LOCKOUT
TAGOUT
PLAN

(Control of Hazardous Energy)

Review and Approval Authority

Prepared and Edited by:

Industrial Hygienist	Date

Reviewed and Approved by:

Director - Environmental Safety	Date
Vice President for Administrative Affairs	Date
Provost	Date

Approved as UM Policy:

President	Date

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Emergency and Assistance Telephone Numbers

FIRE - POLICE - RESCUE - EMERGENCY MEDICAL SERVICE - 24 hour # **9-1-1**

CALL IMMEDIATELY FOR ANY EMERGENCY INCLUDING CONFINED SPACE INCIDENT, CHEMICAL SPILL, FIRE, INJURED OR SICK PERSON

Environmental Safety (Main Office) (Industrial Hygiene, Occupational Safety, Hazardous Waste Management, Fire Protection, Radiation Safety, Insurance Services, Hazard Communication, Accident Investigation, Air Monitoring and Safety Education)	(40)5-3960
University Health Center - Occupational Health (Medical Consultation and Evaluation)	(31)4-8172
Facilities Management Work Control Center (Repair of Facility Equipment Deficiencies, e.g., steam line leaks, electrical failures, ventilation, etc.)	(40)5-2222

Policy Statement

Approved by the President March 13, 1996

A. Purpose

This is a statement of official University policy to establish the process for compliance with the Occupational Safety and Health Administration (OSHA) regulation, "Control of Hazardous Energy", 29 CFR 1910.147. It is intended to protect University employees from hazards caused by the inadvertent activation of equipment during maintenance. This policy establishes the minimum requirements to protect employees from such hazards.

B. Scope

Servicing and/or maintenance which takes place during normal production operations is covered by this plan if: 1) An employee is required to remove or bypass a guard or safety device; or 2) An employee is required to place any part of his or her body into an area of the machine or piece of equipment where work is actually performed upon the material being processed (point of operation) or where an associated danger exists during a machine cycle.

Minor tool changes and adjustments (e.g., clearing jammed paper from a copier, printer or typewriter) and other minor servicing activities, which are routine, repetitive, and take place during normal production operations, are not covered by this plan. This type of maintenance must be completed using alternative safety measures (e.g., proper use of manufacturer-required and recommended machine guards).

This plan also does not apply to work on cord and plug connected electrical equipment for which exposure to the hazards of unexpected start-up is controlled by unplugging it from the energy source if the plug is under the exclusive control of the employee performing the service.

C. Policy

The University is dedicated to providing safe work facilities for students and employees, and complying with federal and state occupational health and safety standards. Administrators, managers, faculty, staff and students all share a responsibility to reduce hazards due to the unintentional release of hazardous energy.

The Lockout/Tagout Plan (LOTO) shall be implemented for all facilities at the College Park Campus where there is need to perform maintenance or provide routine service to machinery or equipment. Servicing of all electrically, chemically, pneumatically, thermally and/or hydraulically powered machinery is included in this plan. Contractors who perform work on University equipment shall also comply with the procedures outlined in this plan.

D. Duties and Responsibilities

1. Department of Environmental Safety (DES) shall:

(a) Provide consultation to assist in the identification of equipment where LOTO should be utilized.
(b) Prepare the LOTO Plan with periodic review and revisions as needed;
(c) Distribute the LOTO plan to each affected department for distribution to all individuals who are authorized by the department to perform maintenance on energized equipment;
(d) Approve locks to be used by individual departments;
(e) Investigate and document all reported accidents and/or near-miss accidents that are directly or indirectly related to the locking and tagging of equipment; and
(f) Provide training and retraining to all authorized employees.

2. Department Heads shall:

(a) Designate supervisors to implement specific LOTO procedures; and
(b) Select appropriate locking and tagging devices for their respective department.

3. Designated Supervisors shall:

(a) Implement all provisions of the LOTO for work areas under their control;
(b) Inventory and identify all potentially dangerous equipment capable of releasing hazardous energy during maintenance in work areas or facilities under their control;
(c) Prepare specific LOTO and emergency procedures for hazardous machinery (refer to Appendix A of the LOTO Plan;
(d) Identify persons authorized to implement LOTO procedures and assure that each person attends training provided by the Department of Environmental Safety;
(e) Report all workplace injuries, unsafe conditions and near-misses to the Department of Environmental Safety;

(f) Instruct authorized LOTO personnel regarding the applicability of this plan to their respective shop;
(g) Provide proper locking and tagging equipment including locks, tags, multiple lock holders, etc.;
(h) Direct periodic safety audits of LOTO procedures to determine regulatory compliance, and recommend action to correct conditions of non-compliance; and
(i) Comply with necessary documentation requirements.

