have the same or similar types of controls, and which can be rendered safe using the same sequential procedural steps, can be covered by a single procedure, if that procedure satisfactorily addresses the hazards and specifies the measures for controlling the hazards. For purposes of procedure grouping, machines and equipment may be grouped together as one procedure if they all are listed or identified in the scope of the energy control procedure and if they all have the same or similar:

A. Procedural steps for shutting down, isolating, blocking, securing, and dissipating stored energy in machines or equipment;

B. Procedural steps for the placement, removal, and transfer of the lockout or tagout devices and the responsibility for them; and

C. Requirements for testing a machine or equipment to determine and verify the effectiveness of LOTO devices and other control measures.

Thus, for example, an employer who has a number of power presses with similar design characteristics and energy sources, may decide to group their die-setting activities into a single procedure if the presses have the same or similar control measures and the same sequential procedural steps are used for controlling hazardous energy. However, this single procedure would need sufficient detail and clarity to guide a die-setter safely through the task steps when servicing each of the power presses. Alternatively, employers may choose to develop separate die-set

procedures for each press or each type of press. Either method is acceptable as long as the energy control procedure detail provides authorized employees enough information and guidance to safely accomplish all die set-up tasks – e.g., when, where, how and in what order to: 1) position the slide, 2) open the electric disconnect switch, 3) install the safety blocks, and 4) insert the die shoes.

Likewise, many of the machines (e.g. table saws, radial arm saws, planers, routers, grinders, conveyors) in a woodworking shop are similar for purposes of the energy control procedure requirements because they all use relatively the same or similar types (e.g., 120 VAC and 240 VAC, nominal electric disconnect switches) of energy, have the same or similar controls for isolating the machines from the energy source, and use the same sequential procedural steps to protect employees from the mechanical hazards (e.g., shut off the machine; open the electric disconnect adjacent to the machine; apply a personal LO device; allow the blades or other machine components to stop before removing the guards; verify that the machine is isolated and can not unexpectedly startup). Therefore, a single energy control procedure may be used for this group of woodworking machines, as long as the procedure includes each machine within its scope and has sufficient specificity to allow employees to effectively isolate the hazardous energy source(s) and safely return each of the machine(s) to service.

NOTE: OR-OSHA recognizes that some employers choose to develop "machine-specific" energy control procedures for individual machines or pieces of equipment because this approach provides an optimum level of detail, enhancing overall employee safety during servicing operations. In order not to discourage this practice, employers who develop energy control procedures for individual machines still may group same or similar individual machine/equipment procedures for periodic inspection purposes. [See Section XVII of this chapter for details.]

However, OR-OSHA recognizes that, while in many cases an employer will be able to develop a single energy control procedure applicable to all machines and equipment in a facility, an employer may be required to develop more than one procedure when variations in machine types, energy sources, or energy control methods mandate additional specificity in order to permit employees to effectively isolate hazardous energy and safely perform servicing/maintenance activities.

For example, a single procedure for a number of machines would not be adequate if it does not guide an employee through the energy control process and provide the specific instruction necessary to permit the employee to protect herself effectively from hazardous energy associated with each piece of machinery. For example, assume that a single procedure is intended to cover a group of machines and that part of the energy control procedure requires the use of a start/stop button for shutdown and energy isolation verification purposes. However, one of the machines does not have a start/stop button because it is wired directly to an electronic *on-demand* signal. In this scenario, the single procedure will not provide adequate instructions for the machine without a start/stop button because the single procedure will not provide sufficient employee guidance on how to effectively shut down the machine and verify energy isolation.

Likewise, grouping dissimilar process systems (e.g., an ammonia refrigeration vs. a natural gas fuel heating system) with different types of hazards and control step sequences or unique control measures within a single energy control procedure would not be permitted if the procedure did not sufficiently specify the hazards and specific control measures pursuant to the LOTO standard's energy control procedure provisions. The Agency recognizes that, while in many cases an employer will be able to develop a single energy control procedure applicable to all machines and equipment in a facility, the employer is required to develop more than one procedure (or to

supplement a single, generic procedure with supplemental means such as checklists, appendices, or work authorization permits) for unique or different energy sources, particularly when the associated control measures are dissimilar.

It is important to emphasize that the nature of the machine or piece of equipment (i.e., its production function) is not a significant factor in deciding whether machines/equipment can be covered by a single procedure. For example, machines that are designed to perform different production functions (e.g., a mechanical conveyor, an electrically powered ironworker, a table saw, and a multi-spindle milling machine) may be covered by a single procedure if the procedure clearly and specifically details the same or similar energy control (LOTO) measures such that the authorized employees have sufficient guidance to enable them to safely and effectively utilize hazardous energy control measures for each of the machines that will be included within the procedure.

OR-OSHA recognizes that many portions of an energy control procedure may be standardized for an entire facility. However, it is necessary to supplement the generic procedure with checklists or other supplemental means (e.g., a checklist, work authorization permit system, or manufacturers' servicing and maintenance guidelines) to provide the required specificity – pursuant to paragraph (c)(4)(ii) – when variations (e.g., differences in the machines/equipment, types of energy, energy isolation devices, or hazards) necessitate additional specificity to enable employees to safely and effectively control hazardous energy when working with particular machines or equipment. The generic procedure and supplemental means must provide authorized employees with clear and detailed guidance so that they can understand how to safely and effectively utilize hazardous energy control measures for the machine or equipment being serviced or maintained.

For example, if not apparent, the checklist might address the number and locations of the energy isolating devices in order to achieve total de-energization. If the procedure itself takes the form of a checklist, it must reflect, in part, the sequence of steps necessary to safely and effectively control all hazardous energy sources. The information contained in the generic procedure and supplemental means would, at a minimum, need to meet the performance-oriented requirements of the LOTO standard.

NOTE: The use of generic energy control procedures alone are unacceptable, if generic procedures do not meet the provisions set forth in 1910.147(c)(4)(ii).

In the chemical process and petroleum refining industries, for example, companies augment generic LOTO procedures with work authorization permit systems to detail the job-specific hazardous energy control measures before employees perform servicing and maintenance work activities. It is recognized that the comprehensive use of such a system is more efficient and relevant to the daily tasks than would a *cookbook* type procedure, which might not fully account for a specific situation that might have occurred around the time of the servicing and maintenance activity.

However, if a company uses a work permit authorization system, each permit must identify the: 1) equipment to be serviced/maintained, 2) types and unique energy characteristics that may be encountered, and 3) specific safe work procedures to be used to effectively control hazardous energy associated with the permit's scope of work. Ultimately, however, the quality of any

hazardous energy control effort, and ultimately employee safety, is dependent upon the hazard analysis, which in turn is dependent upon the knowledge and skill of the individuals – e.g., operations personnel, engineering support – that identify the tasks, the energy related hazards, and appropriate control measures for the specific servicing operation.

NOTE: Work authorization permit system procedures must, in part, specify that employees are required to perform their work in accordance with the terms and limitations of the work permit and include the means to enforce employee compliance with the work permit provisions. Chapter 4, Section VI of this manual also contains information on the use of work authorization permits as employee accountability devices in group LOTO (control and accountability) procedures.

With the understanding that the standard is flexible and performance-oriented, many procedural items may be incorporated into a generic plant-wide policy (when supplemental means are used) or incorporated without revision into each energy control procedure, regardless of the type of machine or equipment, the type of energy, or the energy control devices associated with the control of the hazardous energy. For example, an employer may decide that it is better to address the purpose and use of the procedure, as well as other general issues, in their generic procedure's policy sections. The following are some general policy issues that may be capable of being developed and contained in the generic portion of the company's energy control procedure:

A. Who is authorized to perform LOTO?
B. Who will notify affected employees of the application and removal of LOTO devices?
C. What method (e.g., lockout versus tagout, including, where appropriate, *full employee protection* measures) will be used for securing energy isolating devices?
D. What types of energy isolation (e.g., electric disconnects) and control methods will be employed in the facility?
E. How will energy control devices be removed and by whom?
F. If removal by others is contemplated by the employer in situations permitted under the LOTO standard, what are the specific procedural steps for the removal of the authorized employee's LOTO device by someone other than the person who applied the device?
G. How will the removal of control devices and re-energization be performed?
H. How will the implementation of these energy control procedures be supervised and enforced?
I. Where groups perform servicing or maintenance work, how will the group LOTO activities be performed and coordinated?
J. Where the servicing or maintenance exceeds a single shift or there is a personnel change, how will authorized employee responsibility be transferred during shift and personnel changes (e.g., job locks)?
K. Where contractor employees may be affected by hazardous energy, how will outside personnel (e.g., contractors) be informed of energy control procedures?

Some issues that an employer may need to incorporate in its supplemental sections, such as a checklist, include:

A. What equipment is being serviced/maintained and what is the scope of work?
B. What are the specific (types and magnitude) hazardous energy sources associated with the system and the specific method and sequence of activities required to control these hazards?
C. How is a safe and orderly shutdown of the system performed?
D. Where (if not readily apparent) and how does the isolation or blocking of energy occur?
E. How is stored energy in the system released?

F. Are there precautions (e.g., use of a test instrument) necessary to monitor for hazards associated with energy re-accumulation?
G. How do authorized employees test and verify that de-energization and isolation have been accomplished?
H. How are LOTO devices removed and what are the steps to re-energize the system?
I. How do employees safely test and position machine components?

In summary, when CSHOs evaluate an employer's energy control procedures, they must determine:

> *Whether an energy control procedure, pursuant to 1910.147(c)(4)(ii), provides sufficient detail and adequate guidance for an authorized employee(s) to clearly understand how to safely and effectively utilize hazardous energy control measures for the particular machine or piece of equipment being serviced and/or maintained?*

If the procedure does, the employer has complied with this performance-oriented standard.

X. **Application of Control Measures.** The implementation of energy control procedures is accomplished, in large part, by following the provisions of paragraph 1910.147(d). The established procedure contains six separate and distinct steps which must be followed in the order that they are presented [(d)(1) through (d)(6)]. The following energy control elements and actions are presented in the sequence in which they must be implemented, and several fatality case reports, from the NIOSH Fatality Assessment and Control Evaluation (FACE) Program, are presented for illustrative purposes:

A. Preparation for shutdown, which requires each authorized employee to have knowledge of the type and magnitude of the energy, the hazards of the energy to be controlled, and the means for controlling these hazards;

B. Machine or equipment shut down in accordance with established procedures required by this standard. An orderly shutdown must be utilized to avoid any additional or increased hazards as a result of de-energization;

> FACE Report No. 94CO02901: *Recycle Technician Died from Injuries Sustained When He Fell into a Cardboard Compactor* – Colorado [http://www.cdc.gov/niosh/face/stateface/co/94co029.html]. A 38-year-old worker at a county sanitary landfill died after falling into a large trash compactor used to bale cardboard for recycling. The cardboard was lifted 20 feet by a belt conveyor and fed through a 20- by 44-inch opening into a hopper. The hopper had automatic controls that activated the baler when enough material collected in the baling chamber. When the baler was activated, material in the chamber was compressed by a ram that entered the chamber from the side. Excess material above the chamber was trimmed by a shearer.
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> On the day of the incident, cardboard jammed at the conveyor discharge opening. Without stopping, de-energizing, or locking out the equipment, the victim rode the conveyor up to the discharge opening to clear the jam. He fell into the hopper and the baling cycle was automatically activated, amputating his legs. The victim bled to death before he could be removed from the machine [Colorado Department of Public Health and Environment 1994].

