



LOCKOUT/TAGOUT COMPLIANCE GUIDE



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SP #27 (Revised 01/15/20)

TABLE OF CONTENTS

	<u>Page #</u>
1 Introduction	1
2 Employer Responsibility	1
3 Scope and Application of Lockout/Tagout Requirements	2
4 Vertical Standards Disallow Tagout System	3
5 Tasks Covered by the Standard.....	5
6 Employers Not Covered by the Standard.....	5
7 Exceptions to Part 85	6
- Total Exceptions.....	6
- Partial Exceptions	6
- Capability of Accepting Lockout.....	7
8 Lockout/Tagout Program.....	7
- Specific Machine/Equipment Procedure	7
- Employee Training	11
- Periodic Inspection and Review	12
9 Protective Materials and Hardware	13
10 Machine Start-up	13
11 Recordkeeping	15
12 Minor Adjustments and Servicing.....	15
13 Electrical Work	16
14 Special Conditions.....	17
- Testing or Positioning of Equipment/Machines	17
- Exchange of Information with Outside Contractors.....	18
- Group Lockout or Tagout	18
- Shift or Personnel Changes	19

APPENDIX

	<u>Page #</u>
A Control of Hazardous Energy (Lockout/Tagout) Sample Program	20
B Lockout/Tagout Written Program Evaluation	31
C Lockout/Tagout Compliance Guide: An Approach to Establishing Written Lockout Procedures.....	32
D Energy Source Evaluation and Energy Control Procedure	33
D-1 Sample Guideline of Energy Source Evaluation and Energy Control Procedure	35
E Partial Exception Worksheet	37
F Control of Hazardous Energy Sources (Lockout/Tagout): Employee Training Certification	38
G Control of Hazardous Energy Sources (Lockout/Tagout): List of Authorized Lockout Individuals	39
H Control of Hazardous Energy Sources (Lockout/Tagout): Periodic Inspection Certification	40
I Group Lockout Scenarios.....	41

1. Introduction

Locking out machinery and equipment prior to servicing or maintenance is an essential element of protecting employees from the unexpected energization or motion, start-up of the machine or equipment, or release of stored energy. To address this issue and to comply with the Michigan Occupational Safety and Health Act's **General Industry Safety Standard Part 85. The Control of Hazardous Energy Sources Standard**, the CET Division has developed the Lockout/Tagout Compliance Guide. **The Control of Hazardous Energy Sources** standard will be referred to throughout this guide as Part 85.

This guide reviews all required areas of a comprehensive lockout/tagout program. It includes examples and suggestions to consider in developing a program. This manual is presented in general terms in an effort to assist with compliance and complement relative regulations and equipment manufacturers' requirements.

In addition to the provisions of Part 85, MIOSHA also enforces separate rules for working on or near exposed energized or de-energized parts. These rules, which include provisions for lockout of electrical systems, are contained in **General Industry Safety Standard Part 40. Electrical Safety-Related Work Practices**.

2. Employer Responsibility

An employer is responsible for ensuring the safety of its employees and for complying with all related requirements of **Part 85. The Control of Hazardous Energy Sources**. It is important that levels of management promote positive attitudes regarding safety, incorporate safety into their work practices, and cooperate fully in the implementation of safety-related programs.

MIOSHA requires the employer to plan for the control of energy during servicing and/or maintenance of machines and equipment by doing the following:

- Establish an energy control program.
- Develop, document and utilize lockout/tagout procedures.
- Provide employees appropriate training.
- Provide, at no cost to employees, equipment required by the lockout/tagout procedures.
- Continuing competency through training.

Part 85 provides control of hazardous energy when the hazard to the employee is mechanical. Part 40 addresses safe work-practices, including lockout, where the hazard to the employee is electrical. Lockout/tagout procedures can be included in one document.

3. Scope and Application of Lockout/Tagout Requirements

A lockout/tagout program applies to employers that service and/or maintain machines and equipment in which the unexpected energization or motion, start-up, or release of stored energy could cause injury or death to employees. The application of this program will prevent equipment from unexpectedly being set in motion and endangering workers. Potential hazardous energy sources must be identified, isolated, and locked or tagged out before starting a service and /or maintenance task. Typical tasks requiring lockout/tagout procedures include:

- A task requiring an employee to place any part of their body into an area on a machine's point of operation or where an associated danger zone exists during a machine's operating cycle.
- Cleaning, repairing, and maintaining machinery with moving parts.
- Clearing jammed mechanisms.
- Removing or bypassing a guard or other safety device.
- Repairing electrical circuits.

Minimum requirements for the control of hazardous energy are set forth in MIOSHA General Industry Safety Standard **Part 85. The Control of Hazardous Energy Sources**, which was effective May 25, 1993. This standard adopts OSHA 1910.147 by reference and revoked previous lockout provisions in MIOSHA General Industry Safety Standards Part 1. General Provisions.

In addition to MIOSHA General Industry Safety Standards Part 85 and Part 40, a number of other MIOSHA General Industry Safety Standards also contain lockout provisions which must be consulted. These standards which apply to specific processes or industries, called vertical standards, also contain lockout requirements which may be above and beyond Part 85.

When a specific MIOSHA standard contains a lockout requirement, this requirement must be followed as it preempts the tagout option contained in Part 85. In these cases, although a specific standard requirement for lockout is followed, the procedural and training requirements of Part 85 continue to apply as well so that the end result is a complete program for protecting employees from energy hazards.

4. Vertical Standards Disallow Tagout System

Table 1 lists examples of rules from MIOSHA General Industry Safety Standards with specific lockout references requiring locks be used. For these work operations, a tagout system will **not** be acceptable.

Table 1. List of Standards Requiring Use of Locks in Lieu of Tags

Part 14. Conveyors	<p>R 408.11431. Lockout. 1431 (1) An employer shall establish and maintain a lockout procedure which shall safeguard an employee.</p> <p>(2) An electrically powered conveyor shall be equipped with a disconnect switch at the power source which shall be shut off and locked out during any type of repair, service or set up work if a hazard exists.</p>
Part 17. Refuse Packers	<p>R 408.11715 (3) A lockout procedure for a refuse packer unit shall be established and followed whereby the power shall be shut off and the key removed before and during repairs to the packer or compaction mechanism, except during maintenance testing.</p> <p>(4) A power source of a stationary refuse packer unit to be repaired, serviced or set up shall be locked out by each employee while doing such work. Any residual pressure shall be relieved before and during the work.</p>
Part 18. Overhead and Gantry Cranes	<p>R 408.11875 (3)(c) The main switch shall be placed in the off or open position and locked, except where power is necessary to adjust or service the crane.</p>
Part 26. Metalworking	<p>R 408.12618 (1) A power source of any metalworking machine or equipment to be repaired or serviced shall be locked out and, where required, residual pressure relieved by each employee doing such work if unexpected motion would cause injury, except where power is essential for testing and set up.</p>
Part 42. Forging	<p>R 408.14246 (2) A steam hammer shall be provided with a quick access emergency shut off valve identified by name or color in the supply, sometimes called admission, pipe line at a location within reach of the operator. This valve shall be closed and locked in the off position while the hammer is being adjusted, repaired, or serviced, or when the dies are being changed, except where necessary to move the ram.</p>
Part 45. Die Casting	<p>R 408.14525 (1) A power source of a machine or equipment to be repaired or for die repair shall be locked out by each employee doing the work if unexpected motion would cause injury. Residual pressure shall be relieved or isolated before and during the work if unexpected motion would cause injury. The means of isolation shall also be locked out.</p>