4. Authorized employees shall:

(a) Adhere to the requirements of the Lockout Tagout Plan;
(b) Follow guidelines referenced in this plan to protect themselves and others from the release of hazardous energy;
(c) Ensure the security of their own locking devices;
(d) Complete all safety training requirements and comply with documentation procedures; and
(e) Report all workplace injuries, unsafe conditions and near-misses to their supervisors and/or the Department of Environmental Safety.

5. Affected employees shall:

(a) Notify the appropriate persons when equipment needs servicing; and
(b) Follow LOTO instructions given by the authorized employees.

E. Information

Assistance will be provided by the Department of Environmental Safety to any Department or individual requesting guidance or training to satisfy implementation of this policy. (Departmental telephone number is (301) 405-3960; electronic mail (E-Mail) address is Safety@umd.edu; WWW Home Page address is http://www.des.umd.edu)

Glossary of Terms

Affected personnel: Persons that may use the machine being serviced during the course of their work day and may attempt to activate machinery while service is being done. Affected persons also include those persons whose job requires working in an area while such servicing or maintenance is being performed.

Authorized personnel: Persons that have received training in the use of Lockout/ Tagout equipment and are authorized to perform maintenance. Authorized personnel also include those persons responsible for properly locking and tagging machinery that is to be serviced. (Affected personnel may also be authorized personnel when that employees duties include servicing or maintenance of machinery.)

Blank: A disk inserted into the space between two pipe flanges to prevent the passage of liquid or gases through a pipe.

Bleed: The release of stored hydraulic, electrical or pneumatic energy.

Energy Sources: Any source of electrical, pneumatic, hydraulic, thermal, chemical or other type of energy.

Lock: Keyed device, specified in type and color by the department completing the service, used to secure equipment. Keys for the lock shall be kept by the person completing the service only. Locks issued for use with this plan shall not be used for other purposes. Additionally, locks shall be able to withstand the environment in which they are being used.

Lockout: A system in which a lock, when properly attached to a power or energy source, prevents the unintentional activation of equipment. The lock physically hold the switch or handle in the "off" position until it is removed by the authorized personnel.

Lockout/ Tagout (LOTO): A list of procedures, abbreviated as LOTO, designed and implemented to protect employees from an accidental discharge of energy. LOTO is used interchangeably with, "Control of Hazardous Energy".

Servicing and/or Maintenance: Constructing, repairing, installing, adjusting, inspecting, modifying, lubricating, cleaning and/or clearing jammed equipment.

Tagout: A tagging procedure, intended to act only as a warning device, used to prevent the unintentional activation of equipment. The tag used at UM will contain the name and title of the authorized employee and read "DO NOT OPERATE". Tagout device attachment means shall be of a non-reusable type, attachable by hand, self-locking, and non-releasable with a minimum locking strength of no less than 50 pounds. All tags and attachment means shall also be made to withstand the environment in which they are being used.

Information and Training

All participating UM employees must assume an active role in maintaining a safe working environment by reporting any problems or noncompliance with policies to their supervisor and/or the Department of Environmental Safety (DES). All employees are expected to assist their peers and should fully utilize any information provided during formal and informal training sessions. Any staff member who does not understand a policy or procedure should consult their supervisor or DES for clarification.

All employees required to service machinery that has the potential for release of hazardous energy shall be provided with information and training regarding the Lockout Tagout Plan (LOTO). Employees shall be informed of:

1. The contents of the OSHA standard;

2. The location and availability of the LOTO Plan;

3. The procedures covered by the LOTO Plan including:
   - (a) Explanations of provisions;
   - (b) Description of physical hazards common to inappropriate locking and tagging of machinery;
   - (c) Description of hazardous energy sources common to UM;
   - (d) Review of measures to protect employees, faculty, students, staff and visitors from the inadvertent release of hazardous energy;
   - (e) Discussion of procedures to de-energize equipment and release or secure all residual energies; and
   - (f) Location of University reference materials on the control of hazardous energy.

4. Evaluation technique to determine if energy hazards are present.

Training of employees and supervisors in the methods and procedures for LOTO and the provisions of the OSHA Control of Hazardous Energy Standard's requirements, shall be conducted by DES during training sessions scheduled through the Department of Personnel Services Employee Relations and Training, or through special arrangement. The individual department managers and supervisors shall be responsible for training of all authorized employees in the specific operations, safety equipment and emergency procedures used by their respective departments.