C. Operation of all energy isolating devices that are needed to control the hazardous energy to the machine or equipment;

FACE Report No. 5: *Uncontrolled Kinetic and Thermal Energy* (NIOSH ALERT No. 99-110). A 33-year-old janitorial worker died after he was trapped inside a linen dryer at a hospital laundry while cleaning plastic debris from the inside of the dryer drum. The cleaning task (which usually took 15 minutes to an hour) involved propping open the door to the dryer with a piece of wood and entering the 4- by 8-foot dryer drum. The melted debris was removed by scraping and chiseling it with screwdrivers and chisels. The dryer was part of an automated system that delivered wet laundry from the washer through an overhead conveyor to the dryer, where it was dried during a 6-minute cycle with air temperatures of 217° to 230°F. The system control panel was equipped with an error light that was activated if the dryer door was open, indicating that the dryer was out of service.

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

D. Application of lockout or tagout devices to the energy isolating devices by authorized employees so that they hold the isolation devices in a “safe” or “off” position;

FACE Report No. 95-12: *Laborer Fatally Injured While Cleaning Concrete Mixer* – Tennessee [http://www.cdc.gov/niosh/face/Inhouse/full9512.html]. A 25-year-old male worker at a concrete pipe manufacturing facility died from injuries he received while cleaning a ribbon-type concrete mixer. The victim's daily tasks included cleaning out the concrete mixer at the end of the shift. The clean-out procedure was to shut off the power at the breaker panel (approximately 35 feet from the mixer), push the toggle switch by the mixer to make sure that the power was off, and then enter the mixer to clean it.

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

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

E. Relieve, disconnect, restrain, or otherwise render safe all potentially hazardous stored or residual energy in the machine or equipment. If re-accumulation of hazardous energy is a possibility, then the verification of isolation must be continued until the servicing/ maintenance is completed, or until the possibility of such accumulation no longer exists; and

Steel Manufacturing Incident – Gas Condensate Fire; Investigation Report, No. 2001-02-I-IN; Chesterton, IN, February 2, 2001; U.S. Chemical Safety and Hazard Investigation Board. On February 2, 2001, workers were attempting to remove a slip blind and a cracked valve from a coke oven gas line leading to a decommissioned furnace in preparation for a cutting and welding operation. In this incident, workers first purged the piping system with nitrogen to force out residual chemicals, including a hazardous mixture of peroxide and alcohol that reacts violently when heated. But unknown to the workers, the piping system included a 300-foot-long section that was three feet lower than the rest of the pipes, and despite the nitrogen purge, a significant amount of the hazardous mixture remained trapped.

The next step in the operation was to use high-temperature steam to purge the piping of what workers believed would be a small amount of residual flammable hydrocarbon vapor. But the steam heated the peroxide that was trapped in the low section of piping. The peroxide then began to decompose, releasing heat and creating intense pressure. The pressure blew out a valve gasket and violently ruptured the pipe. Flammable vapors shot out of the openings and ignited into a large fireball, injuring plant workers. One millwright and one contractor supervisor died. Four millwrights were injured, one seriously.

After the accident, two drains were found in the low section of the pipe, which could have been used to remove the trapped liquid [residual hazardous energy]. According to the CSB, had the procedures called for reviewing plant pipe drawings and physically walking the entire line within the work boundaries, the accident [involving residual flammable chemical energy] likely would have been avoided.

F. Verification by the authorized employee that the previous steps of the procedure have effectively isolated the machine or equipment. This must be done prior to starting the servicing or maintenance work. The authorized employees need to verify that: the machine or equipment has been turned off or shutdown properly as required by paragraph (d)(2) of the standard; all the energy isolating devices were identified, located and operated as required by paragraph (d)(3); the LOTO devices have been attached to the energy isolating devices as required by paragraph (d)(4); and the stored energy has been rendered safe as required by paragraph (d)(5). The authorized employees also need to verify that, by performing these steps, they have effectively isolated hazardous energy associated with their servicing and/or maintenance activities such that they cannot be injured by hazardous energy sources while performing the servicing and/or maintenance activities. These potentially life-saving steps are intended to ensure the employee that the machine or equipment is isolated from the energy source, that the residual energy has been dissipated or blocked, and that injury could not result from the inadvertent activation of the operating controls.

Both visual inspections and physical tests are important elements of verification of de-energization. The use of visual inspection techniques is critically important as authorized employees can visually confirm that switches, valves, breakers, etc. have been properly moved to and secured in the *off* or *safe* position. Visual inspection can also verify whether or not LOTO and other protective devices have been applied to the control points in a manner that would prevent the unsafe movement of the switches or valves. Finally, a visual inspection can be used to verify that isolation has taken place by determining that all motion has stopped and that all coasting parts such as flywheels, grinding wheels, saw blades, etc. have come to rest.

However, in the majority of situations, visual inspection techniques must be accompanied by physical tests to ensure that the steps taken to isolate hazardous energy have worked successfully to isolate the energy from the machine or piece of equipment. OR-OSHA emphasizes that, in order to reliably ascertain whether hazardous energy has been effectively isolated; the authorized employee generally will need to use a combination of visual inspection techniques and other detection methods. Depending upon the measures necessary to detect the presence of hazardous energy, visual inspection techniques generally will need to be performed in conjunction with the use of a test instrument (e.g., voltmeter; combustible gas indicator) and/or a deliberate attempt to start-up machines or equipment. Indeed, in most cases, it is only through the use of a test instrument or a deliberate attempt to start-up a machine that the authorized employee will be able to ascertain whether the steps taken to isolate hazardous energy (which were checked through visual inspection techniques) actually worked to isolate the energy from the machine. The appropriate combination of verification methods will depend upon the types of machinery or equipment involved, the complexity of the system, and other factors.

For example, visual verification that a disconnect switch is in the *open* or *off* position, even in conjunction with the operation of the equipment's control(s), is not a reliable indication that an electric circuit has been de-energized when employees will be working on or near exposed electrical parts. It is possible to interrupt a portion of the circuit so that the equipment will not operate even though the rest of the circuit is still alive. Therefore, a qualified person must use test equipment to verify de-energization by testing the electric circuit elements and equipment parts to which employees will be exposed. A test is also required to check for any voltage even though specific parts of a circuit have been deenergized and presumed safe because it is possible, under certain conditions, to feed circuits from the load side (e.g., back-feed; short circuit) or to have induced voltage. See 1910.333(b)(2)(iv) on electrical safety-related work practices for further details.

Commission Decision: In a split decision in *Interstate Brands Corp*., 20 BNA OSHC 1102 (Docket No. 00-1077, 2003), the Occupational Safety and Health Review Commission (OSHRC) vacated a citation item charging the employer with failing to include a procedure for verifying the effectiveness of energy control procedures for a particular piece of equipment in the energy control program. The program generally required that, after locking or tagging out equipment, employees were both to check the equipment visually and to attempt to restart it to verify that it was de-energized. The equipment at issue did not have an on/off switch, and the program did not provide an alternative verification method. The Commission held that the Secretary had not established that the visual verification method by itself was inadequate in the particular circumstances of the case.

Inspection Strategy: In most workplaces where the LOTO standard applies, enforcement will not be affected by the IBC decision because the decision applies to the specific facts at issue.

In situations where an energy control procedure provides only visual verification of isolation, CSHOs should determine whether the visual verification alone would be effective, and if not, must sufficiently document why the visual verification steps alone are inadequate to ensure the effective isolation of hazardous energy. Proposed citations based on the inadequacy of visual verification techniques alone should be discussed with the OR-OSHA Administrator and Field Manager.

XI. **Removal of Lockout/Tagout Devices.** Paragraph 1910.147(e) requires that certain actions be taken before LOTO devices are removed from energy isolating devices so that equipment may be returned to a safe operating condition without injury to employees. Due to the performance-oriented nature of the provisions, they are expressed in broad terms. As such, the employer is responsible for, and is in the best position to make a determination of the hazards associated with the system energization or startup and the appropriate control measures, because the employer is familiar with its operation of the equipment and relevant energy hazards.

Pursuant to 1910.147(e), all of the following steps must be accomplished by authorized employees in accordance with the specific provisions of the employer's energy control procedure before LOTO devices are removed and energy is restored to the machine or equipment.

A. Inspect machine/equipment system components to ensure that: 1) non-essential tools and materials have been removed; and 2) machine or equipment components are operationally intact. Any inoperable safeguard or extraneous item in the maintenance area, for example, can potentially cause injury to employees if the equipment were to be re-energized or started up.

These 1910.147(e)(1) pre-startup inspection steps are intended to ensure that the machine or equipment has been returned to an effective operating condition, so that it is safe to re-energize the machine/equipment after the servicing or maintenance is complete. Depending on the equipment design, visual inspection alone might be sufficient to meet this requirement. For example, a verification procedure may be as simple as having a foreman, supervisor or other person-in-charge ask the employees if they are done, and then spot check the equipment to ensure that it is safe to be returned to normal operations. Such spot checking could include a simple determination of whether the machine guards are functioning (as intended) and whether employees have cleaned up after themselves. A more complicated machine or equipment system, however, may require additional measures, which may include, but are not limited to, checking equipment manufacturer design specifications or following pre-start-up procedures and checklists.

B. Check the location of all employees, and ensure that all employees have been removed from machine/equipment areas and are positioned safely. This determination usually can be accomplished by a visual inspection; however, depending on the size and/or complexity of the equipment and the scope of the operation, the determination may necessitate the use of administrative procedures and warning devices such as horns, bells or buzzers. [1910.147(e)(2)].

C. Each LOTO device must be removed by the employee who applied the device. This is an essential step in the procedure because each authorized employee will have her own personal LOTO device attached to the energy isolating device(s) during maintenance operations. [1910.147(e)(3)]. The employer must have procedures in place to determine whether all such devices have been removed by each authorized employee before re-energization or startup.