Part 52. Sawmills	<p>R 408.15223 (4) A written lockout procedure shall be established by an employer and used by an employee. A power source of any equipment to be repaired, serviced or set up shall be locked out by each employee while doing such work. Any residual pressure shall be relieved prior to and during such work.</p>
Part 57. Oil and Gas Well Drilling and Servicing	<p>R 408.15731 (2) A lockout system shall be established for drilling rig equipment, except on draw works, slush pumps, and rotaries where a tag out system may be used. An employee shall be trained in the use of a lockout system to prevent unexpected energizing of any equipment from any energy source which might inflict injury to personnel. A lock or tag shall not be removed without the approval of the person who installed it or his or her authorized replacement.</p>
Part 62. Plastic Molding	<p>R 408.16227 (2) Each employee doing the work (maintenance) shall lock out the power source of the machine or equipment to be repaired or serviced if unexpected motion would cause injury. Any residual pressure which would be hazardous shall be relieved before and remain relieved during work by an employee doing the work</p>
Part 63. Pulp, Paper, and Paperboard Mills	<p>R 408.16323 (4) A power source of any equipment to be repaired, serviced or set-up shall be locked out by each employee doing the work where unexpected start-up would cause injury except when motion is necessary during set-up or adjustment. Such motion shall be achieved by a manually held constant pressure control device. Residual pressure can be relieved prior to and during such work when the equipment is locked out.</p>
Part 65. Mills and Calendars for Rubber and Plastic	<p>R 408.6527(1) Insure that the power source of a mill, calendar or their auxiliary equipment to be repaired, serviced or set-up is locked out by each employee doing the work if unexpected start-up would cause injury.</p>
Part 72. Automotive Service Operations	<p>R 408.17222 (3) Machinery or equipment shall be equipped with a disconnect switch which shall be locked in the off position, unless the machinery or equipment is equipped with a plug-in cord which shall be disconnected and tagged, when the machinery or equipment is repaired or serviced if unexpected motion would cause injury.</p>

5. *Tasks Covered by the Standard*

Part 85 covers the servicing and maintenance of machines, equipment, and associated activities. The purpose is to protect employees from injury due to unexpected/unintended motion, energization, start-up, or release of stored energy from the machine, equipment, or process. The standard establishes minimum performance requirements for the control of such hazardous energy.

Energy sources include electrical, pneumatic, hydraulic, mechanical, thermal, and chemical. There may also be stored or residual energy that may remain once the primary energy source is shut down. Stored energy may result from steam, air pressure, compression of springs, electrical capacitors, or gravity. For assistance with performing an Energy Source Evaluation, refer to Appendix C, D and D-1.

Normal production operations are not covered. Servicing and/or maintenance during normal production operations are covered by Part 85 if:

- An employee is required to remove or bypass a guard or other safety device.
- An employee is required to place any part of his or her body into an area on a machine or piece of equipment where work is actually performed upon the material being processed (point of operation).
- An employee is exposed to an associated danger zone during a machine operating cycle.

6. *Employers Not Covered by the Standard*

MIOSHA Part 85 applies to general industry employers. Part 85 does not apply to:

- Construction, agriculture and maritime employment;
- Installations under the exclusive control of electrical utilities for the purpose of power generation, transmission and distribution, including related equipment for communication or metering;
- Exposure to electrical hazards from work on, near, or with conductors or equipment in electrical utilization installations; and
- Oil and gas well drilling and servicing.

7. Exceptions to Part 85

A. Total Exceptions

Minor Tool Changes

Minor tool changes and adjustments, and other minor servicing activities which take place during normal production operations, are not covered by Part 85 if they are:

- Routine
- Repetitive
- Integral to use of the equipment for production

The above exceptions apply provided that the work is performed using alternative measures which provide effective protection. For more information refer to Section 12. Minor Adjustments and Servicing.

Cord and Plug Connected Equipment

Part 85 does not apply to work on cord and plug connected electrical equipment for which exposure to the hazards of unexpected energization or start-up of the equipment is controlled by the unplugging of the equipment from the energy source. The unplugged cord must be under the exclusive control of the employee(s) conducting the service or maintenance activities.

Hot Tap Operations

Part 85 also excludes hot tap operations involving transmission and distribution systems for substances such as gas, steam, water, or petroleum products when they are performed on pressurized pipelines, provided that the employer demonstrates the following:

- Continuity of service is essential.
- Shutdown of the system is impractical.
- Documented procedures are followed, and special equipment is used which will provide proven effective protection for employees.

B. Partial Exception

There is an exemption from required written, equipment-specific procedures when all eight of the elements listed below exist. (Note: Equipment covered by this partial exemption must still be locked out following established procedures listed in Section 8. Lockout/Tagout Program in this compliance guide and Appendix E: Partial Exception Checklist.)

1. The machine/equipment has no potential for stored or residual energy after shutdown which would endanger an employee.

2. The machine or equipment has a single energy source that is identifiable and capable of isolation.
3. The isolation and locking out of that energy source will completely de-energize and deactivate the machine or equipment.
4. The machine or equipment is isolated from that energy source and locked out during service or maintenance.
5. A single lockout device will achieve a locked out condition.
6. The lockout device is under the exclusive control of the authorized employee performing the service or maintenance.
7. The servicing or maintenance does not create hazards for other employees.
8. The employer utilizing the exception, has had no accidents involving the unexpected activation or energization of the machine or equipment during service or maintenance.

C. Capability of Accepting Lockout

Part 85 requires that machines and equipment be capable of being locked out if the machine was installed, modified, renovated, replaced or had major repairs performed after January 2, 1990.

8. Lockout/Tagout Program

A lockout/tagout program is designed to address risks posed by hazardous energies. Before service/maintenance activities begin, the machine or equipment shall be isolated from the energy source and rendered inoperative. At a minimum, an employer's lockout/tagout program must include: **A) documented energy control procedures, B) employee training, and C) periodic inspections.**

Procedures for each type of machine or equipment must be developed, documented and utilized to address how potentially hazardous energy will be controlled during machine or equipment servicing and maintenance. Employers must also make sure that the established procedures are followed.

A. Specific Machine/Equipment Procedure

When a machine specific documented procedure is required, it must include the following actions and elements which must be done in the order listed below when locking or tagging out equipment:

1. Preparation for shutdown

All authorized employees need to know the type and magnitude of the energy, the hazards of the energy to be controlled, and the method or means to control the energy before the employee turns off a machine or equipment. The Energy Source Evaluation and Energy Control Procedure form (Appendix D) should be filled out in advance and used by the authorized employee. Refer to Appendix D-1 for a sample machine specific procedure.

2. Notify all affected employees

The authorized employee turning off the power warns affected employees in the work area that power will be shut off, the reason for the shut-down, and that the equipment will be locked/tagged out.

3. Machine or equipment shutdown

Procedures must be established for turning off or shutting down each piece of equipment. An orderly shutdown must be utilized to avoid additional or increased hazards to employees as a result of the equipment stoppage. When appropriate, a "DO NOT OPERATE" tag shall be affixed to the OFF switch.

For additional information on use of tags, refer to Section 8. Lockout/Program, 8. Use of Tagout Systems.

4. Machine or equipment isolation

Physically locate all energy isolating devices that are needed to control the energy of the machine or equipment. Isolate the machine or equipment from the energy sources.

5. Lockout or tagout device application

The authorized employee places locks or tags in the appropriate energy isolating location. A lockout device is defined as a device, such as a key lock, that utilizes a positive means or holds an energy isolating device in a safe position and prevents the energizing of a machine or equipment.

A tagout device is defined as a prominent warning device, such as a tag and means of attachment, that can be securely fastened to an energy isolating device, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

- Only authorized employees shall place the lockout or tagout device on each energy isolating device.
- Lockout devices need to be affixed properly so that it will hold the energy isolating devices in a **SAFE** or **OFF** position.
- Tagout devices, when used, must be placed to clearly indicate

that operation or movement of energy isolating device from the **SAFE** or **OFF** position is not allowed.

Refer to Section 8. Lockout/Tagout Program, 8. Use of Tagout Systems for additional information.

6. Release of stored energy

After lockout devices have been placed on the equipment, all stored electrical, gravitational, mechanical, and/or thermal energy must be disconnected and drained to a zero-energy state or otherwise made safe by blocking or repositioning of equipment. This can be accomplished by:

- Release of pressurized lines such as hydraulic, air, steam, gas and water.
- Release of spring-loaded equipment.
- Blocking mechanical equipment with moving, rotating, or elevated parts.

7. Proof of isolation

Before starting work on a machine or equipment that has been locked out or tagged out, the authorized employee needs to show that machine or equipment has been isolated or de-energized. This is generally accomplished by first establishing that no personnel are exposed and then turning the machine switch to the ON position using the normal operating controls.

Verification of isolation must be continued if there is a chance of the re-accumulation of stored energy during the service/maintenance activity.

8. Use of Tagout Systems

A tagout system may be utilized by an employer when an energy isolating device is not capable of being locked out.

When the energy isolating device is capable of being locked out, the employer must use lockout unless it can be demonstrated that the utilization of a tagout system will provide full employee protection.