Documentation of general LOTO training conducted by DES shall be maintained by the Department of Personnel Services as part of the employee's permanent record. Documentation of department-specific training, provided by department managers and

supervisors, shall be maintained within each department. Departmental training records may also be included in the employee's permanent record by sending a copy of the training record with a note requesting it be included in the employee's personnel file to Payroll, Rm. 1101L, Chesapeake Building.

Retraining shall be provided for all authorized and affected employees whenever there is a change in their job assignment, a change in machines, equipment or processes that present new hazard, or when there is a change in the energy control procedure. Retraining shall also be conducted whenever a periodic inspection reveals deficiencies in the program.

Procedures

The following are minimum requirements for the use of energy isolating devices whenever maintenance or servicing is done. They shall be used to ensure that the machine or equipment is stopped and isolated from all potentially hazardous energy. Additionally, they will serve as an outline to protect workers from the inadvertent release of hazardous energy.

Locking devices and tags shall be used when employees are performing maintenance or service to any machine or system where unexpected or unintentional motion could cause harm. Locking devices shall also be used when guards or other safety devices must be removed during service or when moving or energized parts put any part of the employee's body at risk of injury.

Examples of conditions where locking and tagging should be used may include, but are not limited to:

a) Clearing blocked or jammed mechanical equipment;
b) Maintenance or repair work on equipment with moving parts;
c) Confined space entries (*Refer to the University Confined Space Plan*); and
d) Repairs or installation of electrical equipment.

If the equipment being serviced must be temporarily re-activated (for example, to test the equipment as part of the installation) all start-up and lockout procedures must be followed.

Specific Instructions for Hazardous Machinery

Specific instructions shall be developed for the locking and tagging of machinery or equipment under the following conditions:

(a) When the machine being serviced has the potential for stored or residual energy, or the re-accumulation of stored energy after shut down;
(b) When the machine has multiple energy sources;
(c) When the isolation and locking of the machine will not completely deactivate it;
(d) When the machine cannot be locked out;
(e) When a single lockout device will not achieve a lockout condition; or
(f) When the lockout device will not be under the exclusive control of the authorized employee performing the service.

(Appendix II of this plan can be used to assist the supervisor in preparing specific procedures.)

Working Without a Lock

If a lock cannot be applied to the equipment, and the supervisor can demonstrate that the tagging procedure will provide a level of safety equivalent to that obtained by the use of a lock, a tag may be used instead. A tag used without a lock shall be supplemented by one additional safety measure that provides a level of safety equivalent to that obtained by the use of a lock. Additional safety methods may include the removal of an isolating circuit element, blocking of a control switch, opening of an extra disconnecting device or the removal of a valve handle to reduce the likelihood of inadvertent activation. The tagout device shall be attached to the same location that the lockout device would have been attached.

Implementing Lockout/Tagout

Employees shall implement an orderly shutdown of machinery to avoid any additional or increased hazards resulting from equipment stoppage. The following is a list of steps to be used during shutdown.

I. PREPARING FOR SHUTDOWN

(a) Identify the types of energy and sources

(b) Notify affected employees of intent to service equipment

II. SHUTTING DOWN THE EQUIPMENT

(a) Turn off equipment

(b) Deactivate energy

(c) Release all stored or residual energy

(d) Attach locking and tagging devices

(e) Verify that equipment is secure and deactivated

III. PREPARING TO RETURN EQUIPMENT TO SERVICE

(a) Remove all tools from the equipment

(b) Inspect the controls to verify they are in the "off" position

(c) Remove all locking and tagging devices

(d) Re-energize the equipment

(e) Notify affected employees when machine is back in service

I. PREPARATION FOR SHUTDOWN:

(a) Identification of the Energy Type or Source

Determine where and how equipment is being energized. Since some equipment is powered by several sources (e.g., electrical, mechanical, pneumatic, chemical, thermal and hydraulic), all energizing sources shall be identified. For complex equipment, refer to the manufacturer's control diagram detailing the locations of all isolating points. These points may include breaker panels, switches and valves. Furthermore, possible residual energy and methods used to dissipate or restrain that energy shall be identified. In addition to identifying energy sources, the employee must determine the magnitude of the energy, the hazards of the energy to be controlled and the methods or means to control the energy. **If authorized employees are unable to determine each form of energy, they must consult their supervisors before work is started.**

(b) Notification of employees

Affected employees must be notified by authorized personnel of the intent to service equipment. Notification shall be given before LOTO controls are applied and should

contain the name and job titles of authorized employees, location of equipment being serviced, and duration/date of service.