D. Inform affected employees (as defined by 1910.147(b)) that the lockout or tagout device(s) have been removed and that the machine or equipment will be reenergized. [1910.147(c)(9) and (e)(2)(ii)]. It is at this point when the control of the equipment is typically transferred back to the operations personnel for the purpose of returning the system to *normal production operations* – i.e., as the authorized employee(s) relinquish their personal control over the hazardous energy source(s).

NOTE: A start-up (re-energizing) procedure is considered a *normal production operation* and is not normally covered by the provisions of 1910.147 as long as the procedure does not involve:

- Testing or positioning of machines, equipment or components thereof (as detailed in 1910.147(f)(1)); or
- *Setting up* (as defined in 1910.147(b)).

For example, a machine startup may simply involve placing the electric disconnect in the *on* position and pushing a control switch to start the production operation. In this scenario, the LOTO standard would not apply as the operator is utilizing the machine to perform its normal production function. However, in other instances, servicing and/or maintenance activity, and subsequent coverage by 1910.147, may occur following the re-energization of the machine or equipment. For example, if an employer must test or position equipment to determine if the servicing and maintenance activity was successful, or to complete the setting up of equipment, this would still be considered servicing and maintenance activity as defined by the standard. Under these situations, the provisions of 1910.147 will continue to apply until the machine or equipment is capable of performing its intended production function.

E. Safely start-up (re-energize) the equipment in accordance with generally recognized good engineering practice. An orderly start-up procedure must be utilized to avoid any additional or increased hazards to employees as a result of machine or equipment start-up.

NOTE: The employer is still obligated under the Occupational Safety and Health Act of 1970 to take reasonable steps to protect employees from the recognized hazards associated with the operation. In other words, the machine or equipment must be re-energized and/or started up in such a manner to avoid any additional or increased hazard(s) to employees as a result of the re-energization or startup process. Failure to do so may constitute a violation of a specific OR-OSHA standard (e.g., the 1910, Subdivision O *Machinery and machine guarding* standards; the *Process safety management* standard, 1910.119) or the General Duty Clause, Section 5(a)(1) of the Act, if an employer has failed to furnish a workplace that is free from recognized hazards causing or likely to cause death or serious physical hazard. See 1910.5(f).

With regard to LOTO device removal (Step C), it cannot be over-emphasized that employees who work on de-energized machinery may be seriously injured or killed if LOTO devices are removed and the machinery is re-energized without their authorization. Lockout or tagout is personal protection. For this reason, it is extremely important that all employees respect lockout and tagout devices and that the LOTO devices be removed only by the person(s) who applied them. In the rare situation in which the employee who placed the LOTO device is not available to remove that LOTO device, the device may be removed under the direction of the employer, provided that the employer's energy control program incorporates specific procedures and training for that purpose.

NOTE: Pursuant to the paragraph (e) exception, these procedures must incorporate, at a minimum, measures to accomplish the following:

- Verification that the authorized employee (who applied the device) is not at the facility;
- Making all reasonable efforts to contact that employee to inform him or her that the LOTO devices(s) has been removed; and
- Ensuring that this employee knows of the removal of the device before he resumes work at the facility.

Removal of a personal LOTO device by another person may not be based on convenience and may not be done simply because the employee is not available at the LOTO location, but is still at the workplace. The steps above are necessary to ensure that the employee who is protected by the device is not exposed to energy hazards either at the time of its removal or after its removal.

XII. **Machine or Equipment Testing or Repositioning.** The LOTO standard requires an employer to develop and utilize a procedure, in conjunction with the energy control procedure that establishes a logical sequence of actions to be taken in situations where energy isolating devices are locked and/or tagged out and there is a need for machine component testing or positioning. OR-OSHA allows temporary removal of LOTO devices and the re-energization of the machine only when necessary to perform particular tasks that require energization – i.e., when power must be restored to test or position machines, equipment, or their components. However, employers must provide employee protection (e.g., via machine guarding techniques when it is not possible to remove an employee(s) from the danger area) that eliminates exposure to hazardous energy during all phases of the testing or repositioning operation.

NOTE: CSHO's must cite the 1910.147(f)(1) sequence of step requirements, and not the paragraph (c)(4) provisions, when an employer fails to develop or utilize procedures to safely test or position machines/equipment in conjunction with servicing and maintenance activities.

When testing or positioning is necessary, the relevant procedure must establish a sequence of actions to be undertaken, in accordance with 1910.147(f)(1), since employees may be exposed to significant risks during these transition periods. These actions are required to maintain the integrity and continuity of employee protection. These prescribed steps must be implemented in sequence prior to re-energization:

A. Clear machines of tools and materials – See 1910.147(e)(1);

B. Remove employees from the hazardous areas around the machine – See 1910.147(e)(2);

C. Remove the lockout or tagout devices as specified in the standard – See 1910.147(e)(3);

D. Energize the machine and employ effective employee protection while testing or positioning machinery; and

E. Turn off all systems, isolate the machine from the energy source, and reapply lockout or tagout devices as specified, if additional servicing or maintenance is required – See 1910.147(d).

This temporary exception applies only for the limited time required for testing or repositioning the machine/equipment or its components. When an energized state is no longer required, the authorized employees must again de-energize the machine/equipment and resume the energy control measures. Paragraph (f)(1) of the standard does not allow the employer to disregard the requirement for locking out or tagging out during other portions of the servicing or maintenance operation.

XIII. Outside Personnel. Outside servicing and maintenance personnel, such as contractors, service representatives, or employees from a temporary employment agency engaged in general industry activities are subject to the requirements of this standard. These requirements are necessary when outside personnel work on machines or equipment because their activities have the same or greater potential for exposing employees to servicing or maintenance hazards as would exist if the on-site employer's own employees were performing the work.

If outside contractors service or maintain machinery, the on-site employer and the contractor must inform each other of their respective lockout or tagout procedures. The performance-oriented nature of the standard permits the outside (contractor) employer to use either: the host employer's energy control procedure, which some companies will require; its own procedures; or a combination of the two procedures, provided the resulting procedure meets the requirements of the LOTO standard. In some instances, for example, the host employer will prohibit the contractor from shutting down and isolating the host's equipment and the host will implement many of the equipment-specific energy control measures contained in the LOTO standard's energy control procedural requirements. See 1910.147(c)(4)(ii). The contractor employees would then apply their own personal LOTO devices to a group LOTO mechanism, such as a lockbox, before they verify that the energy sources have been adequately isolated and de-energized. In summary, each employer has an employee protection obligation to control hazardous energy, and this performance oriented standard allows the employers the flexibility on how to meet the LOTO standard requirements.

NOTE: Refer to the *Citation Guidance* policy contained in Chapter 2, Section III.A for additional information regarding host employer and outside contractors and OSHA's *Multi-Employer Citation Policy, A-257*.

On-site employers and outside employers must inform each other of their respective LOTO procedures. OSHA expects that, in most cases, the on-site and outside contractors will exchange copies of their respective energy control procedures and may, when appropriate, have a discussion regarding relevant provisions (e.g., control measures for all hazardous energy sources potentially to be encountered) of the respective procedures. This provision is intended to ensure that both the host employer and outside personnel are aware that their interaction can be a possible source of injury to employees and are effectively coordinating energy control procedure interaction to protect all employees from hazardous energy. [See paragraph 1910.147(f)(2)(i).]

The onsite employer and the contractor also must each ensure that its respective employees understand and comply with all requirements of the contractor's energy control procedure(s). [See paragraph 1910.147(f)(2)(ii).] The facility owner must evaluate the various aspects of the contractor's energy control procedure(s) to ensure that its own employees are not placed at risk by the implementation of the contractor's procedure because each employer has an independent obligation to provide employee protection. This knowledge prevents any misunderstanding by either the plant employees or the outside personnel regarding the application of the energy control procedures.

XIV. **Group Lockout/Tagout.** Group LOTO applies to the performance of servicing or maintenance activities when more than one employee is engaged in the servicing operation. When servicing and maintenance is performed by a crew, craft, department or other group, a procedure must be utilized that affords each employee a level of protection equivalent to that provided by the implementation of a personal lockout or tagout device.

Regardless of the situation, the requirements of this standard specify that each employee performing servicing and maintenance activities must be in control of hazardous energy throughout her entire period of exposure. Each employee in the group needs to affix her personal lockout or tagout device as part of the group LOTO procedure.

Acceptable group energy control procedures are further discussed in Chapter 4.

XV. **Shift or Personnel Changes.** The employer must ensure that specific procedures are implemented during shift or personnel changes to provide a continuity of lockout or tagout protection throughout this transition period. This assurance usually involves action by the authorized or supervisory employee (*Primary Authorized Employee*) responsible for the coordination of affected workforces and the continuity of LOTO protection. See 1910.147(c)(4)(ii)(C) and 1910.147(f)(4). The responsibility includes the orderly transfer of lockout or tagout device protection between employees on outgoing and incoming shifts to ensure that the machine or equipment is safe to work on.

Generally, the transfer of responsibility can be accomplished by the oncoming shift accepting control of the system involved prior to the release of control over the system by the off-going employees. The orderly transfer of personal LOTO devices between off-going and on-coming employees must ensure that there is no gap in coverage between the off-going employee's removal of her LOTO device and the on-coming employee's attachment of his device.

The performance-oriented nature of this provision allows employers to utilize a variety of methods that ensure the continuity of LOTO protection during shift or personnel change. The following procedures are examples of methods that would provide such employee protection:

A. All authorized employees leave their personal LOTO devices in place until the job is completed. The energy cannot be restored and the machine energized until all the employees have removed their personal LOTO devices;

B. The on-coming employee(s) apply their personal LOTO devices before the off-going employee(s) remove their personal LOTO devices (as many facilities have over-lapping shift work);

C. Each on-coming employee starts LOTO from scratch, in accordance with 1910.147, by applying and releasing LOTO for the entire period of time that the employee services a machine. The machine is returned to operational status, with all the safeguards in place, so that the next employee may perform LOTO; and

D. The use of shift or personnel transfer devices, sometimes referred to as LOTO continuity devices.

For example, where the off-going employee removes his personal lockout or tagout device before the oncoming employee arrives, the procedure may allow for the departing employee to apply another interim LOTO continuity device (*Shift Transfer Device*) prior to the time the employee removes his device. This interim procedural step would indicate that the departing employee's lockout or tagout device has been removed, but that the machine or equipment has not been re-energized. The on-coming employees would affix his personal LOTO device before removing the LOTO continuity device, and each oncoming employee would then verify that the system was still isolated.