After January 2, 1990, whenever replacement, major repair, renovation or modification of a machine or equipment is performed, and whenever new machines or equipment are installed, it must be capable of accepting a lockout device.

Whenever tagout systems are used, all other procedures consistent with the lockout program must be followed. Additional control measures must also be taken to reinforce the tagout system.

Lockout is a sure means of ensuring de-energization of equipment. Therefore, when a tagout program is used for equipment capable of being locked out, an employer must demonstrate the following:

- The tagout program will provide a level of safety equivalent to that obtained by using a lockout program.
- Full compliance with all tagout-related provisions of this standard together with such additional elements as are necessary to provide the equivalent safety available from the use of a lockout device.
- Implementation of additional safety measures such as the removal of an isolating circuit element, blocking of a controlling switch, opening of an extra disconnecting device, or the removal of a valve handle to reduce the likelihood of inadvertent energization.

Tags must meet the following minimum guidelines:

- Tags must be legible and understandable by all affected and authorized employees.
- Tags must be made of durable materials to withstand expected environmental conditions.
- Tags must contain warnings against energizing the equipment, such as DO NOT START, DO NOT OPEN, DO NOT CLOSE, DO NOT ENERGIZE, or DO NOT OPERATE.
- Tags must be able to indicate the identity of the employee applying the device.

Tags attached to energy isolating devices should be removed only by the person originally attaching them. Removal by anyone else must follow guidelines established in Section 10. Machine Start-up.

Tags must be attached to energy isolating devices securely enough that they cannot be accidentally removed and must be in plain view and at the same location as the energy isolating device. Tags cannot be bypassed, ignored or otherwise defeated.

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

- Tags are only warning devices placed on energy isolating devices, and do not provide physical restraint on those devices that is provided by a lock.
- Once a tag is attached to an energy isolating means, it is not to be removed without permission from the authorized person responsible for it.
- A tag should also never be bypassed, ignored, or otherwise defeated.
- Tags must be legible and easily understood by all authorized employees, affected employees, and all other employees whose work operations are in or near the area.

- Tags and their means of attachment must be made of materials which will withstand the environmental conditions encountered in the workplace.
- Tags must be securely attached to energy isolating devices so that they cannot be accidentally detached during use.

B. Employee Training

The employer's training program must cover, at a minimum, the following three areas: energy control program, elements of energy control procedures relevant to employee duties, and applicable requirements of Part 85.

The lockout/tagout requirements include three different levels of training requirements which depend on the duties assigned to the employee. Employees are categorized as Authorized, Affected and Other.

1. Authorized Employees

Authorized employees are those who have received proper training and will be issued and apply lockout/tagout devices. An affected employee becomes an authorized employee when duties include performing servicing or maintenance while exposed to potentially hazardous energy. Training for authorized employees shall include:

- Recognition of locations, types and magnitudes of potential hazardous energy sources in the work area.
- Proper lockout/tagout procedures.
- Proper use of lockout/tagout devices (and any related equipment) used by the employer.
- Lockout or tagout device removal.
- Explanation of applicable MIOSHA standards.

2. Affected Employees

Affected employees need instruction in the purpose and use of the energy control procedures because they must work in the area where equipment is being serviced or maintained under lockout or tagout. The training shall include:

- Purpose of the energy control procedures.
- Use of the lockout/tagout procedures.
- Prohibition on tampering with lockout/tagout equipment.

3. Other Employees

An "other employee" is one whose work operations are or may be in an area where energy control procedures may be utilized.

Other employees must be instructed about the employer's lockout/tagout procedures. These employees must also be aware that attempts to restart or re-energize machines or equipment which are locked out or tagged out are not allowed.

4. Employee Retraining

Authorized and affected employees must be retrained whenever the following occurs:

- New or revised energy control procedure is implemented.
- Authorized employee's job duties change (regarding lockout/tagout).
- Change in machines, equipment or processes present a new hazard.
- Periodic inspections show, or the employer has reason to believe, that inadequacies in the employee's knowledge or use of the energy control procedures exists.

Employers must certify that employee retraining has been completed and is kept up to date. The certification should contain each employee's name, dates of training and items covered. See Appendix F for Sample Employee Training Certification Form.

C. Periodic Inspection and Review

At least annually, a periodic inspection of the energy control procedures for equipment/machines involved in the Lockout/Tagout Program must be performed by departments to ensure that proper procedures are being followed. The inspection should be performed by an employee other than the authorized employees utilizing the lockout/tagout procedure. The inspection should include a review between the inspector, authorized employees, and any other affected employees. Typical items covered in an inspection would include:

- Review of current energy control methods.
- Correct energy source identification.
- Proper lockout device usage.
- Methods used to release stored energies.
- Review of employee responsibilities and procedures they use under those responsibilities, including following proper lockout/tagout steps.
- Employee complaints regarding deficiencies in the Lockout/Tagout Program.

These inspections shall at least provide for a demonstration of the procedures and may be implemented through random audits and planned visual observations. These inspections are intended to ensure that the energy control procedures are being properly implemented and to provide an essential check on the continued utilization of the procedures.

- When lockout is used, the employer's inspection shall include a review of the responsibilities of each authorized employee implementing the procedure with that employee.
- Group meetings between the authorized employee who is performing the inspection and all authorized employees who implement the procedure would constitute compliance with this requirement.
- When tagout is used, the employer shall conduct this review with each affected and authorized employee.

If the review shows inadequacies in any lockout/tagout procedures, corrections must be made. The inspector should record on the inspection form (See Appendix H) any appropriate changes that have been made and that retraining is required.

9. Protective Materials and Hardware

Lockout/tagout equipment consists of tags, locks, hasps, chains, and other hardware for securing, isolating, or blocking equipment from energy sources. The devices must be of durable construction and capable of withstanding conditions in which they are placed such as hot, cold, wet, corrosive, or other environments.

Lockout/tagout devices must be identified as such and must only be used for the control of hazardous energy sources. **All other uses of these devices are prohibited.**

The employer is responsible for providing locks, tags, chains, pins, or other hardware to be used to secure or block equipment/machines from energy sources. The lockout/tagout devices should be standardized in color, shape, size and format.

10. Machine Start-up

Your documented procedure must also address how you will initiate start-up once maintenance or servicing is complete. Follow this procedure to release the equipment or process from lockout or tagout:

A. The machine or Equipment

- Inspect the work area to ensure that unnecessary items have been removed and that machine or equipment parts are intact.
- Ensure all safety guards and devices are reinstalled.

B. Employees

- Employees must be safely positioned or removed from the work area.
- Tell affected employees that the lockout or tagout devices are being removed before removing the lockout or tagout devices and before re-energizing machines or equipment.

C. Lockout or Tagout Devices Removal

- The employee who applied the lockout or tagout device must be the person to remove the device.
- Affected employees are notified that the servicing is completed and the machine is ready for use.

D. Lock or Tag Removal by Person(s) Other Than The Person Originally Attaching The Device

Before removing a lock or tag that has been affixed by another employee, the supervisor must:

- Verify that the employee who attached the device is not available to remove the device.
- Make all reasonable efforts to notify the employee that their device will be removed.
- Ensure the authorized employee knows that the lockout/tagout device has been removed. This must be done before the employee resumes work.

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

- Verification by the employer that the authorized employee who applied the device is not at the facility.
- Making all reasonable efforts to contact the authorized employee to inform him/her that his/her lockout or tagout device has been removed.
- Ensuring that the authorized employee has this knowledge before he/she resumes work at that facility.

11. Recordkeeping

All Lockout/Tagout Program records must be maintained by the employer. The records must include:

- Employee attendance sheets (See Appendix F).
- Specific lockout/tagout procedures for equipment/machines covered by the program (See Appendix D).
- Completed periodic inspection of lockout/tagout procedures for all equipment/machines in the program (See Appendix H).
- Training summary, including energy control program procedures and applicable requirements of Part 85.

12. Minor Adjustments and Servicing

Activities such as lubrication, cleaning or un-jamming, servicing 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 are covered by this standard. However, minor tool changes and adjustments, and other minor servicing activities, which take place during **normal production operations**, are not covered by this standard if they are routine, repetitive, and integral to the use of equipment for production, and if work is performed using alternative protective measures which provide effective employee protection.