II. SHUTDOWN OF MACHINE:

(a) Shut Off Equipment

If the machine or equipment is operating, employees shall shut it down by the normal stopping procedures (depress the stop button, open the switch, close valve, etc.).

(b) Deactivate the Energy

Disconnect the device from all energy sources and release all residual energies that may present a hazard. Inspect the equipment to ensure all energy sources are disconnected.

(c) Release of Stored or Residual Energy

Release stored or residual energy, such as that in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems and pressurized systems (air, gas, steam, or water). If energy is incapable of being released, the employee shall reposition, block or utilize some other protective measure to prevent the release of residual energy while service is in progress.

(d) Attach a Lock and Tag

Attach a lock and tag, of designated color, type and descriptive warning, on each disconnecting means used to de-energize circuits and equipment on which work is to be performed. The lock shall be attached to prevent persons from operating the equipment. Tags must be securely attached to energy isolating devices so that they cannot be inadvertently or accidentally detached during use. Additionally, tags shall be attached to all points where equipment or circuits can be energized. If multiple employees are servicing the same equipment, each shall attach their own lock to a multiple lock plate.

Note: No attempt shall be made to remove another employee's lock unless the requirements listed in Section III (c) of this document are satisfied.

(d) Verify that equipment is secure and deactivated

Test the deactivation of the equipment to ensure that equipment cannot be energized and potential energy sources secured. This should be done by:

- **(i)** Checking that no personnel are exposed;
- **(ii)** Verifying the isolation of equipment by operating the push button or other normal operating controls. Secure all switches to prevent movement to the "on" or "start" position;
- **(iii)** Checking pressure gauges to ensure de-pressurization of lines; and
- **(iv)** Inspecting electrical circuits to confirm zero voltage.

Note: All employees should consider equipment to be operable at all times except when they have personally locked it out.

III. RETURNING EQUIPMENT TO SERVICE

After service has been completed and the machine is ready to be tested or returned to service the following steps must be followed.

(a) Inspect the machine and work area

Inspect the machine(s) to insure that non-essential materials have been removed and the machine is in operating order. Visual inspections shall be conducted to ensure: a) tools and equipment are removed and secured safe guards are in place; and b) blocks, pins and chain (used during the lockout) are removed. Additionally, employees shall verify all equipment components are fully assembled and operational. Finally, employees shall inspect the work area to ensure that all employees have been safely positioned or removed from the area.

(b) Inspect the controls

Verify the controls are in neutral or the "off" position.

(c) Remove the lock devices

Each lock shall be removed by the authorized employee that applied it or under his/her direct supervision. If the authorized employee is absent from the work place then the lock or tag can be removed by a qualified person designated to perform this task provided that the immediate supervisor:

- **(i)** Verifies that the employee is not present and therefore unable to remove the lock;
- **(ii)** Makes all reasonable efforts to inform the authorized employee that the lockout/tagout device has been removed; **and**
- **(iii)** Ensures that the authorized employee knows the lockout/tagout device has been removed before work resumes.

(d) Re-energize the machine.

After completing the above steps, restore the energy to the machine.

(e) Notify affected employees

Notify affected employees that the servicing or maintenance is completed, and the machine or equipment is ready for use.

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Appendix I

OSHA Control of Hazardous Energy Standard (29 CFR 1910.147)

(a) Scope, application and purpose

(1) Scope.

(i) This standard covers the servicing and maintenance of machines and equipment in which the "unexpected" energization or start up of the machines or equipment, or release of stored energy could cause injury to employees. This standard establishes minimum performance requirements for the control of such hazardous energy.

(ii) This standard does not cover the following:

(A) Construction, agriculture and maritime employment;

(B) Installations under the exclusive control of electric utilities for the purpose of power generation, transmission and distribution, including related equipment for communication or metering; and

(C) Exposure to electrical hazards from work on, near, or with conductors or equipment in electric utilization installations, which is covered by Subpart S of this part; and

(D) Oil and gas well drilling and servicing.

(2) Application.

(i) This standard applies to the control of energy during servicing and/or maintenance of machines and equipment.

(iii) Normal production operations are not covered by this standard (See Subpart O of this Part). Servicing and/or maintenance which takes place during normal production operations is covered by this standard only if:

(A) An employee is required to remove or bypass a guard or other safety device; or

(B) 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) or where an associated danger zone exists during a machine operating cycle.