The *Job Lock*, also known as the *Operations Lock* or *Production Lock*, is another common method used to ensure the continuity of energy isolation during multi-shift operations. This type of lock is the first lock placed on the energy isolating device(s) or lockbox, and it is the last lock removed when the job is completed. Each primary authorized employee from each shift controls the key to the job lock. Each authorized employee attaches her personal LOTO device to the group LOTO mechanism (with the *Job Lock* attached) while she performs work on the machine or equipment and removes the device when leaving for the day or when the job is completed. By using this *Job Lock* method, the security provisions of the energy control system are maintained across shift changes, and this procedure provides adequate assurance to the on-coming employee that the machine or equipment is safe to work on. See Chapter 4, Section IV for additional guidance.

In other words, LOTO continuity devices are devised for shift or personnel changes and they differ from personal LOTO devices because their application is intended to ensure the continuity of employee protection during shift and personnel changes – pursuant to 1910.147(f)(4). The hardware for these continuity devices must meet the prescribed specifications, contained in 1910.147(c)(5). However, in lieu of identifying the authorized employee who applied the LOTO continuity device, an employer may alternatively identify the party responsible (e.g., operations department; maintenance department) for the application and removal of the continuity device as these organizational groups may be responsible for the application and removal of the shift/personnel transfer devices.

In addition, the requirements contained in 1910.147(c)(8), 1910.147(d)(4)(i), and 1910.147(e)(3) do not apply to LOTO devices used to ensure the continuity of employee protection for shift or personnel changes. In other words, the authorized employee who applies the continuity device (e.g., *Shift Transfer Device*, *Job Lock*) may or may not be the same authorized employee who removes the continuity device, as long as these actions are performed in accordance with the employer's established energy control procedure. For additional information, refer to Chapter 4, Section IV on the *Job Lock* (*Type D*) control measure.

Another element for assuring continuity of protection is the requirement that each oncoming employee verify that the machine or equipment has been effectively de-energized and isolated. When LOTO devices (personal and/or continuity devices) remain on energy isolation devices

from a previous shift, all of the on-coming shift employees must verify for themselves the effective de-energization and isolation of the machinery or equipment. On-coming employees may not depend on the actions of other employees or supervisors, particularly those who have left the workplace for the day, for assurance that it is safe to work on the machinery or equipment.

NOTE: OR-OSHA has recognized the need for an alternative to the verification requirement where complex LOTO operations involve many employees and numerous energy isolating devices. This procedure is described in Chapter 4.

XVI. **Employee Training.** OR-OSHA's performance-oriented LOTO training program requirements, as detailed in 1910.147(c)(7), were developed to provide employer flexibility and to deal with the wide range of conditions in various workplaces. The specific training material will vary from workplace to workplace, and even from employee to employee within a single workplace, depending upon: the complexity of the machine or equipment and the procedures, the employee's job duties, their responsibilities, and other factors.

NOTE: Self-paced, interactive computer-based training can serve as a valuable training tool in the context of an overall training program. However, unless the training program is specific to the servicing that will be performed by an individual employee, use of computer-based training by itself would not be sufficient to meet the intent of OR-OSHA's LOTO training requirements. The Agency's position regarding computer-based training is essentially the same as our policy on the use of training videos, since the two approaches have similar shortcomings. OR-OSHA urges employers to be wary of relying solely on generic, *packaged* training programs in meeting their training requirements because training must be relevant for the employees' actual servicing and maintenance work activities. Essential training information will necessarily vary from workplace to workplace, and even from employee to employee within a single workplace, depending on the type and complexity of the energy control procedure, as well as the employee's duties and responsibilities under the LOTO program. Specifically, training under LOTO includes site-specific elements and, very importantly, it must be tailored to employees' assigned duties.

In addition, the employer has the responsibility to ensure that employees understand the purpose and function of the energy control program and to ensure that these employees have the knowledge and skills required to safely apply the energy control measures. In an effective training program, it is important that trainees have the opportunity to ask questions when material is unfamiliar to them. In a computer-based program, this may be achieved by providing a telephone hotline so that trainees will have direct access to a qualified trainer. Equally important is the use of hands-on training and exercises to provide trainees with an opportunity to become familiar with equipment and safe practices in a non-hazardous setting. Industrial operations, and in particular hazardous energy control operations, can involve many complex and potentially hazardous tasks. It is imperative that employees be able to perform such tasks safely.

In summary, OR-OSHA believes that computer-based training programs and training videos can be used as part of an effective safety and health training program to satisfy OR-OSHA training requirements, if the training as a whole provides employees with the information and knowledge necessary to safely perform the work. CSHOs can determine the adequacy of the training by examining the training program as a whole and by conducting employee interviews to evaluate employee knowledge and understanding.

In order to provide adequate information, any LOTO training program must address, at a minimum, the following three areas: 1) the purpose and function of the energy control program; 2) the elements of energy control procedures relevant to employee duties; and 3) the pertinent requirements and prohibitions of the LOTO standard. The training, detailed in paragraph (c)(7)(i), must be specific to the needs of *authorized*, *affected*, and other employees, and the degree of knowledge required for these three employee groups diminishes from *authorized employee* to *affected employee* and from *affected employee* to other employee.

Authorized employees are those responsible for implementing the energy control procedures (e.g., an employee who locks out or tags out machines) and/or performing the servicing or maintenance activities. These employees must have the knowledge and skills necessary for the safe application, use, and removal of energy isolating devices. For employers with a large number of procedures, each *authorized employee* must be able to safely perform the work required by any energy control procedure that he may be called upon to use, however rarely. Therefore, these employees need training in the applicable aspects of the procedure and its proper utilization, together with training in the:

A. Recognition and understanding of all applicable hazardous energy sources;

B. Type and magnitude of the hazardous energy sources associated with machinery or equipment on which they will perform servicing or maintenance; and

C. Energy control procedures, including the methods and means to isolate and control relevant energy sources.

Affected employees are those employees (e.g., machine operators and material handling specialists) who operate or interact with machines that are serviced and maintained pursuant to energy control procedures, as well as those employees (e.g., general laborers) who are assigned to work in areas where energy control procedures are utilized to service or maintain machinery. In other words, employees who are assigned to areas where servicing or maintenance work is performed, but who do not implement energy control procedures or perform servicing and/or maintenance work need only be trained as *affected employees*. *Affected employees* must be able to:

A. Recognize LOTO devices immediately;

B. Recognize when the energy control procedure is being used;

C. Understand the purpose and use of the procedure; and, most importantly;

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

Affected employees are required to be instructed in these matters and be informed that disregarding or violating the prohibitions imposed by the energy control procedure could endanger their own lives or the lives of their co-workers.

All other employees who may be in an area where energy control procedures may be utilized must receive instruction regarding the energy control procedure and the prohibition against removing a lockout or tagout device and attempting to restart, reenergize, or operate the machinery. This instruction, which can be provided during new employee orientations, by use of employee handbooks, or through safety meetings, must convey what the energy control program

does, the program's prohibitions, and that the employees are not to touch any locks, tags, energy isolation devices, or equipment covered by this program. This instruction is required for all employees who are not classified as "authorized" or "affected" employees unless the company establishes, communicates, and enforces a policy prohibiting an employee or group of designated employees from ever being in an area where servicing or maintenance is performed pursuant to an energy control procedure. Thus, for example, this training would not be required for an office administrator who is prohibited from going into production areas where all servicing and maintenance activities are performed. On the other hand, this training would be required for a salesperson who rarely goes into production areas, but who may go into production areas to discuss product specifications associated with a particular order while servicing or maintenance work may be being performed.

In addition, if tagout devices are used, all employees in all three of the aforementioned categories must receive training regarding the inherent limitations of tags. The training, described in paragraph (c)(7)(ii), must inform employees that:

A. Tags are essentially warning labels affixed to energy isolating devices, and therefore do not provide the physical restraint associated with locks;

B. Employees are not to remove tags attached to energy isolating devices by authorized employees (unless they are permitted to do so by the employer's energy control procedure due to the unavailability of authorized employees at the workplace – in accordance with the paragraph (e)(3) exception), and that they are never to bypass, ignore, or in any manner defeat the tagout system;

C. Tags must be legible and understandable by authorized and affected employees, as well as other employees who work, or may work, near operations using the energy control procedure;

D. The materials used for tags, including the means of attaching them, must be able to withstand the environmental conditions encountered in the workplace;

E. Tags invoke a false sense of security, and employees must understand that tags are only part of the over-all energy control program; and

F. Employees must attach tags securely to energy isolating devices to prevent the removal of the tags during use.

Although the standard does not prescribe annual refresher training or a set frequency for retraining, it does require training under specific circumstances and specifies those issues that the training must cover. For example, the employer must provide initial training before the servicing and maintenance activities begin and must provide retraining as necessary. However, retraining is required, by paragraph (c)(7)(iii), if a periodic inspection reveals, or an employer has reason to believe, that there are deviations from the application of the energy control procedure or inadequacies in an employee's knowledge of or use the energy control procedure. Additionally, retraining must be provided for all authorized and affected employees whenever there is a change in:

A. Job assignments;

B. Energy control procedures; or

C. Machinery, equipment, or processes that present a new hazard.

The retraining must reestablish employee proficiency and, if relevant, address new or revised energy control procedures. The scope and content of all the retraining must be based upon the severity of the problems encountered and must be directed toward the elimination of those problems. Unless employees are retrained whenever deviations or inadequacies are discovered (or when the employer has reason to believe a problem exists) the overall effectiveness of the energy control program will diminish over time. Properly trained employees, who are proficient in their energy control responsibilities, are critical to the success of the energy control program.

NOTE: OSHA issued a citation of 1910.147(c)(7)(iii)(A) alleging that the employer did not give lockout/tagout retraining to all employees who had been given new job assignments. The violation addressed two employees, one a pipe-fitter for 20 years, the other an automotive mechanic, who were reclassified as maintenance employees during a reorganization of the plant. The Occupational Safety and Health Review Commission (OSHRC) affirmed the citation holding that these employees were required to perform jobs they had not performed before and were not familiar with the associated lockout/tagout hazards. See *Caterpillar, Inc.*, 17 BNA OSHC 1584, (No. 93-2230, 1996).

Training certifications, which contain each employee's name and dates of training, are required, by paragraph (c)(7)(iv), for both initial training and retraining. These training records must be kept only for the last training activity. However, the employer must certify that the training (required by the LOTO standard) has been given to each employee covered by the standard. In other words, employers must be able to demonstrate that the required LOTO training, which is directly relevant to the duties of the employee, was provided and understood. In evaluating whether an employee has been adequately trained, Compliance Safety and Health Officers (CSHOs) need to examine the employee's responsibilities under the energy control program in relation to the elements of the LOTO standard.

NOTE: The American National Standard on the *Control of Hazardous Energy - Lockout/Tagout And Alternative Methods* (ANSI/ASSE Z244.1-2003; *Communication and training,* Section 5.5) utilizes an approach that, in part, directs users (employers) to inform all personnel regarding the provisions of the energy control program to an *appropriate level* and to apprise appropriate authorized individuals of aspects of the program. Very importantly, this consensus standard emphasizes that the *user should avoid exclusive use of generic training programs to ensure that authorized individuals adequately understand the user's specific program* and that a structured program should be used to make training *understandable to all authorized individuals regardless of their education, primary language, or disabilities*.