Thus, lockout or tagout is not required by this standard if the alternative protective measures enable the servicing employee to clean or un-jam, or otherwise service the machine without being exposed to unexpected energization or activation of the equipment, or the release of stored energy.

Compliance with the machine guarding requirements is an example of such alternative measures. In addition, personal protective equipment may be necessary during a servicing or maintenance operation when a toxic substance is to be isolated. Under such circumstances, the requirements of applicable standards, such as Part 33. Personal Protective Equipment, must be met.

An employer who requires employees to perform routine maintenance and/or servicing while a machine or process is operating in the production mode, must provide employee safeguarding under the applicable machine guarding requirements. Operations such as lubrication, draining sumps, servicing of filters, and inspection for leaks and/or mechanical malfunction, are examples of routine operations which often can be accomplished with effective production-mode safeguards.

However, the replacement of machine or process equipment components such as valves, gauges, linkages, support structure, etc. is not considered to be a normal routine maintenance function which can safely be accomplished during machine or process equipment operation.

Several alternative means of safeguarding the hazardous portions of machines and equipment are presented by the national consensus standard, ANSI B11.19-1990. Although that standard is not all inclusive, it describes effective safeguarding alternatives for the protection of employees. The safeguards described include interlocked barrier guards, presence sensing devices and various devices under the exclusive control of the employee. Such devices or guards, 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 criteria described above.

13. Electrical Work

Working safely on and around electricity is addressed by MIOSHA General Industry Safety Division **Part 40. Electrical Safety-Related Work Practices**. This standard contains rules for persons who are *qualified* and *unqualified*. Refer to Rule 408.14004 for the specific rules regarding lockout of electrical systems.

There are occupational categories of employees who face a higher than normal risk of electrical accidents.

Category A employees would be those employees intentionally exposed to and/or expected to work on exposed live parts in a variety of situations. Examples of Category A employees would include: electricians, electrical trouble shooters, general maintenance workers and overhead sign workers.

Category B employees would be those who are or may be exposed to a known, limited electrical hazard due to a specific job assignment. Examples of Category B employers include: bench test or repair workers, electrostatic spray finishing, welders, mechanical maintenance workers, janitorial cleaning in electrical rooms or changing lights bulbs, electrical meter testing and repair.

Category C employees would be those who are not assigned to any electrical work, but whose jobs place them in a position where they need to be mindful of casual exposures to exposed live parts. Examples of Category C employees include: material handlers, crane operators, janitors, building painters, landscapers, and machine operators.

A **qualified** person is someone permitted to work on or near exposed energized parts; therefore, Category A employees, at a minimum, must be trained in, and familiar with, **all** of the following procedures as listed in Rule 408.14002(5) and 408.14004:

1. The skills and techniques to distinguish exposed live parts of electrical equipment.
2. The skills and techniques necessary to determine the nominal voltage of exposed live parts.
3. The clearance distances specified in Part 40, Rule 408.14005, Table 2 and the corresponding voltages to which the person will be exposed.

Only qualified persons may work on electric circuit parts or equipment that have not been de-energized under procedures specified in Part 40, Rule 408.14004. Those qualified persons (Category A employees) shall be trained in and familiar with the proper use of all of the following items listed in Rule 408.14005(2):

1. Special precautionary techniques.
2. Personal protective equipment.
3. Insulating and shielding materials.
4. Insulating tools.
5. Testing equipment.

An unqualified person is someone with little or no training as described above and who works on, near, or with any of the following installations:

1. Installations of electrical conductors and equipment within or on buildings or other structures and on other premises such as yards, carnival, parking and other lots, and industrial substations.
2. Installations of conductors that connect to the supply of electricity.
3. Installations of other outside conductors on the premises.
4. Installations of optical fiber cable where such installations are made together with electric conductors.

An employer must ensure that unqualified workers are trained in, and familiar with, the safety-related work practices required by these rules in Part 40. Rule 408.14002 that pertain to their respective job assignments.

14. Special Conditions

A. Testing or Positioning of Equipment/Machines

When an employee must move part of a machine to test or position it for service/maintenance, and re-energization is required, the temporary removal of lockout/tagout devices and subsequent re-energization must follow this sequence:

- Clear machine/equipment of tools and other miscellaneous materials.
- Remove all employees from the machine/equipment area.
- Remove lockout/tagout devices.
- Energize and proceed with testing or positioning.
- De-energize and reapply lockout/tagout devices.

B. Exchange of Information with Outside Contractors

When the work of an outside contractor involves equipment/machines covered under the Lockout/Tagout Program, the employer must:

- Ensure that there is an appropriate exchange of information regarding lockout/tagout procedures to be used by both the employer and the outside contractor.
- Inform employees of any differences (i.e., restrictions and prohibitions) between the two programs.

One suggested practice is to use the Appendix D: Energy Source Evaluation and Energy Control Procedure for the exchange of information; and to attach the contractor's procedures form to your Energy Control Procedures form for the specific equipment/machine until work is completed.

C. Group Lockout or Tagout

There are special procedures for servicing and/or maintenance performed by two or more people. One employee shall be designated with primary responsibility for the project. This employee will remain responsible throughout the project. This employee should notify the specific employees on the crew(s). This information should also be identified on the Energy Source Evaluation and Energy Control Procedure form (Appendix D). The group lockout lead person is responsible for the following:

- Ensuring the continuity of energy control measures for the group (e.g., obtaining an appropriate group lockout/tagout device).
- Continually monitoring the work to ensure that employees on the crew are not exposed to lockout/tagout hazards.
- Verify that all procedures for returning the equipment back into service are completed before removing the group lockout/tagout device.

Each authorized employee will place a personal lockout or tagout device on the group lockout device, group lockbox, or similar mechanism when he or she begins work. Each employee removes their device when finished working on the machine or equipment being serviced or maintained.

See Appendix I for acceptable examples of group lockout procedures.

D. Shift or Personnel Changes

If a shift or personnel change occurs before the maintenance or servicing is finished, it is the responsibility of the off-going and on-coming shift supervisors involved with the locked or tagged out equipment/machine to:

- Ensure that the continuity of the energy control procedure is maintained until the on-coming shift supervisor arrives and takes control of the job.
- Decide whether to use the same lockout/tagout device that was originally attached or use a separate device attached under the direction of the on-coming supervisor.
- Document the method used (original device or separate device) on the Energy Source Evaluation and Energy Control Procedure form (Appendix D).

APPENDIX A

Control of Hazardous Energy (Lockout/Tagout) Sample Program

This program is intended to serve as a SAMPLE ONLY. Each employer must customize this sample based on the needs of the workplace. Instructions or notes are printed in italics.

It is the policy of _____ that all equipment be locked out during servicing and/or maintenance work to protect against accidental or inadvertent activation that could result in personal injury or equipment damage. In addition to disconnecting the power source, it is also required that all residual pressures be relieved and energizing lines closed (secured) prior to and during any such work.

PURPOSE

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

RESPONSIBILITY

All employees (authorized, affected, or others) are required to comply with the requirements of lockout.

The authorized employees are required to perform the lockout following this procedure.

All employees, upon observing a machine or piece of equipment is locked out for servicing or maintenance work, shall not attempt to start, energize or use that machine or equipment.

Employees shall consult with supervision/management whenever there are any questions regarding energy control procedures or methods.

Supervision/management shall enforce the energy control procedure including the use of corrective disciplinary action when necessary.

APPLICATION

1. OBTAINING A LOCK AND IDENTIFICATION LABEL

Identify how employees will obtain locks and the methods you will use to identify locks. Here is an example.

Authorized employees shall be issued a master lock from their supervisor as their personal safety lock. Safety locks used for personal protection will be individually numbered, keyed padlocks painted red in color. One key will be in the possession of the employee using the safety lockout lock. The other key, or a master key, will be maintained by supervision/management in a lock box in the maintenance office for emergency lock removal as established in the energy control procedure.

Personal safety locks (red) used for energy control shall have a durable tag attached which indicates a lockout condition. The tag shall include the name of the employee who attached the safety lock and the date and time applied.

Personal safety locks (red) are for the personal protection of employees and are to be used solely for the control of hazardous energy sources (power lockout).

2. WHAT TO LOCKOUT

During servicing or maintenance, a machine utilizing any mechanical power source such as electrical, pneumatic, steam, hydraulic, and/or air must be locked out when the unexpected energization or startup of the machine or equipment or release of stored energy could cause injury to employees. The lockout must render the machine inoperative and immovable.