Note: Exception to paragraph (a)(2)(ii):
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 the equipment for production, provided that the work is performed using alternative measures which provide effective protection (See Subpart O of this Part).

(iii) This standard does not apply to the following:

(A) Work on cord and plug connected electric 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 and by the plug being under the exclusive control of the employee performing the servicing or maintenance.

(B) 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 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 which will provide proven effective protection for employees.

(3) Purpose.

(i) This section requires employers to establish a program and utilize procedures for affixing appropriate lockout devices or tagout devices to energy isolating devices, and to otherwise disable machines or equipment to prevent unexpected energization, start up or release of stored energy in order to prevent injury to employees.

(ii) When other standards in this part require the use of lockout or tagout, they shall be used and supplemented by the procedural and training requirements of this section.

(b) Definitions applicable to this section.

"Affected employee." An employee whose job requires him/her to operator 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.
"Authorized employee." A person who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment. An affected employee becomes an authorized employee when that employee's duties include performing servicing or maintenance covered under this section.
"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.
"Energized." Connected to an energy source or containing residual or stored energy.
"Energy isolating device." A mechanical device that physically prevents the transmission or release or energy, including but not limited to the following: A manually operated electrical circuit breaker, a disconnect switch, a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors and, in addition, no pole can be operated independently; a line valve; a block; and any similar device used to block or isolate energy. Push buttons, selector switches and other control circuit type devices are not energy isolating devices.
"Energy source." Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.
"Hot tap." A procedure used in the repair maintenance and services 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.
"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.
"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.

"Normal production operations." The utilization of a machine or equipment to perform its intended production function.
"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 unjamming of machines or equipment and making adjustments or tool changes, where the employee may be exposed to the unexpected energization or startup of the equipment or release of hazardous energy.
"Setting up." Any work performed to prepare a machine or equipment to perform its normal production operation.
"Tagout." The placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.
"Tagout 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, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

(c) General -

(1) Energy control program.
The employer shall establish a program consisting of energy control procedures, employee training and to periodic inspections to ensure that before any employee performs any servicing or maintenance on a machine or equipment where the unexpected energizing, startup or release of stored energy could occur and cause injury, the machine or equipment shall be isolated from the energy source and rendered inoperative.

(2) Lockout/tagout.
(i) If an energy isolating device is not capable of being locked out, the employer's energy control program under paragraph (c)(1) of this section shall utilize a tagout system.
(ii) If an energy isolating device is capable of being locked out, the employer's energy control program under paragraph (c)(1) of this section shall utilize lockout, unless the employer can demonstrate that the utilization of a tagout system will provide full employee protection as set forth in paragraph (c)(3) of this section.
(iii) After January 2, 1990, whenever replacement or major repair, renovation or modification of a machine or equipment is performed, and whenever new machines or equipment are installed, energy isolating devices for such machine or equipment shall be designed to accept a lockout device.

(3) Full employee protection.
(i) When a tagout device is used on an energy isolating device which is capable of being locked out, the tagout device shall be attached at the same location that the lockout device would have been attached, and the employer shall demonstrate that the tagout program will provide a level of safety equivalent to that obtained by using a lockout program.
(ii) In demonstrating that a level of safety is achieved in the tagout program which is equivalent to the level of safety obtained by using a lockout program, the employer shall demonstrate 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. Additional means to be considered as part of the demonstration of full employee protection shall

include the 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.

(4) Energy control procedure.

(i) 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.

Note: "Exception:" The employer need not document the required procedure for a particular machine or equipment, when all of the following elements exist: [1] The machine or equipment has no potential for stored or residual energy or reaccumulation of stored energy after shut down which could endanger employees; [2] the machine or equipment has a single energy source which can be readily identified and isolated; [3] the isolation and locking out of that energy source will completely deenergize and deactivate the machine or equipment; [4] the machine or equipment is isolated from that energy source and locked out during servicing or maintenance; [5] a single lockout device will achieve a locker-out condition; [6] the lockout device is under the exclusive control of the authorized employee performing the servicing or maintenance; [7] the servicing or maintenance does not create hazards for other employees; and [8] the employer, in utilizing this exception, has had no accidents involving the unexpected activation or reenergization of the machine or equipment during servicing or maintenance.