The section on *Communication and training*, however, differs from the specific training requirements contained in the OR-OSHA LOTO standard and utilizes a more general approach to the subject. Some of the 1910.147(c)(7) issues that are not explicitly addressed in the consensus standard include the requirement to:

1. Train each employee in the elements of each energy control procedures relevant to his job duties and responsibilities (whereas Section 5.5.2 permits employers to train personnel on a sample of machine specific procedures);

2. Train employees in the pertinent requirements of the LOTO standard;

3. Train *affected employees* and other employees for the subject matter contained respectively in 1910.147 (c)(7)(i)(B) and (c)(7)(i)(C);

4. Provide additional employee training requirements on the limitations of tags, as required by 1910.147(c)(7)(ii), when employees utilize tagout systems; and

5. Provide retraining to re-establish employee proficiency pursuant to the 1910.147(c)(7)(iii)(C) requirements.

Training, according to the LOTO requirements, must be commensurate with each employee's job responsibilities such that employees have the understanding, knowledge, and skills required to safely apply the applicable provisions of the energy control procedure(s). The ANSI Z244.1-2003 consensus standard does not affect the employer's obligation to meet all of the requirements contained in 1910.147(c)(7) and (d)(1).

XVII. Periodic Inspection. Due to the significant risks associated with inadequate energy control procedures and the failure to properly implement effective energy control procedures, section 1910.147(c)(6)(i) requires that periodic inspections be performed at least annually (based on twelve-month intervals) to verify that the procedures are adequate and being properly applied. OR-OSHA believes that these periodic inspections will, in part, ensure that the employees involved are familiar with their responsibilities and that employees maintain proficiency in the energy control procedures that they implement.

NOTE: Energy control procedures used less frequently than once a year (based on a twelve-month interval) need be inspected only when used.

These periodic inspections must contain at least two components: 1) an inspection of each energy control procedure, and 2) a review of each employee's responsibilities under the energy control procedure being inspected. Each energy control procedure required by 1910.147(c)(4) must be separately inspected to ensure that the energy control procedure is adequate and is being properly implemented by the authorized employee in accordance with the LOTO standard.

NOTE: Energy control procedures that are not required to be documented, per the 1910.147(c)(4)(i) documentation exception, still need to be inspected and reviewed to ensure that they are adequate and being properly utilized.

At a minimum, these inspections must include a demonstration of the procedures and must be performed while the authorized employees perform servicing and/or maintenance activities on machines or equipment. The inspections may be accomplished through random audits, plant safety tours, or planned visual observations. The inspector, who must be an authorized employee other than the one(s) utilizing the energy control procedure being inspected, must observe the implementation of the energy control procedure for the servicing and/or maintenance activities being evaluated and talk with employees implementing the procedure to determine that all the requirements of the LOTO standard are understood and being followed by employees.

NOTE: The authorized employee performing the inspection may be someone who previously has or currently implements the energy control procedure being inspected, as long as he is not implementing any part of the energy control procedure while it is being inspected. In the event a small business cannot meet this requirement, contained in 1910.147(c)(6)(i)(A), CSHOs shall evaluate the situation, on a case-by-case basis, in accordance with the impossibility affirmative defense. See Chapter 2, Section VI.B for additional guidance.

Specifically, the inspector must be able to determine whether: 1) the steps in the energy control procedure are being followed; 2) the employees involved know their responsibilities under the procedure; and 3) the procedure is adequate to provide the necessary protection, and, if inadequate, what modifications are needed.

Although not required by the standard, some employers develop, document, and utilize separate energy control procedures for individual machines or pieces of equipment when the standard would permit a single procedure to apply to the group of machines and equipment. An employer who exceeds the minimum requirements of the standard and develops distinct energy control procedures for individual pieces of machinery is not subjected to more extensive inspection and review obligations than an employer who groups a set of same or similar machines and develops a single, compliant energy control procedure for the set of machines. A grouping of individual procedures, meeting the criteria contained in this section, would be considered one procedure for periodic inspection purposes.

An employer may group distinct procedures associated with similar machines or equipment and consider the group of distinct procedures to be a single procedure for purposes of conducting a periodic inspection, if the machines or equipment in the group have the same or similar types of control measures. Refer to Section IX of this chapter for additional information on energy control procedures, including the performance criteria for procedure grouping.

Grouping energy control procedures for same or similar machines or equipment for inspection purposes may streamline the inspection and review process, since there will be a smaller number of procedure groups than individual procedures. Thus, an employer may elect to group procedures as described above, and then inspect a representative number of such employees implementing one procedure within each group. This approach is acceptable as long as the inspection sampling reasonably reflects plant servicing and/or maintenance operations and hazardous energy control practices for the procedures being inspected.

If procedures are grouped for inspection purposes, the employer should consider selecting different individual procedures (from the group of same or similar procedures) each year for evaluation so that, over time, each individual procedure is eventually inspected as part of an inspection program. However, within a group of procedures, an employer may be justified in focusing more regularly on a subset of procedures that are more likely to be deficient or incorrectly implemented by employees, if institutional experience (e.g., accident rates associated with certain machinery) or other factors (e.g., the unusually large number of employees required to accomplish the servicing activity) support such a strategy. Regardless of the approach, these representative procedure inspections must reasonably reflect plant servicing and/or maintenance operations and practices.

NOTE: If the employer chooses to group and inspect energy control procedures for inspection purposes, the inspector must be an authorized employee who is not implementing the procedure that is being inspected. If the representative sampling reveals an energy control procedural problem associated with one of the procedures that have been grouped for inspection purposes, the employer must resolve the deviation or inadequacy with respect to each of the procedures associated with the group of machines or equipment.

On the other hand, some companies develop an elaborate generic energy control procedure and supplement the generic procedure with checklists or appendices to address various, distinct machinery and equipment in their facilities. This type of procedure, as well as those described above, may be considered a single energy control procedure (instead of multiple procedures) for inspection purposes, if all of the criteria contained in this chapter on grouping same or similar

machines/equipment are met. However, if checklists or appendices address machinery/equipment that do not all use the same or similar types of control measures, the employer is required to divide machinery and equipment referenced in the checklists or appendices into groups, such that the machines/equipment in any group have the same or similar types of control measures. Once this is accomplished, an employer may inspect and review the generic energy control procedure in conjunction with each distinct group of machines/equipment referenced in the relevant checklists or appendices.

A review of each employee's responsibilities under the procedure, in accordance with 1910.147(c)(6)(i)(C) and (D), is the second periodic inspection component. When lockout is used, the employer's inspection must include a review of the responsibilities of each authorized employee implementing the procedure with that employee. When tagout is used, the employer must conduct this review with each affected and authorized employee.

However, in order to meet the review requirement, the inspector does not have to observe every authorized employee implementing the energy control procedure on the machine or equipment on which he is authorized to do servicing and/or maintenance. Rather, the inspector performing the inspection may observe and talk with a representative number of such employees implementing the procedure in order to obtain a reasonable reflection of the servicing or maintenance work practices being evaluated. In addition, to supplement this representative inspection sampling approach, additional supplemental reviews, as discussed in this section, must still be performed with all of the authorized employees who are reasonably expected to implement the procedure during the year. Group meetings may be the most effective way to meet the review requirements and to reestablish employee procedure responsibilities and proficiency.

With regard to the authorized employees (e.g., general plant maintenance personnel) who perform a multitude of servicing and/or maintenance tasks throughout an entire facility, it may not be practical for an employer to identify each of the procedures that these employees will implement during the year. However, before performing servicing or maintenance on a machine or piece of equipment, each authorized employee must have reviewed the inspection results from that machine or piece of equipment (or similar machine/piece of equipment, if machines/pieces of equipment have been grouped for inspection purposes). Among the acceptable methods for communicating inspection results to employees who were not identified previously would be to include the inspection review as part of an annual safety contact (if the review occurs prior to the employee's implementation of the procedure at issue) or in a pre-shutdown briefing (e.g., as part of the *Preparation for shutdown* requirements contained in 1910.147(d)(1)). Employee retraining, if required by 1910.147(c)(7)(iii), for infrequently used energy control procedures must be performed prior to the start of the infrequent servicing/maintenance task.

Obviously, the content and detail of this review will be determined by the results of the inspection's representative sampling. For example, if the result of a representative procedure sampling determines that no deficiencies exist, then this review may involve positive re-enforcement communications through individual or group meeting(s) regarding the employees' procedural responsibilities.

NOTE: Employee retraining is not required when inspections do not reveal any deficiencies.

A more comprehensive review between the inspector and each authorized employee is necessary if it is discovered that there are deviations from the energy control procedure being implemented or inadequacies in employee knowledge regarding the energy control procedure or its application. Corrective actions (e.g., enforcement of existing procedures) need to be instituted and retraining must be performed whenever any inspection reveals inadequacies in the employee's knowledge of, or use of, the energy control procedure. See 1910.147(c)(6)(i)(B) and 1910.147(c)(7)(iii)(B).

If the inspection reveals energy control procedure inadequacies, then a more detailed review with all employees must be performed to address new/modified employee responsibilities whenever there is a change in an energy control procedure. A modification in the procedure necessitates additional employee retraining [in accordance with paragraph (c)(7)(iii)] and certification [in accordance with 1910.147(c)(7)(iv)] to re-establish employee proficiency for all affected and authorized employees affected by the change in the procedure. (Refer to Section XVI of this Chapter for policy on employee training.)

Additionally, employers must certify, in accordance with 1910.147(c)(6)(ii), that the prescribed periodic inspections have been performed. The certification must specify: 1) the machine or equipment on which the energy control procedure was used; 2) the date of the inspection; 3) the names of the employee(s) included in the inspection; and 4) the name(s) of the person(s) who performed the inspection. The inspection records provide CSHOs with a means to determine employer compliance with the standard. Most importantly, the inspection process provides employers with the assurance that employees can safely service, maintain, and repair machines and equipment.

At one particular establishment, a work permit system (that identified the machine/equipment being serviced/maintained and the authorized employees' names) had been developed with a section on the permit for an inspector to certify performance of all of the elements outlined in 1910.147(c)(6) of the standard. The inspector signed and dated the permit after the inspection was completed, thereby certifying, in accordance with the standard, that the periodic inspection had taken place. This method would meet the performance-oriented requirements for the inspection component of periodic inspections, if the inspector was able to determine whether: 1) the steps in the procedure are being followed; 2) the employees involved know their responsibilities under the procedure; and 3) the procedure is adequate to provide the necessary protection, and, if inadequate, what modifications are needed. This work permit inspection technique may be especially useful where employees perform certain LOTO tasks infrequently.