3. WHEN LOCKOUT METHODS ARE REQUIRED

Based on the energy source evaluation at your facility, you will identify which tasks require lockout. Here are some examples.

- A. Equipment cleaning or Jam-clearing Tasks** - When a normally moving piece of equipment is stopped for cleaning, clearing, or adjustment during which a startup could cause injury, lockout is used.

- B. **Equipment Repair** - Whenever a repair is being performed on or near equipment where there is a possibility of injury as a result of starting the equipment, lockout is used. This includes any and all equipment from which a guard or other safety device has been removed.
- C. **Installation Tasks** - Frequently during installation, either part or all of the components making up the installation can be operated before the installation is complete. If needed for testing, precautions must be taken to prevent injuries to personnel during the test periods and the equipment again locked out when the test is complete or interrupted.
- D. **Electrical Repair Tasks** - Whenever any work other than testing is to be performed on an electrical circuit, the wiring involved must be deactivated and locked out so that it cannot be reactivated during this work.

4. GROUP LOCKOUT

Refer to Section 14: Special Conditions of the guide for group lockout options to be included in this section if appropriate. Here is one example.

Before the work begins, the lockout procedure will be reviewed with each group member. One authorized employee will be designated as responsible for the lockout.

If more than one department, shift, etc., is involved, one authorized employee will coordinate the lockout to ensure that all control measures are applied and that there is continuity of protection for the group.

Each authorized employee will affix a personal safety lock (red) to the group lockout and will remove their lock when he/she stops working on the machine or equipment. Each lock must have that person's name affixed to it.

5. SHIFT CHANGES

Identify how employees will maintain continuity of machine safeguarding during a shift change. Here is an example.

The continuity of machine safeguarding, during shift or personnel changes or during long intervals of time between work, will be accomplished through the use of an equipment lock. Personnel changing shifts will install an equipment lock to the lockout adapter prior to removing their personal safety lock unless the equipment is ready to go back into service. A tag, indicating the status of the machine/equipment, will be attached to the equipment lock.

Equipment locks shall be painted blue in color and will be used to lock out machines/equipment during shift changes or to maintain machines/equipment off line and to prevent unintentional operation.

Equipment locks (blue) are not to be used as energy control devices for personal protection. Equipment locks will be applied and removed by supervisory/management personnel.

6. WHEN LOCKOUT METHODS ARE NOT REQUIRED

Based on the energy source evaluation, you will identify tasks where lockout methods are not required. Here are some examples.

- A. Minor tool changes (for example, changing a drill bit) are not covered when a stop button is used to control unexpected motion during the tool change or minor adjustment and when the start button is both visible and under the employee's immediate control.
- B. Other minor servicing activities that take place during normal production operations are not covered by this standard if they are routine, repetitive, and integral to the use of equipment for production and if work is performed using alternative protective measures that provide effective employee protection.
- C. Cord and plug connected equipment must be unplugged and under the exclusive control of the employee performing the service or maintenance work. The plug must physically be in the possession of the employee, or in arm's reach, and in the line of sight of the employee. Lockout devices are available to lockout the plug when disconnected.
- D. Repair, trouble-shooting and set-up adjustments must be performed on energized equipment **only** when it is absolutely necessary to leave the machine energized. For the purpose of this procedure, the trouble-shooting process will end, and a lockout will be required when:
 - Power is shut-off.
 - A particular problem has been located and repairs start.
 - Individual machine components are being replaced.
 - Circuit changes are being made.

PROCEDURES

*Describe the specific procedures your company will use to perform lockout.
Here is an example:*

The essential part of lockout of any equipment or lines is to **ensure that the equipment cannot be started** or source lines opened by unauthorized personnel during servicing and maintenance work. If you have questions relating to the appropriate procedures to be followed, ask your supervisor prior to commencing work.

1. APPLICATION OF LOCKOUT CONTROL

- A. Preparation for Shutdown** - Personal Safety Locks (red) and keys will be kept by each individual operator, mechanic, and/or electrician. Supervisors will also have their own locks and keys. Authorized employees shall review the written lockout procedure to have complete understanding of the type(s) and magnitude of the energy, the hazards of the energy to be controlled, and the methods or means to control the energy.
- B. Notification of Employees** - Affected employees shall be notified by the authorized employees that the machine or equipment is going to be locked out.
- C. Machine or Equipment Shutdown** - The machine or equipment shall be turned off or shut down using the energy control procedures established for the machine or equipment.
- D. Machine or Equipment Isolation** - All energy isolating controls that are needed to control the energy of the machine or equipment shall be physically located and operated in such a manner as to isolate the machine or equipment from the energy sources (e.g., steam, pneumatic, hydraulic, and air). A Zero Energy State must be proven. If the valves do not permit the use of a standard lock out, another method such as a wire cable and lock can be used.
- E. Lockout Device Application** - The multiple lock adapter and lock shall be affixed in such a manner as to hold the energy isolation devices in a safe or off position.
- F. Notification of Affected Personnel** - Affected employees shall be notified by the authorized employees that the machine or equipment is locked out. In addition to verbal notification, a sign indicating a power lockout condition will be placed near the machine/equipment controls.

- G. Verification of Isolation** - Prior to starting work on a machine or equipment that has been locked out, each authorized employee involved shall verify that the isolation and de-energization of the machine or equipment have been accomplished by testing the effectiveness of the lockout by attempting to cycle the machine or start the equipment at the motor control center panel or start/stop switch (key/lock system).

Each authorized employee will notify other authorized and affected personnel in the area that they are going to attempt to cycle the machine or equipment prior to doing so and shall ensure that personnel are free and clear of the machine or equipment prior to operating the controls.

If the controls activate the machine or equipment or cause any machine or equipment movement, each authorized employee will begin again at Step A. Preparation for Shutdown.

If there is the possibility of re-accumulation of stored energy to a hazardous level, verification or isolation shall be continued until the servicing or maintenance is completed, or until the possibility of re-accumulation no longer exists. Stored or potential energy will be relieved, restrained, or otherwise made safe.

- H. Begin Work Activity** - Work activity will begin once each authorized employee involved has verified that the current control of hazardous energy sources has been effective.

2. TESTING/POSITIONING OF MACHINES/EQUIPMENT/COMPONENTS

In situations in which lockout devices must be removed from the energy isolating device and the machine or equipment energized to test or position the machine, equipment or component, the following sequence of actions shall be followed:

- A.** Clear the machine or equipment of tools and materials.
- B.** Remove employees from the machine or equipment area.
- C.** Notify affected employees that the lockout devices are going to be removed.
- D.** Each authorized employee who applied a safety lock will remove their own safety lock.
- E.** Notify affected employees that the safety locks have been removed and that the machine or equipment is going to be energized.
- F.** Energize and test the equipment.
- G.** De-energize all systems and reapply energy control measures in accordance with established procedures.

3. LOCK REMOVAL

Each lockout lock shall be removed from each energy isolating device by the authorized employee who applied the device except for conditions specified in emergency lock removal. A lockout must never be broken (lock removed) by anyone other than the employee who performed that lockout.

4. EMERGENCY LOCK REMOVAL

Employers must have specific procedures incorporated into the Energy Control Program to address emergency lock removal. Employees must be trained in these procedures. Here is an example.

When an authorized employee is not available to remove their lock, the supervisor and operations managers of that employee have the authority to request the removal of a lock in the absence of the employee. In those cases when a supervisor exercises that authority, the following procedure must be followed:

- A. The supervisor shall contact an authorized person and request assistance in this procedure.
- B. The supervisor and an authorized person must attempt to contact (at least verbally) the employee to whom the lock belongs and determine if the employee is on the premises.
- C. If the employee is on the premises, he/she alone has the authority to determine whether the lock can be removed based on the guidelines of the lockout procedure.
- D. If the employee is not on the premises, the supervisor or an authorized person will make a reasonable effort to contact the employee and will ask the employee whether the work is complete and the equipment is ready to be activated. The employee will be advised that his/her lock will be removed.
- E. If the employee advises that the equipment is not ready to be activated, the supervisor must arrange to have another lock placed on the equipment as soon as the existing lock is removed.
- F. If the employee advises that the equipment is ready to be activated, the supervisor shall inspect the work area to verify that there is no danger in re-energizing the equipment, remove the lock, and inform the department management that the equipment is operational.