(ii) The procedures shall clearly and specifically outline the scope, purpose, authorization, rules, and techniques to be utilized for the control of hazardous energy, and the means to enforce compliance including, but not limited to, the following:

(A) A specific statement of the intended use of the procedure;

(B) Specific procedural steps for shutting down, isolating, blocking and securing machines or equipment to control hazardous energy;

(C) Specific procedural steps for the placement, removal and transfer of lockout devices or tagout devices and the responsibility for them; and

(D) Specific requirements for testing a machine or equipment to determine and verify the effectiveness of lockout devices, tagout devices, and other energy control measures.

(5) Protective materials and hardware.

(i) Locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners, or other hardware shall be provided by the employer for isolating, securing or blocking of machines or equipment from energy sources.

(ii) Lockout devices and tagout devices shall be singularly identified; shall be the only device(s) used for controlling energy; shall not be used for other purposes; and shall meet the following requirements:

(A) "Durable."

{1} Lockout and tagout devices shall be capable of withstanding the environment to which they are exposed for the maximum period of time that exposure is expected.

{2} Tagout devices shall be constructed and printed so that exposure to weather conditions or wet and damp locations will not cause the tag to deteriorate or the message on the tag to become illegible.

{3} Tags shall not deteriorate when used in corrosive environments such as areas where acid and alkali chemicals are handled land stored.

(B) "Standardized."

Lockout and tagout devices shall be standardized within the facility in at least one of the following criteria: Color; shape; or size; and additionally, in the case of tagout devices, print and format shall be standardized.

(C) "Substantial" -

{1} "Lockout devices." Lockout devices shall be substantial enough to prevent removal without the use of excessive force or unusual techniques, such as with the use of bolt cutters or other metal cutting tools.

{2} "Tagout devices." Tagout devices, including their means of attachment, shall be substantial enough to prevent inadvertent or accidental removal. Tagout device attachment means shall be of a non-reusable type, attachable by hand, self-locking, and non-releasable with a minimum unlocking strength of no less than 50 pounds and having the general design and basic characteristics of being at least equivalent to a one-piece, all environment-tolerant nylon cable tie.

(D) "Identifiable."

Lockout devices and tagout devices shall indicate the identify of the employee applying the device(s).

(iii) Tagout devices shall warn against hazardous conditions if the machine or equipment is energized and shall include a legend such as the following: "Do Not Start. Do Not Open. Do Not Close. Do Not Energize. Do Not Operate."

(6) Periodic inspection.

(i) The employer shall conduct a periodic inspection of the energy control procedure at least annually to ensure that the procedure and the requirements of this standard are being followed.

(A) The periodic inspection shall be performed by an authorized employee other than the one(s) utilizing the energy control procedure being inspected.

(B) The periodic inspection shall be conducted to correct any deviations or inadequacies identified.

(C) Where lockout is used for energy control, the periodic inspection shall include a review, between the inspector and each authorized employee, of that employee's responsibilities under the energy control procedure being inspected.

(D) Where tagout is used for energy control, the periodic inspection shall include a review, between the inspector and each authorized and affected employee, of that employee's responsibilities under the energy control procedure being inspected, and the elements set forth in paragraph(c)(7)(ii) of this section.

(ii) The employer shall certify that the periodic inspections have been performed. The certification shall identify the machine or equipment on which the energy control procedure was being utilized, the date of the inspection, the employees included in the inspection, and the person performing the inspection.

(7) Training and communication.

(i) The employer shall provide training to ensure that the purpose and function of the energy control program are understood by employees and that the knowledge and skills required for the safe application, usage, and removal of the energy controls are acquired by employees. The training shall include the following:

(A) Each authorized employee shall 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 energy isolation and control.

(B) Each affected employee shall be instructed in the purpose and use of the energy control procedure.

(C) All 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 the prohibition relating to attempts to restart or reenergize machines or equipment which are locked out or tagged out.

(ii) When tagout systems are used, employees shall also be trained in the following limitations of tags:

(A) Tags are essentially warning devices affixed to energy isolating devices, and do not provide the physical restraint on those devices that is provided by a lock.

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

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

(D) Tags and their means of attachment must be made of materials which will withstand the environmental conditions encountered in the workplace.

(E) Tags may evoke a false sense of security, and their meaning needs to be understood as part of the overall energy control program.

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

(iii) Employee retraining.

(A) 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.

(B) Additional retraining shall also be conducted whenever a periodic inspection under paragraph (c)(6) of this section reveals, or whenever the employer has reason to believe that there are deviations from or inadequacies in the employee's knowledge or use of the energy control procedures.