NOTE: The American National Standard on the Control of Hazardous Energy - Lockout/Tagout And Alternative Methods (ANSI/ASSE Z244.1-2003; Section 5.6) contains *Program review provisions* that do not mandate all of the minimum requirements (e.g., additional *affected employee* review requirements, pursuant to 1910.147(c)(6)(i)(D), when tagout is used for energy control) that are prescribed in 1910.147(c)(6) of the LOTO standard. The ANSI Z244.1-2003 consensus standard does not affect the employer's obligation to meet all of the requirements contained in the LOTO and related hazardous energy control standards.

CHAPTER 4 -- GROUP LOCKOUT/TAGOUT

This chapter provides enforcement guidelines, policy and various group LOTO procedure examples to assist Compliance Safety and Health Officers (CSHOs) in their evaluation of hazardous energy control procedures.

I. **Definitions.** Group LOTO terms are defined in Chapter 1, Section V of this document.

II. **Background.** Group LOTO procedures described in this standard and instruction require each authorized employee to be in control of potentially hazardous energy hazards while performing servicing/maintenance work. A significant rulemaking issue involved group energy control procedures' level of protection and the degree of individual employee control over hazardous energy sources. The proposed rule for group lockout initially specified that an authorized employee would have a primary lock, to be affixed when the equipment is de-energized, and removed when the job is completed. It did not provide for the use of individual lockout or tagout devices by the individual employees in the group. Based on a re-examination of the issue, the final rule required an additional element that was deemed essential for the safety of employees: *Each employee in the group needs to be able to affix her personal lockout or tagout device as part of the group lockout* [LOTO procedure].

OR-OSHA determined that this additional protection, contained in paragraph 1910.147(f)(3)(ii)(D) of the final rule, was necessary for the following reasons:

A. The placement of a personal LOTO device would provide that employee with direct control over her own protection (until the device is removed), rather than having to rely completely on other people;

B. The use of a personal device will reinforce the right of the servicing and maintenance employee to verify that the equipment or machinery has been properly de-energized and isolated in accordance with the energy control procedure; and

C. The presence of the individual employee's lockout or tagout device on an energy isolating device will inform all other persons, including the other authorized employees and supervisors, that the employee is still working on the equipment or machine and that it is not safe to re-energize the system.

III. **Group Lockout/Tagout: Organizational Structure.** Under paragraph 1910.147(f)(3)(i), employers are required to use a procedure that affords the employees a level of protection equivalent to that provided by the implementation of a personal lockout or tagout device when a crew, craft, department, or other group lockout or tagout device is used. The other elements for group LOTO, contained in paragraph 1910.147(f)(3)(ii), address personal lockout or tagout devices, workforce coordination and overall managerial procedure responsibilities.

Although there are various ways to establish a compliant group energy control program, a group energy control procedure might have the following basic organizational structure.

A. Primary Authorized Employee Designation. A primary authorized employee would be designated. This employee would exercise primary responsibility for implementation and coordination of the overall LOTO of hazardous energy sources for the equipment to be serviced. [1910.147(f)(3)(ii)(C).]

B. Primary Authorized Employee Coordination. A primary authorized employee would coordinate authorized employee changes and affected workforces (multiple work crews) with equipment operators before and after completion of servicing and maintenance operations that require LOTO. He also has the responsibility to ensure continuity of protection with respect to multi-shift energy isolation (e.g., through the use of group continuity devices, such as "Job Lock" or "Operations Lock" procedures). [1910.147(f)(3)(ii)(C).]

C. Principal Authorized Employee Designation. Principal authorized employee(s) would be designated for each workforce or crew. When more than one crew, craft, department, etc., is involved, one principal authorized employee would account for a single group of servicing/maintenance personnel. Each principal employee is responsible (to the primary authorized employee) for maintaining accountability and for the individual exposure status of each employee in that specific group in conformance with the company procedure. [1910.147(f)(3)(ii)(A) and (B).]

D. Verification System. A verification system is implemented to ensure the continued isolation and de-energization of hazardous energy sources during the course of maintenance and servicing operations. Once the equipment is shut down and the hazardous energy has been controlled, maintenance/servicing personnel, sometimes in conjunction with operations personnel, must test the machinery or equipment to verify that the isolation of the equipment's energy source(s) is effective. The employees may walk through the affected work area to verify isolation. If there is a potential for the release or re-accumulation of hazardous energy, verification of isolation must be continued.

OR-OSHA has accepted an alternative to the individual employee verification requirement where complex LOTO operations involve many employees and numerous energy isolating devices. In such situations, the employer may designate a primary authorized employee, with the primary responsibility for a set number of employees working under the group LOTO device(s). The primary authorized employee must implement and coordinate the LOTO of hazardous energy sources and verify that the steps taken, in accordance with the specific energy control procedure, have in fact isolated the machine or equipment effectively from the hazardous energy sources. This must be accomplished before individual authorized employees participating in the group LOTO affix their personal lockout or tagout device to the group LOTO box and before they perform servicing/maintenance activities.

When a primary authorized employee verifies isolation, all of the authorized employees participating in the group LOTO must be informed of their right also to verify the effectiveness of the lockout measures and must be allowed to personally verify that hazardous energy sources have been effectively isolated, if they so choose. An authorized employee who opts to verify the effectiveness of the isolation measures must perform this verification after affixing his personal lockout or tagout device to the lock box and before performing servicing/maintenance activities.

E. Authorized Employees. Each authorized employee must affix a personal LOTO device to the group lockout device, group lock-box or comparable mechanism and remove that device when she is finished with the servicing or maintenance activity [1910.147(f)(3)(ii)(D)]. No person may attach or remove another person's LOTO device, including signing on or signing off for another person, unless the provisions of the exception to 1910.147(e)(3) are met.

For example, the authorized employee in charge of a crew ("Principal Authorized Employee") does not remove the group lockout or tagout mechanism from the energy isolating devices until each employee in the group has removed her personal device. Individual employee device removal indicates that employees are no longer exposed to the hazards from the servicing or maintenance operation. Most importantly, these group LOTO devices (personal lockout or tagout devices; group LOTO mechanisms) ensure that the equipment LOTO devices are maintained on energy isolating devices throughout the "life of the job."

IV. **Group Lockout/Tagout Overview.** Group LOTO is required when more than one employee is engaged in the performance of servicing and/or maintenance activities. Group energy control procedures may need to be tailored to the specific industrial operation, but regardless of the situation, each employee performing servicing or maintenance activities must be in control of the associated hazardous energy throughout the entire period of her exposure. Absent compliance with the 1910.147(e)(3) exception, no employee may affix (or remove) the personal LOTO device of another employee.

The following energy control procedure overview addresses the employer's group LOTO requirements, and is intended to supplement other policy contained in this manual:

A. Shutdown Preparation. Before the machine or equipment is turned off or shut down, each authorized employee (who is to be involved during the servicing/maintenance operation) must have knowledge of the type and magnitude of the hazards related to the energy to be controlled and of the means to control the energy. [1910.147(d)(1).] In the event that the machine or equipment was shut down on a previous shift, the authorized employee must be made aware of these elements before beginning his work.

B. Shutdown. An orderly shutdown of the machine or equipment must be conducted that conforms to the appropriate documented company procedure for the machine or equipment. The shutdown must be implemented in a manner that ensures that no new or increased hazards are created by the shutdown. [1910.147(d)(2).]

C. Affected Employee Notification. The employer or an authorized employee must notify affected employees prior to applying LOTO devices. Such notification ensures that employees do not attempt to reactivate a machine or piece of equipment that has been taken out of service. [1910.147(c)(9).]

D. Isolation. All energy isolating devices needed to control the hazardous energy to the machine or equipment must be physically located and operated so that they isolate the machine or equipment from the source(s) of energy. [1910.147(d)(3).]

E. Application of Lockout/Tagout Devices. Each authorized employee(s) must personally affix a lockout or tagout device to each energy isolating device (or the group LOTO mechanism associated with the energy isolating devices) and no employee may affix a personal LOTO device for another employee. [1910.147(d)(4)(i).] During all group LOTO operations where the release of hazardous energy is possible, each authorized employee performing servicing or maintenance shall be protected by his personal lockout or tagout device and by the company procedure.

NOTE: Paragraph 1910.147 (f)(3)(ii)(D) requires each employee in a group to affix his personal LOTO device as part of the group LOTO. Verbal accountability methods do not afford protection equivalent to that provided by the implementation of a personal LOTO device. The Occupational Safety and Health Commission (OSHRC) affirmed a citation on this matter by stating that this requirement clearly and explicitly mandates the use of a personal lockout or tagout device in a tagging situation because the core concept of LOTO is *personal* protection. See *Exelon Generating Corp., LaSalle County Station*, OSHRC (Docket No. 00-1198, 2005).

1. The guidance contained in this chapter illustrates various types of compliant group energy control procedures. For example, a single lock on each energy isolating device, together with the use of a lockbox for retention of the locks' keys, would permit authorized employees personal control of the hazardous energy source(s), if each authorized employee personally locked the lock-box. See the Type B group lockout illustration for further details on this technique. [1910.147(f)(3)(i).]

2. Locks shall be affixed in a manner that will hold the energy isolating device in a safe (off) position. [1910.147(d)(4)(ii).]

3. Tagout devices, where used, shall be affixed at the same location as would a lock if such fittings are provided, or shall be affixed in a manner that will clearly indicate that movement of the isolating device is prohibited. [1910.147(d)(4)(iii).]

F. Stored Energy. Following the application of locks or tags, all potentially hazardous stored energy or residual energy shall be relieved, disconnected, restrained, and otherwise rendered safe. [1910.147(d)(5)(i).]

If there is a possibility of re-accumulation of stored energy, verification of energy isolation must be continued until the servicing or maintenance work is completed or the hazard no longer exists. [1910.147(d)(5)(ii).]

Monitoring may be accomplished, for example, by visual observation and/or with the aid of a monitoring device (test instrument) that will sound an alarm if a hazardous energy level is being approached. The standard requires the employer to continue to verify isolation when energy leaks may reach dangerous levels. This may involve means such as continuous monitoring for the displacement of oxygen or the buildup of flammable gases or vapors to concentrations approaching and exceeding the lower explosive level of a substance.

G. Verification of Isolation. Depending upon the measures necessary to detect the presence of hazardous energy, the verification of isolation may involve the use of a test instrument (e.g., combustible gas indicator), a visual inspection, and/or a deliberate attempt to start-up machines or equipment. Authorized employees must take whatever means are necessary to test the machine or equipment to reliably verify that isolation and de-energization have been effectively accomplished before starting servicing/maintenance work on machines or equipment that has been locked or tagged out. [1910.147(d)(6).] Energy control procedures must include these specific requirements for the testing of machine(s) or equipment to determine the effectiveness of LOTO devices and other control measures. [1910.147(c)(4)(ii)(D).]