- G. If contact is not established, the supervisor will inspect the equipment for completeness of work and authorize the removal of the lock. The employee whose safety lock has been removed will be notified immediately upon return to work, by a note being attached to his/her time card requiring that they come to the supervisor's office for to discuss the situation and get a new safety lock.
- H. If the equipment is ready to be activated, the supervisor will inform the department management that the equipment is operational. At this point, the supervisor can authorize removal of the lock.

The person removing the safety lock is responsible for making certain that all requirements for restoring power are followed prior to removing the safety lock.

5. LOCKOUT DEVICES

List the types of lockout devices authorized for use at your facility. Here are some examples.

- A. **Electrical disconnect or breaker lockout device** - the switch lever must be padlocked in the *OFF* position using a shackle and/or padlock with an identification label.
- B. **Valve lockout device** - can be locked out by using a padlock, a cable and lock, or a valve handle lockout device. The method used is determined by the type of valve.
- C. **Line Blinds or "Pancakes"** - to isolate the time flow of fluid or gases in piping systems. (To be used in conjunction with pipe breaking procedures.)
- D. **Multiple locks (gang hasp)** - when more than one person or group has to work on a machine, a lock adapter shall be used. Each person or group must place a lock on the adapter thus assuring each person a safe and complete lockout. It is important that during a shift change, locks be left in place until the time that the next crew is present and have placed their locks on the adapter.

TRAINING REQUIREMENTS

You must identify and train employees by category. See Section 8. Lockout/Tagout Program, B. Employee Training.

1. CATEGORIES OF EMPLOYEE TRAINING

- A. Authorized employees** will receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for the energy isolation and control. An employee will not be considered authorized until training has been completed.
- B. Affected employees** shall be instructed in the purpose and use of the energy control procedure.
- C. “Other” employees** whose work operations **are** or **may be** in an area where energy control procedures may be utilized, **shall** be instructed about the procedure, and about their responsibility not to restart or re-energize machines or equipment which are locked out.

2. EMPLOYEE RETRAINING

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

Additional retraining shall also be conducted whenever periodic inspection reveals, or whenever there is reason to believe, that there are deviations from or inadequacies in the employee’s knowledge or use of the energy control procedures.

Retraining will re-establish employee proficiency and introduce new or revised control methods and procedures, as necessary.

3. CERTIFYING TRAINING/RETRAINING

Management shall certify that employee training/retraining has been accomplished and is being kept up to date. Certification shall include written documentation containing the employee’s name, category status (authorized, affected, other), and dates of training, as well as a signed statement by the supervisor, signifying that the training has been conducted.

PERIODIC INSPECTION

Specify how you conduct periodic inspections. See Appendix H for a sample form.

1. INSPECTION

Periodic inspections must be performed by the authorized employee(s) while engaged in the process of performing the energy control procedure. Records shall be kept on these inspections. Documentation should include employee names, dates of inspection, and the written procedure used during this lockout. This will be accomplished by reviewing the procedure with authorized employees who normally lockout this equipment. These inspections shall be conducted at least annually.

The authorized employee conducting the inspection will observe the actual implementation of the procedure. The inspection shall also include a review of the employee's responsibilities under the energy control procedure.

2. INSPECTION DOCUMENTATION

See Appendix H for a sample Periodic Inspection Certification form.

The authorized person conducting the periodic inspection shall certify that such inspection has been conducted. Certification shall include written documentation which identifies the machine or equipment on which the energy control procedure was being utilized, the employees included in the inspection, any deviations or inadequacies in employee's knowledge or use of energy control procedures identified, the name of the authorized person performing the inspection, the date of the inspection, and a signed statement by the authorized employee conducting the inspection.

ENFORCEMENT

Individual company policies or contracts may guide the disciplinary procedure identified in this section. Here is one example.

Due to the seriousness of this policy and the degree of injury that may be caused by not following this policy and the specific procedures that are included in this policy, corrective action, up to and including immediate discharge, may result if this policy is violated.

CONTRACTORS

Identify how you expect contractors to address lockout/tagout while in your facility. Here is one example.

All outside contractors are required to comply with this procedure while performing work for _____ . A signed statement is kept on file to verify compliance with all regulations.

APPENDIX B

(LOCKOUT/TAGOUT) WRITTEN PROGRAM EVALUATION

YES	NO	DO THE PROGRAM/PROCEDURES CONTAIN THE FOLLOWING ELEMENTS:
___	___	A DEFINITION OF THE PURPOSE AND SCOPE OF LOCKOUT AND/OR TAGOUT PROCEDURES.
___	___	BASIC LOCKOUT/TAGOUT RULES AND AUTHORIZATION.
___	___	MEANS OF ENFORCING COMPLIANCE.
YES	NO	SPECIFIC DOCUMENTED PROCEDURES FOR:
___	___	SHUTTING DOWN MACHINES AND/OR EQUIPMENT.
___	___	ISOLATING, BLOCKING, AND SECURING MACHINES AND/OR EQUIPMENT.
___	___	PLACEMENT OF LOCKOUT/TAGOUT DEVICES.
___	___	RELEASING STORED ENERGY.
___	___	TESTING A MACHINE AND/OR EQUIPMENT TO VERIFY THE EFFECTIVENESS OF THE LOCKOUT/TAGOUT DEVICES.
___	___	REMOVAL OF LOCKOUT/TAGOUT DEVICES.
___	___	TRANSFER OF LOCKOUT/TAGOUT DEVICES. (SHIFT OR PERSONNEL CHANGES)
___	___	RESPONSIBILITY FOR LOCKOUT/TAGOUT DEVICES DURING GROUP LOCKOUT/TAGOUT.
___	___	GROUP LOCKOUT/TAGOUT.
___	___	ADDITIONAL MEASURES TAKEN IF A TAG IS USED IN LIEU OF A LOCK.
		THE EMPLOYER MUST ALWAYS COMPLY WITH THE FOLLOWING ITEMS:
___	___	PROVIDE ENERGY CONTROL DEVICES WHICH MEET THE REQUIREMENTS DEFINED IN PART 85 (C)(5).
___	___	INFORM OUTSIDE CONTRACTORS OF YOUR LOCKOUT/TAGOUT PROGRAM AND NOTIFY YOUR EMPLOYEES OF THE CONTRACTOR'S ENERGY CONTROL PROGRAM.
___	___	CERTIFICATION OF A PERIODIC INSPECTION CONDUCTED AT LEAST ANNUALLY.
___	___	CERTIFICATION OF TRAINING AND RETRAINING FOR AUTHORIZED, AFFECTED, AND OTHER EMPLOYEES.
___	___	HANDLING CORD AND PLUG CONNECTED EQUIPMENT PART 85 (A)(2)(III)(A).

APPENDIX C

LOCKOUT/TAGOUT COMPLIANCE GUIDE AN APPROACH TO ESTABLISHING WRITTEN LOCKOUT PROCEDURES

1. Evaluate all machines/equipment/processes using the first three columns of “**Energy Source Evaluation and Energy Control Procedures**” form. (Appendix D)
 - A. Source and magnitude of the energy. (i.e. Electrical = 480-volt, 3 phase; Pneumatic = 125 p.s.i., etc.)
 - B. Location of isolating device. (Adjacent to the control panel, pneumatic line between surge tank and filters, etc.)
 - C. Means of isolation. (Disconnect switchbox; ball valve, etc.)

2. Separate the evaluations into three groups.

Group A. All machines/equipment with more than one energy source.

Group B. All machines/equipment with one, lockable energy source.

Group C. All machines/equipment with single-source, cord and plug connection.

3. Develop **written procedures**, using the remaining columns for all equipment in **Group A**.

If one energy source will isolate another energy source, that detail must be in Step 4. For instance, if isolating and locking out the electricity will automatically isolate and dump residual hydraulic pressure, that fact must be detailed in the procedure. You can't just say, “isolate and lock out electricity.”

You must include a specific statement of the intended use of the procedure. Depending on the activities to take place, more than one procedure may be necessary for any one machine/equipment. (For example, different procedures may be necessary for unjamming stuck parts, die changes, preventative maintenance, etc.)