(C) The retraining shall reestablish employee proficiency and introduce new or revised control methods and procedures, as necessary.

(iv) The employer shall certify that employee training has been accomplished and is being kept up to date. The certification shall contain each employee's name and dates of training.

(8) Energy isolation.

Lockout or tagout shall be performed only by the authorized employees who are performing the servicing or maintenance.

(9) Notification of employees.
Affected employees shall be notified by the employer or authorized employee of the application and removal of lockout devices or tagout devices. Notification shall be given before the controls are applied, and after they are removed from the machine or equipment.

(d) Application of control.
The established procedures for the application of energy control (the lockout or tagout procedures) shall cover the following elements and actions and shall be done in the following sequence:

(1) Preparation for shutdown.
Before an authorized or affected employee turns off a machine or equipment, the authorized employee shall have knowledge of the type and magnitude of the energy, the hazards of the energy to be controlled, and the method or means to control the energy.

(2) Machine or equipment shutdown.
The machine or equipment shall be turned off or shut down using the procedures established for the machine or equipment. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the equipment stoppage.

(3) Machine or equipment isolation.
All energy isolating devices that are needed to control the energy to the machine or equipment shall be physically located and operated in such a manner as to isolate the machine or equipment from the energy source(s).

(4) Lockout or tagout device application.
(i) Lockout or tagout devices shall be affixed to each energy isolating device by authorized employees.
(ii) Lockout devices, where used, shall be affixed in a manner to that will hold the energy isolating devices in a "safe" or "off" position.
(iii) Tagout devices, where used, shall be affixed in such a manner as will clearly indicate that the operation or movement of energy isolating devices from the "safe" or "off" position is prohibited.
(A) Where tagout devices are used with energy isolating devices designed with the capability of being locked, the tag attachment shall be fastened at the same point at which the lock would have been attached.
(B) Where a tag cannot be affixed directly to the energy isolating device, the tag shall be located as close as safely possible to the device, in a position that will be immediately obvious to anyone attempting to operate the device.

(5) Stored energy.
(i) Following the application of lockout or tagout devices to energy isolating devices, all potentially hazardous stored or residual energy shall be relieved, disconnected, restrained, and otherwise rendered safe.
(ii) If there is a possibility of reaccumulation of stored energy to a hazardous level, verification of isolation shall be continued until the servicing or maintenance is completed, or until the possibility of such accumulation no longer exists.

(6) Verification of isolation.
Prior to starting work on machines or equipment that have been locked out or tagged out, the authorized employee shall verify that isolation and deenergization of the machine or equipment have been accomplished.

(e) Release from lockout or tagout.
Before lockout or tagout devices are removed and energy is restored to the machine or equipment,

procedures shall be followed and actions taken by the authorized employee(s) to ensure the following:

(1) The machine or equipment.
The work area shall be inspected to ensure that nonessential items have been removed and to ensure that machine or equipment components are operationally intact.

(2) Employees.
(i) The work area shall be checked to ensure that all employees have been safely positioned or removed.
(ii) Before lockout or tagout devices are removed and before machines or equipment are energized, affected employees shall be notified that the lockout or tagout devices have been removed.
(iii) After lockout or tagout devices have been removed and before a machine or equipment is started, affected employees shall be notified that the lockout or tagout device(s) have been removed.

(3) Lockout or tagout devices removal.
Each lockout or tagout device shall be removed from each energy isolating device by the employee who applied the device. Exception to paragraph (e)(3). 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 that 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 shall include at least the following elements:
(i) Verification by the employer that the authorized employee who applied the device is not at the facility:
(ii) Making all reasonable efforts to contact the authorized employee to inform him/her that his/her lockout or tagout device has been removed; and
(iii) Ensuring that the authorized employee has this knowledge before he/she resumes work at that facility.

(f) Additional requirements.

(1) Testing or positioning of machines, equipment or components thereof.
In situations in which lockout or tagout devices must be temporarily removed from the energy isolating device and the machine or equipment energized to test or position the machine, equipment or component thereof, the following sequence of actions shall be followed:
(i) Clear the machine or equipment of tools and materials in accordance with paragraph (e)(1) of this section;
(ii) Remove employees from the machine or equipment area in accordance with paragraph (e)(2) of this section;
(iii) Remove the lockout or tagout devices as specified in paragraph (e)(3) of this section;
(iv) Energize and proceed with testing or positioning;
(v) Deenergize all systems and reapply energy control measures in accordance with paragraph (d) of this section to continue the servicing and/or maintenance.