Verification must be performed by each authorized employee before starting work following a shift change unless the employer elects to incorporate the primary authorized employee verification system alternative described in Chapter 3, Section XV and in Section III.D of this chapter. Specific procedures that will ensure the continuity of the LOTO protections during shift or personnel changes are required by paragraph (f)(4) of the standard. Paragraph (f)(4) also requires specific procedures on the transfer of LOTO device protection between off-going employees and on-coming employees.

NOTE: In multi-shift group LOTO servicing/maintenance operations, individual on-coming employees must be provided an opportunity to verify that the equipment or machine has been de-energized. The oncoming employees may not depend upon the actions of another employee or supervisor from an earlier shift for assurance that the job is safe to work.

H. Servicing/Maintenance. Servicing or maintenance work is performed on the locked out or tagged out machine or equipment.

I. Release from Lockout/Tagout. Release from LOTO shall be accomplished in compliance with the requirements at 1910.147(e).

1. Inspection. The machine or equipment area shall be inspected to ensure that it is cleared of nonessential items, which could result in employee injuries, and to ensure the machine or equipment components are operationally intact (e.g., to check that safeguards are properly applied and functioning). [1910.147(e)(1).]

2. Employee Removal of Lockout/Tagout Device. Each authorized employee must remove their respective lockout or tagout device from the energy isolating devices or from the group lock-box(es) following the procedure established by the company. [1910.147(e)(3).]

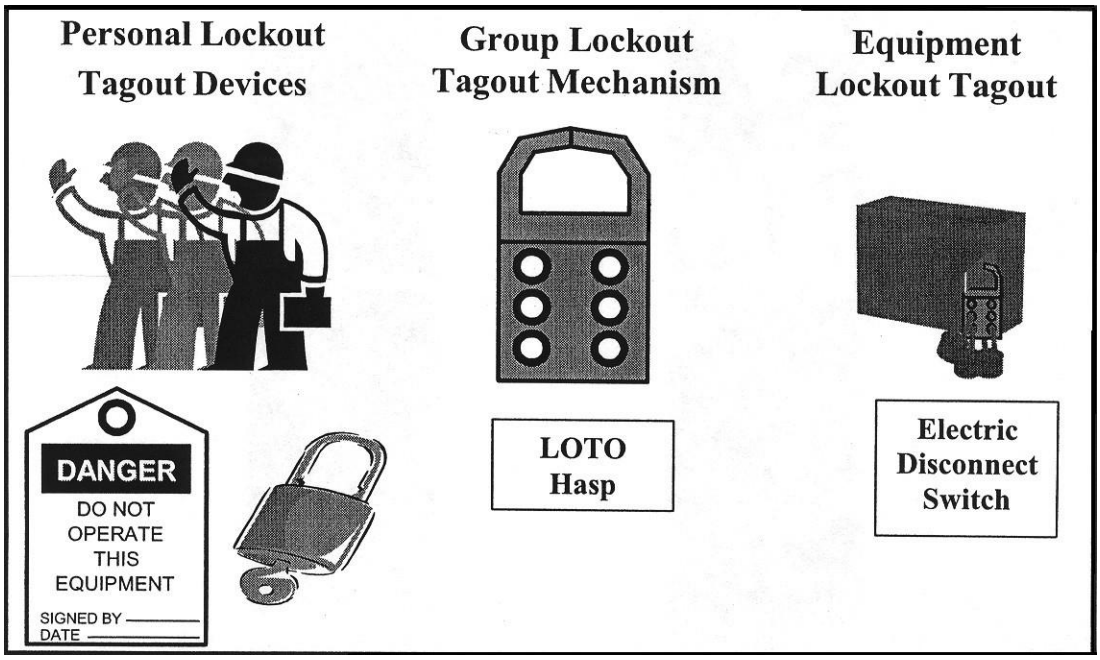
3. Employee Positioning. Before re-energization, all employees in the machine or equipment area shall be safely positioned or moved from the area. [1910.147(e)(2).]

4. Affected Employee Notification. After the LOTO devices have been removed, affected employees must be notified by the employer or an authorized employee that the control devices have been removed. This notification must be given prior to the starting of a machine or piece of equipment. This communication alerts employees that the machine(s) or equipment is capable of being started up. [1910.147(c)(9) and (e)(2)(ii).]

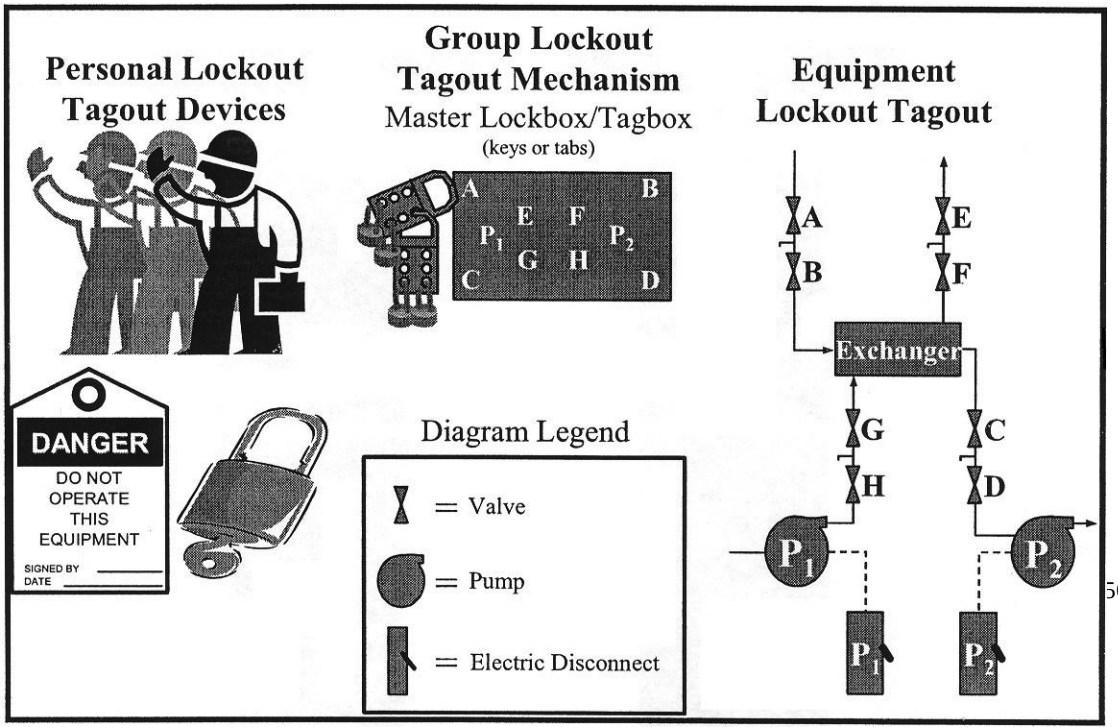
J. Re-energization. Energy may be restored to the machine or equipment.

V. Conventional Group Lockout/Tagout Procedures. Conventional group LOTO procedures require the affixing of individual LOTO devices by each authorized employee to a group LOTO mechanism as discussed in this instruction. The following types of procedures and illustrative examples address circumstances ranging from a small group of servicing/maintenance personnel during a one-shift operation to a comprehensive operation involving many employees over a longer period. These examples are not intended to represent the only acceptable procedures for conducting group operations; instead, they illustrate several feasible alternatives for having authorized employees affix personal LOTO devices in a group LOTO setting.

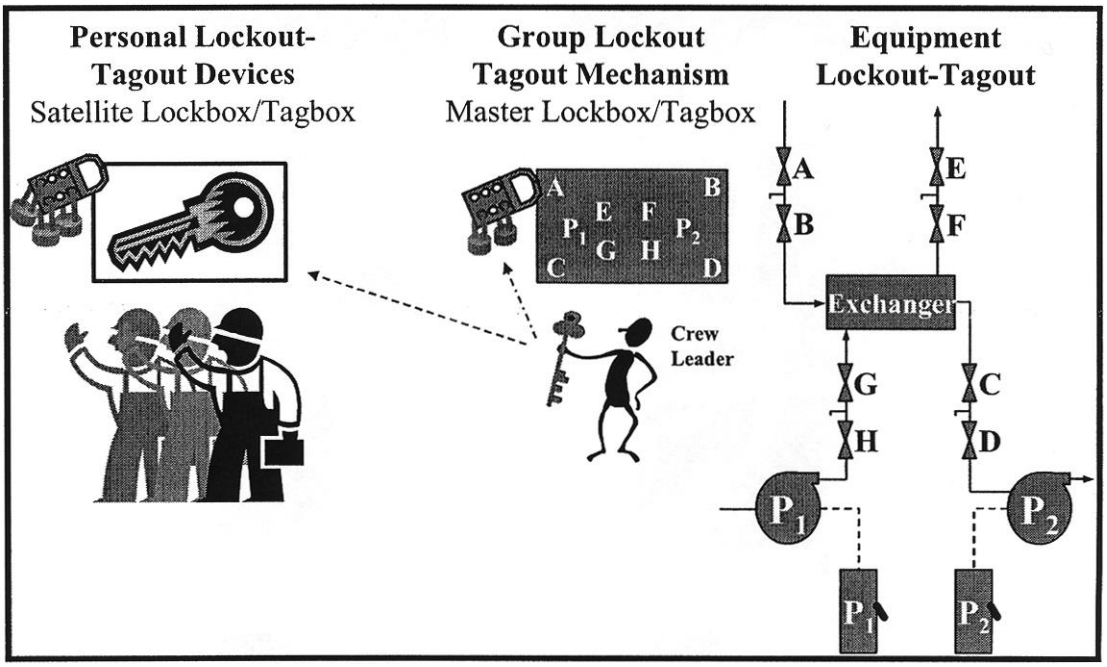
Basic Group LOTO – Type A. Each authorized employee places his personal lock or tagout device on each energy isolating device and removes it upon completion of the assignment. Each authorized employee verifies or observes the de-energization of the equipment.