4. Establish procedure according to “**Partial Exception**” for equipment in **Group B**. Note: Rule 1910.147(c)(4)(i) states that you need not document the required procedure for a particular machine or equipment, when all **8 elements** exist. However, for consistency's sake, you may want to group like machines together and establish a written procedure for them.
5. Equipment in **Group C** are exempt from lockout/tagout requirements as long as they are unplugged and the plug is kept under exclusive control of the employee performing the servicing or maintenance.
6. To qualify for the **Minor Tool Change** exemption as described in Rule 1910.147(a)(2)(ii), the employee must have exclusive control of the controls¹.

¹ To have exclusive control, the employee must be working alone and the controls must be visible and within 3 feet.

APPENDIX D

ENERGY SOURCE EVALUATION AND ENERGY CONTROL PROCEDURE

DATE: _____ CONDUCTED BY: _____ LOCKOUT PROCEDURE #: _____
 EQUIPMENT NAME: _____ MODEL: _____ S/N: _____
 LOCATION: _____ WORK CENTER: _____

ENERGY SOURCE AND MAGNITUDE	MEANS OF ISOLATION	LOCATION OF ISOLATION DEVICE	Step 1: NOTIFY AFFECTED EMPLOYEES	Step 2: STOPPING PROCEDURES FOR SHUTDOWN
ELECTRICAL:				
ENGINE:				
SPRING:				
COUNTERWEIGHT:				
FLYWHEEL:				
HYDRAULIC:				
PNEUMATIC:				
CHEMICAL:				
THERMAL:				
GRAVITY:				
OTHER:				

MAGNITUDE EXAMPLE: ELECTRICAL = 480v Three Phase, PNEUMATIC = 125psi

ENERGY SOURCE EVALUATION AND ENERGY CONTROL PROCEDURE

ENERGY SOURCE AND MAGNITUDE	Step 3: ISOLATE AND APPLY LOCK OR TAG (indicate which)	Step 4: BLOCK OR RELIEVE RESIDUAL ENERGY	Step 5: VERIFY DEENERGIZATION	Step 6: RELEASE FROM LOCKOUT / TAGOUT - **
ELECTRICAL:				
ENGINE:				
SPRING:				
COUNTERWEIGHT:				
FLYWHEEL:				
HYDRAULIC:				
PNEUMATIC:				
CHEMICAL:				
THERMAL:				
GRAVITY:				
OTHER:				

MAGNITUDE EXAMPLE: ELECTRICAL = 480v Three Phase, PNEUMATIC = 125psi

** Unless specific instructions are given: 1. Check machine, remove tools, 2. Confirm employees are safely positioned, 3. Notify affected employees that machine is ready for operation, 4. Remove all blocks or other energy restraints, 5. Replace guards, 6. Remove locks, 7. Restore all energy to machine.

Appendix D-1

ENERGY SOURCE EVALUATION AND ENERGY CONTROL PROCEDURE

(This is a SAMPLE GUIDELINE, not a comprehensive lockout procedure for any particular machine or situation.)

DATE: 5/1/19 CONDUCTED BY: Vern LOCKOUT PROCEDURE #: 3/b
 EQUIPMENT NAME: Part Revolution Press #8 MODEL: Verson S/N: _____
 LOCATION: _____ WORK CENTER: _____

ENERGY SOURCE AND MAGNITUDE	MEANS OF ISOLATION	LOCATION OF ISOLATION DEVICE	Step 1: NOTIFY AFFECTED EMPLOYEES	Step 2: STOPPING PROCEDURES FOR SHUTDOWN
ELECTRICAL: 240 Volt	Main electric panel	Southeast corner behind presses	Notify both operators, material handler, and foreman	Press “Motor Stop/Off” button to deactivate Motor controller
PNEUMATIC: 125 P.S.I. air lines between surge tank and press. 1. To clutch/brake 2. To counterbalance	Lockable, air-dump valve	Labeled air line behind press, attached to frame		Shut off air supply by turning ball valve handle 90°
FLYWHEEL: RPM rotational movement	Power isolated when main electrical and pneumatic are isolated	See electrical and pneumatic		Wait, observe that flywheel has coasted to a complete stop
GRAVITY: RAM	Safety block	Attached to southeast and northwest corners of press		Pull interlock

MAGNITUDE EXAMPLE: ELECTRICAL = 480v Three Phase, PNEUMATIC = 125psi

ENERGY SOURCE EVALUATION AND ENERGY CONTROL PROCEDURE

(This is a SAMPLE GUIDELINE, not a comprehensive lockout procedure for any particular machine or situation.)

LOCKOUT PROCEDURE #: 3/b

EQUIPMENT NAME: Part Revolution Press #8

MODEL: Verson

ENERGY SOURCE AND MAGNITUDE	Step 3: ISOLATE AND APPLY LOCK OR TAG (indicate which)	Step 4: BLOCK OR RELIEVE RESIDUAL ENERGY	Step 5: VERIFY DEENERGIZATION	Step 6: RELEASE FROM LOCKOUT / TAGOUT - **
ELECTRICAL: 240 Volt:	Move disconnect switch to off position. Attach gang clip and lock		Hit "Motor Start" button on operator control panel, press MUST NOT start	
PNEUMATIC:	Insert chain through hole in ball-valve handle and chain in off position. Apply gang clip and lock	Slowly open bleeder valve and listen for escaping air. Leave bleeder valve in open position	Watch and listen for escaping air. Visually check pressure switch indicator	
FLYWHEEL:			Visually verify that flywheel is stopped completely	
GRAVITY:		Place properly adjusted interlocked safety block between ram and bed of press	Visually insure that there is less than 1/4" between ram and block	

MAGNITUDE EXAMPLE: ELECTRICAL = 480v Three Phase, PNEUMATIC = 125psi

** Unless specific instructions are given: 1. Check machine, remove tools, 2. Confirm employees are safely positioned, 3. Notify affected employees that machine is ready for operation, 4. Remove all blocks or other energy restraints, 5. Replace guards, 6. Remove locks, 7. Restore all energy to machine.

APPENDIX E

PARTIAL EXCEPTION WORKSHEET

DATE: _____

COMPLETED BY: _____

MACHINE OR EQUIPMENT COVERED BY THIS WORKSHEET

ALL QUESTIONS MUST BE ANSWERED "YES"
FOR THE PARTIAL EXEMPTION CRITERIA TO BE MET.

	YES	NO	COMMENTS
1. The machine/equipment has no potential for stored or residual energy after shutdown which would endanger an employee.	_____	_____	_____
2. The machine or equipment has a single energy source, that is identifiable and capable of isolation.	_____	_____	_____
3. The isolation and locking out of that energy source will completely de-energize and deactivate the machine or equipment.	_____	_____	_____
4. The machine or equipment is isolated from that energy source and locked out during service or maintenance.	_____	_____	_____
5. A single lockout device will achieve a lockout condition.	_____	_____	_____
6. The lockout device is under the exclusive control of the authorized employee performing the service or maintenance.	_____	_____	_____
7. The servicing or maintenance does not create hazards for other employees.	_____	_____	_____
8. The employer utilizing the exception, has had no accidents involving the unexpected activation or energization of the machine or equipment during service or maintenance.	_____	_____	_____

APPENDIX H

**CONTROL OF HAZARDOUS ENERGY SOURCES
(LOCKOUT/TAGOUT)**

PERIODIC INSPECTION CERTIFICATION

DATE: _____

INSPECTOR: _____

SIGNATURE: _____

**MACHINE OR EQUIPMENT ON WHICH
LOCKOUT/TAGOUT PROCEDURES WERE PERFORMED:**

EMPLOYEE(S) PERFORMING THE LOCKOUT/TAGOUT PROCEDURES

EMPLOYEE NAME (Please Print)

EMPLOYEE SIGNATURE

WERE ALL THE LOCKOUT / TAGOUT PROCEDURES PERFORMED CORRECTLY?

YES _____ NO _____

COMMENTS ON IMPROPER LOCKOUT/TAGOUT PROCEDURES BEING USED ON THE REVERSE SIDE OF THIS SHEET (ex. List of improper procedures being used which require retraining for the employee or notification of the procedures):

APPENDIX I

Group Lockout Scenarios

Under most circumstances, where servicing/maintenance is to be conducted during only one shift by an individual or a small number of persons working together, the installation of each individual's lockout/tagout device upon each energy isolating device would not be a burdensome procedure. However, when many energy sources or many persons are involved, and/or the procedure is to extend over more than one shift, (possibly several days, or weeks) consideration must be given to the implementation of a lockout/tagout procedure that will ensure the safety of the employees involved and will provide for each individual's control of the energy hazards.