(2) Outside personnel (contractors, etc.).

(i) Whenever outside servicing personnel are to be engaged in activities covered by the scope and application of this standard, the on-site employer and the outside employer shall inform each other of their respective lockout or tagout procedures.

(ii) The on-site employer shall ensure that his/her employees understand and comply with the restrictions and prohibitions of the outside employer's energy control program.

(3) Group lockout or tagout.

(i) When servicing and/or maintenance is performed by a crew, craft, department or other group, they shall utilize a procedure which affords the employees a level of protection equivalent to that provided by the implementation of a personal lockout or tagout device.

(ii) Group lockout or tagout devices shall be used in accordance with the procedures required by paragraph (c)(4) of this section including, but not necessarily limited to, the following specific requirements:

(A) Primary responsibility is vested in an authorized employee for a set number of employees working under the protection of a group lockout or tagout device (such as an operations lock);

(B) Provision for the authorized employee to ascertain the exposure status of individual group members with regard to the lockout or tagout of the machine or equipment and

(C) When more than one crew, craft, department, etc. is involved, assignment of overall job-associated lockout or tagout control responsibility to an authorized employee designated to coordinate affected work forces and ensure continuity of protection; and

(D) Each authorized employee shall affix a personal lockout or tagout device to the group lockout device, group lockbox, or comparable mechanism when he or she begins work, and shall remove those devices when he or she stops working on the machine or equipment being serviced or maintained.

(4) Shift or personnel changes.

Specific procedures shall be utilized during shift or personnel changes to ensure the continuity of lockout or tagout protection, including provision for the orderly transfer of lockout or tagout device protection between off-going and oncoming employees, to minimize exposure to hazards from the unexpected energization or start-up of the machine or equipment, or the release of stored energy.

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Appendix II

Specific Instructions for Hazardous Machinery

Part I

Machine Name:_____Machine Serial Number:_____Department Name:_____

_____Approved by:_____Date:_____

Part II

a. What types of hazardous energy may be present?
Circle all that apply.

Electrical Chemical Pneumatic Hydraulic Thermal Other:_____

b. Complete Energy Check List (Reverse side of this form)

c. Special Locking and Tagging instructions:

_____

_____

_____

Part III

Attach a diagram or photo identifying lock and tag locations:

Energy Control Diagram

ENERGY CHECKLIST

Energy Type	Hazard	Magnitude	Control Method
Electrical	Shock Burn Fire _____	110 VAC 220 VAC 208 VAC/30 ___V____A	Main Switch Plug Control Fuse Blocks Shielding
Pneumatic	Mechanical/ Pinch Points Crush Laceration Flying Debris	 Moderate Slight High ___lb Force	 Air Line Valve Gas Cylinder Valve Gas Line Valve _____
Chemical (Gas)	Flammable Corrosive Toxic Reactive	Slight Moderate High	Cylinder Valve Gas Line Valve
Chemical (Liquid)	Flammable Corrosive Toxic Reactive	Slight Moderate High	Valve Flange Plate
Mechanical	Shaft in Motion Moving Parts Crushing Laceration Impalement	Slight Moderate High ____ft-lb ____hp	Main Electrical Switch Plug Control Shielding Blocking Anti-Motion Pin
UV	Skin and Eye Burns	Slight Moderate High ___W/cm²@___ë	Shielding Main Switch Plug Control Circuit Breaker
ElectroMagnet	Strong Field	Slight Moderate High ____Gauss	Main Switch Plug Control Circuit Breaker
Thermal	Burns	Moderate Temperature High Temperature Cryogenic ____EC	Main Switch Plug Control Steam Valve Fluid Line Valve

*Chart adopted from the January/February 1995 issue of *Compliance Magazine.*

Appendix III

Using the LOTO Plan

I. PREPARING FOR SHUTDOWN

(a) Identify the types of energy and sources

(b) Notify affected employees of intent to service machinery

II. SHUTTING DOWN THE EQUIPMENT

(a) Turn off equipment

(b) Deactivate energy

(c) Release all stored or residual energy

(d) Attach locking and tagging devices

(e) Test to make sure equipment has been deactivated

III. COMPLETE WORK

IV. PREPARING TO RETURN EQUIPMENT TO SERVICE

(a) Remove all tools from the equipment

(b) Inspect the controls to verify they are in the "off" position

(c) Remove all locking and tagging devices

(d) Re-energize the equipment

(e) Notify affected employees when equipment is back in service