Master Lockbox/Tagbox – Type B. Under a lock-box procedure, a lock or job-tag with tab is placed on each energy isolation device after de-energization. The key(s) and/or removed tab(s) are then placed into a lock-box. Each authorized employee assigned to the job then affixes his/her personal lock or tag to the lock-box. As a member of a group, each assigned authorized employee verifies that all hazardous energy has been rendered safe. The LOTO devices cannot be removed or the energy isolating device turned on until each individual employee removes their personal lock or tag from the lockbox. Then each appropriate key or tab is matched to its lock or tag, and the machinery/equipment can be re-energized



Satellite Lockbox/Tagbox –Type C. After each energy isolating device is locked/tagged out and the keys/tabs placed into a master lockbox, each servicing/maintenance group principal authorized employee places his personal lock or tag on the master lockbox. Then each principal authorized employee (Crew Leader) inserts his key into a satellite lockbox to which each authorized employee in that specific group affixes his personal lock or tag. Each authorized employee verifies that all hazardous energy has been rendered safe. Only after the servicing/maintenance functions of the specific subgroup have been concluded and the personal locks or tags of the respective employees within the group have been removed from the satellite lock-box can the principal authorized employee remove his key from the satellite box and remove his lock from the master lock-box.



Job Lock – Type D. During operations to be conducted over more than one shift (or even many days or weeks), a system incorporating a job lock might be used in order to ensure continuation of LOTO protection for employees during shift or personnel changes. First, a primary authorized employee secures the master lock-box/tag-box with a job-lock after all the keys/tag stubs (from the LOTO devices that were affixed to the equipment) are inside the lock-box/tag-box. This step is completed before subsequent locks are applied to the group LOTO mechanism by the various types of authorized employees as described in the above (Type A, B and C) procedures.

NOTE: A job-lock may have multiple keys if they are in the sole possession of the various primary authorized employees (one on each shift). Refer to Chapter 3, Section XV for additional information on LOTO continuity devices.

Thereafter, each authorized employee, through the established group LOTO procedures, affixes their personal lock/tag to a master or satellite (via a principal authorized employee) lock-box/tag-box system. After individual LOTO devices are affixed, each authorized employee then verifies that all hazardous energy has been rendered safe or the primary authorized employee (if designated to do so by the employer's energy control procedure) may verify isolation on behalf of

a group of authorized employees, as described in this chapter. In this manner, the continuity of LOTO protection for authorized employees is maintained during shift and during personnel changes while the procedure also provides the primary authorized employee flexibility and control over the equipment at any appropriate time or shift.

VI. **Alternative Group Lockout/Tagout (Control and Accountability) Procedures.** Under most circumstances, where servicing or maintenance is to be conducted during only one shift by a small number of persons, the installation of each individual's LOTO device would not be a burdensome procedure. When complex equipment is being serviced or maintained, when there are many sources of energy, and/or when servicing/maintenance work extends over more than one work shift, OR-OSHA permits employers to utilize an alternative procedure to each employee locking or tagging out each energy isolating device. However, consideration must be given to the procedure's organizational structure, as previously described, in order to ensure the safety and control of each of the employees involved. For example, in the servicing and maintenance of sophisticated and complex equipment, such as process equipment in petroleum refining, petroleum production, and chemical production, there may be a need for the adaptation and modification of normal group energy control procedures in order to ensure the safety of employees.

To permit implementation of a pragmatic system, while accommodating the special constraints of the standard's requirement for ensuring employees a level of protection equivalent to that provided by the use of a personal lockout or tagout device, an alternative procedure may be implemented. Lockout/tagout, blanking, blocking, etc. is often supplemented in these situations by the use of work authorization permits and a system (e.g., master tagging systems) of continuous employee accountability. For example, master tagging systems and work authorization permits are sometimes used to supplement hazardous energy control measures (e.g., locks, tags, blanking, blocking) through a system that provides for individual employee control and continuous employee accountability.

In evaluating whether the equipment being serviced or maintained is so complex as to necessitate a departure from the conventional group lockout/tagout procedures, the following factors (often occurring simultaneously) are among those which must be evaluated:

A. Physical size and extent of the equipment being serviced/maintained;

B. Relative inaccessibility of the energy isolating devices;

C. Number of employees performing the servicing/maintenance;

D. Number of energy isolating devices to be locked/tagged out; and

E. Interdependence and interrelationship of the components in the system or between different systems.

Once the equipment is shut down and the hazardous energy has been controlled, maintenance/servicing personnel, together with operations personnel, must test the machinery or equipment to verify that the isolation of the equipment's energy source(s) is effective. The employees may walk through the affected work area to verify isolation. If there is a potential for the release or re-accumulation of hazardous energy, verification of isolation must be continued. The servicing/maintenance employees may further verify the effectiveness of the isolation by the

procedures that are used in doing the work (e.g., using a bleeder valve to verify depressurization, use of combustible gas test instruments to check for the presence of flammable vapor/gases; flange-breaking techniques, etc.). Throughout the maintenance and/or servicing activity, operations personnel normally maintain control of the equipment.

The following procedures are presented as examples to illustrate the implementation of a group energy control procedure involving many energy isolating devices and/or many servicing/maintenance personnel. Specific issues related to the control of hazardous energy in complex process equipment are described below. This discussion is intended only as an example and is not anticipated to reflect operations at any specific facility.

A. Complex process equipment, which is scheduled for servicing/maintenance operations, is generally identified by plant supervision. Plant supervision would issue specific work orders regarding the operations to be performed.

B. In many instances where complex process equipment is to be serviced or maintained, the process equipment operators conduct the shutdown procedure. This is generally due to their in-depth knowledge of the equipment and the need to conduct the shut-down procedure in a safe, cost-effective and orderly sequence.

C. The operations personnel normally prepare the equipment for LOTO as they proceed with the shutdown and identify the locations for blanks, blocks, etc., by placing "operations locks and/or tags" (Job Locks) on the equipment. The operations personnel can be expected to isolate the hazardous energy, and drain and flush fluids from the process equipment following a standard procedure or a specific work permit procedure.

D. An employer representative or an authorized employee notifies affected employees prior to applying LOTO devices.

E. Upon completion of shutdown, the operations personnel would review the intended job with the servicing and maintenance crew(s) and would ensure their full comprehension of the energy controls necessary to conduct the servicing or maintenance safely. During or immediately after the review of the job, the servicing and maintenance crew(s) would install locks, tags and/or special isolating devices at previously identified equipment locations following the specified work permit procedure.

F. Line openings necessary for the isolation of the equipment would normally be permitted only by special work permits issued by operations personnel. (Such line openings should be monitored by operations personnel as an added safety measure.)

G. All of the previous steps must be documented by a master system of accountability and should be retained at the primary equipment control station for the duration of the job. The master system of accountability may manifest itself as a Master Tag, which is subsequently signed by all of the maintenance/servicing employees protected by the master tag if they fully comprehend the details of the job and the energy isolation devices actuated or put in place. Signing by the respective employees further establishes that energy isolation training relative to this operation has been conducted.

H. After the system has been rendered safe, the authorized employees verify the effectiveness of energy controls in controlling hazardous energy.

NOTE: OR-OSHA has recognized the need for an alternative to the verification requirement where complex LOTO operations involve many employees and numerous energy isolating devices. In such situations, the employer may designate a primary authorized employee (PAE), with the responsibility for a set number of employees working under the group LOTO device(s). The primary authorized employee must implement and coordinate the LOTO of hazardous energy sources and verify that the steps taken, in accordance with the specific energy control procedure, have in fact isolated the machine or equipment effectively from the hazardous energy sources.

In addition to the primary authorized employee, each authorized employee participating in the group LOTO must be informed of his right to verify the effectiveness of the lockout measures, and each authorized employee must be allowed to personally verify, if he so chooses, that hazardous energy sources have been effectively isolated. An authorized employee who opts to verify the effectiveness of the isolation measures must perform this verification simultaneously with or after the PAE verifies the accomplishment of energy isolation and after the authorized employee affixes her personal lockout or tagout device to the group LOTO mechanism. These steps must be taken before authorized employees perform servicing/maintenance activities.

I. Specific work functions are controlled by work permits, which are issued for each shift. Each day each authorized employee assigned must sign in on the work permit at the time of arrival to the job and sign out at departure. Signature, date, and time for sign-in and sign-out would be recorded, reviewed and retained by the applicable crew supervisor who, upon completion of the permit requirements, would return the permit to the operations supervisor. Work permits could extend beyond a single shift and may consequently be the responsibility of several supervisors.

J. Upon completion of the tasks required by the work permit, the authorized employees' names could be signed off the Master Tag by their supervisor once all employees have signed off the work permit. The work permit is then attached to the Master Tag so that the accountability of exposed employees is maintained.

K. As the work is completed by the various crews, the work permits and the accountability of personnel are reconciled jointly by the primary authorized employee and the operations supervisor.

L. During the progress of the work, inspection audits are conducted.

M. Upon completion of all work, the equipment is returned to the operations personnel after the maintenance and servicing crews have removed their LOTO devices, including all completed work permits, and/or special isolating devices following the company procedure.

N. At this time, all authorized employees who were assigned to the tasks are again accounted for and verified to be clear from the equipment area.

O. After the completion of the servicing/ maintenance work, operations personnel remove the LOTO devices originally placed to accomplish energy isolation.

P. After the LOTO devices have been removed, notify affected employees that the control devices have been removed. [This notification must be given prior to the starting of a machine or piece of equipment to alert affected employees that the equipment is capable of being started up.]

Q Operations personnel then begin inspection and testing of the equipment prior to its being returned to production service.

In summary, the use of the work permit and/or master tag system, combined with the verification of hazardous energy control, work procedures, and walk-through, is an acceptable approach to compliance with the group LOTO and shift transfer provisions, as long as the control and accountability procedure provides a level of protection equivalent to each individual authorized employee affixing her lockout device to the energy isolating device. Work authorization permits, when used, must be included as a component of the company's energy control procedure and would additionally require that the company procedure clearly contain, in conjunction with other energy control procedures, the specific requirements detailed in paragraph 1910.147(c)(4) of the standard.

NOTE: A work authorization permit system fulfilling the *Personal Tagout (Accountability) Device* definitional requirements is considered a *Tagout Device* and, as such, all of the tagout provisions of the standard must be met if this system is used. This includes additional employee training and additional periodic inspection requirements.

Furthermore, as the preceding example procedure illustrates, each employee must sign on/off the permit, and the crew leader (*Principal Authorized Employee*) must present this permit documentation to the person responsible for coordinating group LOTO activities (*Primary Authorized Employee*). The crew leader signs off the master tag only after all crew members are accounted for and after all of the crew member signatures (i.e., sign offs) are obtained on the work permit. To ensure a system of continuous employee accountability, the crew leader gives the completed master tag (with signed permit) to the primary authorized employee who is responsible for the overall group LOTO procedure coordination.

This work permit example is an extension of and meets the *Master Tag* definition because the crew leader utilizes the work permit as a satellite control and accountability mechanism. This is similar to the previously described master and satellite lock-box (Type C) example; except that it employs a system of administrative control and continuous employee accountability through a master tag and work permit system instead of personal LOTO devices on satellite- and master-lock boxes.

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