The following procedures are presented as examples to illustrate the implementation of a group lockout/tagout procedure involving many energy isolating devices and/or many servicing/maintenance personnel. They illustrate several alternatives for having authorized employees affix personal lockout/tagout devices in a group lockout/tagout setting. These examples are not intended to represent the only acceptable procedures for conducting group operations.

Definitions for terms used in the group lockout examples are listed below:

- **PRIMARY AUTHORIZED EMPLOYEE** is the authorized employee who exercises overall responsibility for adherence to the company lockout/tagout procedure. [Part 85 1910.147 (f)(3)(ii)(A).] Since it would be unwieldy for 10 people to perform isolation procedures, this person would actually perform the energy isolation procedures.
- **PRINCIPAL AUTHORIZED EMPLOYEE** is an authorized employee who oversees or leads a group of servicing / maintenance workers (e.g., plumbers, carpenters, electricians, metal workers, mechanics).
- **JOB-LOCK** is a device used to ensure the continuity of energy isolation during a multi-shift operation. It is placed upon a lock-box. A key to the job-lock is controlled by each assigned primary authorized employee from each shift.
- **JOB-TAG with TAB** is a special tag for tagout of energy isolating devices during group lockout/tagout procedures. The tab of the tag is removed for insertion into the lock-box. The company procedure would require that the tagout job-tag can not be removed until the tab is rejoined to it.
- **MASTER LOCKBOX** is the lockbox into which all keys and tabs from the lockout or tagout devices securing the machine or equipment are inserted and which would be secured by a *job-lock* during multi-shift operations.
- **SATELLITE LOCKBOX** is a secondary lockbox or lockboxes to which each authorized

employee affixes his / her personal lock or tag.

- **MASTER TAG** is a document used as an administrative control and accountability device. This device is controlled by operations and is a personal tagout device if each employee personally signs on and signs off on it and if the tag clearly identifies each authorized employee who is being protected by it.
- **WORK PERMIT** is a control document which authorizes specific tasks and procedures to be accomplished.

Group Lockout Organization Examples

A group lockout/tagout procedure might provide the following basic organizational structure:

1. A primary authorized employee would be designated. This employee would exercise primary responsibility for implementation and coordination of the lockout/tagout of hazardous energy sources, for the equipment to be serviced.
2. The primary authorized employee would coordinate with equipment operators before and after completion of servicing and maintenance operations which require lockout/tagout.
3. A verification system would be implemented to ensure the continued isolation and de-energization of hazardous energy sources during maintenance and servicing operation.
4. Each authorized employee would be assured of his/her right to verify that the hazardous energy has been isolated and/or de-energized.
5. When more than one crew, craft, department, etc., is involved, each separate group of servicing/maintenance personnel would be accounted for by a principal authorized employee from each group. Each principal employee is responsible to the primary authorized employee for maintaining accountability of each worker in that specific group.

Examples of procedures are presented for the various methods of lockout/tagout using group lockbox procedures. An example of an applicable method for complex process equipment is also presented.

The following procedures address circumstances ranging from a small group of servicing/maintenance employees during a one-shift operation to a comprehensive operation involving many workers over a longer period.

1. Each authorized employee verifies or observes the de-energization of the equipment. Each authorized employee places his/her personal lock or tag upon each energy isolating device and removes it upon departure from that job.
2. Under a lockbox procedure, a lock or job-tag with tab is placed upon each energy isolation device after de-energization by the primary authorized employee. The key(s) and or tabs are then placed into a lockbox. Each authorized employee assigned to the job then affixes his/her personal lock or tag to the lockbox. As a member of a group, each assigned authorized employee verifies that all hazardous energy has been rendered safe. The lockout/tagout devices cannot be removed or the energy isolating device turned on until all locks are removed from lock box and the appropriate key or tab is matched to its lock or tag.
3. 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/her personal lock or tag upon the master lockbox. Then each principal authorized employee inserts his/her key into the group satellite lockbox to which each authorized employee in that specific group affixes his/her personal lock or tag. As a member of a group, each assigned 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 have been removed from the satellite lockbox can the principal authorized employee remove his/her lock from the master lockbox.
4. During operations to be conducted over more than one shift (or even many days or weeks), a system such as described here might be used. Single locks/tags may be used as illustrated under Example 3 procedure, except that the master lockbox must be secured with an equipment lock before subsequent locks by the principal authorized employees are put in place. The equipment lock may have multiple keys if they are in the sole possession of the various primary authorized employees (one on each shift). As a member of a group, each assigned authorized employee verifies that all hazardous energy has been rendered safe. In this manner, the security provisions of the energy control system are maintained across shift changes while permitting re-energization of the equipment at any appropriate time or shift.

Normal group lockout/tagout procedures require the affixing of individual lockout/tagout devices by each authorized employee to a group lockout device. However, in the servicing and maintenance of sophisticated and complex equipment, such as, but not necessarily limited to, process equipment in petroleum refining, petroleum production, and chemical production, there may be a need for adaptation and modification of normal group lockout/tagout procedures in order to assure the safety of the employees performing the servicing and maintenance. Lockout/tagout, blanking, blocking, etc., is often supplemented in these situations by the use of work permits and a system of continuous worker accountability.

Alternative Procedure to Group Lockout/Tagout - Example

In evaluating whether the equipment being served or maintained is so complex as to necessitate a departure from the normal group lockout/tagout procedures to the use of an alternative procedure as set forth below, the following factors (often occurring simultaneously) are some of those which must be evaluated:

- Physical size and extent of the equipment being serviced/maintained.
- Relative inaccessibility of the energy isolating devices.
- Number of employees performing the servicing/maintenance.
- Number of energy isolating devices to be locked/tagged out.
- 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 verify that the isolation of the equipment is effective. The workers 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 workers 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, flange-breaking techniques, etc.). Throughout the maintenance and/or servicing activity, operations personnel normally maintain control of the equipment. The use of the work permit or master tag system (with each employee signing on and signing off the job to ensure continual employee accountability), combined with verification of hazardous energy control, work procedures, and walk-through, is an acceptable approach to compliance with the group lockout/tagout and shift transfer provisions of the standard.

Specific issues related to the control of hazardous energy in complex process equipment are described below in a typical situation which could be found at any facility. This discussion is intended only as an example and is not anticipated to reflect operations at any specific facility.

1. 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.
2. In most instances where complex process equipment is to be serviced or maintained, the process equipment operators can be expected to conduct the shutdown procedure. This is generally due to their in-depth knowledge of the equipment and the need to conduct the shutdown procedure in a safe, economic and specific sequence.

3. The operations personnel will normally prepare the equipment for lockout/tagout as they proceed and will identify the locations for blanks, blocks, etc., by placing operations locks and/or tags 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.
4. Upon completion of shutdown, the operations personnel would review the intended job with the servicing and maintenance crew(s) and would assure their full comprehension of the energy controls necessary to conduct the servicing or maintenance safety. During or immediately after the review of the job, the servicing and maintenance crews would install locks, tags and/or special isolating devices at previously identified equipment locations following the specific work permit procedure.
5. 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.
6. All of the previous steps should have been documented by a master system of accountability and 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 workers if they fully comprehend the details of the job and the energy isolation devices actuated or put in place. This signing by the respective workers further verifies that energy isolation training relative to this operation has been conducted.
7. After the system has been rendered safe, the authorized employees verify energy controls.
8. 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 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 subsequently be the responsibility of several supervisors.
9. Upon completion of the tasks required by the work permit, the authorized employees' names can 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. (Accountability of exposed workers is maintained.)

10. As the work is completed by the various crews, the work permits and the accountability of personnel is reconciled jointly by the primary authorized employee and the operations supervisor.
11. During the progress of the work, inspection audits are conducted.
12. Upon completion of all work, the equipment is returned to the operations personnel after the maintenance and servicing crews have removed their locks, tags, and/or special isolating devices following the company procedure.
13. 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.
14. After the completion of the servicing/maintenance work, operations personnel remove the tags originally placed to identify energy isolation.
15. Operations personnel then begin checkout, verification and testing of the equipment prior to being returned to production service.



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