



Control of Hazardous Energy Program (Lockout/Tagout)

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Approved:

A handwritten signature in cursive script, appearing to read "David D. ...", written over a horizontal line.

Senior Director Environmental Health and Public Safety

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PURPOSE

The purpose of this program is to ensure effective implementation, operation, and recordkeeping of a University lockout/tagout program in compliance with 29 CFR 1910.147 (effective January 2, 1990).

SCOPE

The provisions of the Lockout/Tagout Program shall apply to all personnel at Purdue University's West Lafayette Campus and Regional Campuses, University Research Farms and Agricultural Centers, and related facilities and operations. As used in this program, the terms "employee" and "personnel" include students.

APPLICATION

General

This program applies to 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 program establishes minimum performance requirements for the control of such hazardous energy.

Responsibilities

Each department head is responsible for conducting a hazard assessment of his/her area of control to determine whether the lockout/tagout program applies to the processes and equipment in his or her area. Departments are responsible for adopting and implementing this Control of Hazardous Energy Program (Lockout/Tagout). Employees are responsible to observe safety practices contained in the Lockout/Tagout program and to point out unsafe conditions to their supervisor.

Written Energy Control Procedures

The supervising department shall develop, document, and use energy control procedures to control potentially hazardous energy before workers perform service/maintenance activities covered by the Control of Hazardous Energy (Lockout/Tagout) Standard. This may be accomplished by using the "Equipment Lockout Work Plan" form in Appendix D.

These written, machine or equipment specific procedures must identify the information that the authorized employee(s) must know to control hazardous energy (steam, water, natural gas, compressed air, chemical, electrical, hydraulic, nuclear, mechanical, and others) during servicing or maintenance. If this information is the same for various machines or equipment or if other means of logical grouping exists, then a single energy control procedure may be sufficient. If there are other conditions, such as multiple energy sources, different connecting means, or a particular sequence that must be followed to shut down the machine or equipment, then the supervising department must develop separate, machine or equipment specific, written energy control procedures to protect the employees (See Appendix C for sample Lockout/Tagout procedures).

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Exclusions

1. 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 its single energy source and by the plug being under the exclusive control of the one and only employee performing the servicing;
2. Minor tool changes and adjustments, and other minor servicing activities, which take place during normal production operations, if they are routine, repetitive, and integral to the use of the equipment, provided that the work is performed using alternative measures which provide effective protection, and;
3. 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 supervising department demonstrates to the satisfaction of the Safety Coordinator, Department of Radiological and Environmental Management, that (1) continuity of service is essential; (2) shutdown of system is impractical; and (3) documented procedures are followed, and special equipment is used which will provide proven, effective protection for employees.

ENFORCEMENT

Failure to follow the Purdue University Lockout/Tagout Program can result in life threatening or serious injury situations. Failure to lockout or tagout or otherwise not follow the Lockout/Tagout procedures will result in disciplinary action up to and including discharge.

DEFINITIONS

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

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

"Capable of being locked out" - An energy-isolating device will be considered to be capable of being locked out if either it is designed with a hasp or other attachment or integral part to which, or through which, a lock can be affixed, or if it has a locking mechanism built into it. Other energy-isolating devices will also be considered to be capable of being locked out if lockout can be achieved without the need to dismantle, rebuild, or replace the energy-isolating device or permanently alter its energy control capability.

Energized - Connected to an energy source or containing residual or stored energy.

Energy-isolating device - A mechanical device that physically prevents the transmission or release of energy, including, but not limited to, the following: a manually operated electrical circuit breaker; a disconnect switch; a manually operated switch by which the conductors and, in addition, no pole can be operated independently; a slide gate; a slip blind; a line valve; a block; and any similar device used to block or isolate energy. The term does not include a push button, selector switch, and other control circuit-type 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 a safe position and prevent the energizing of a machine or equipment.

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 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 tag and a means of attachment, which can be fastened securely 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.

PROTECTIVE MATERIALS AND HARDWARE

The supervising department shall provide locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners, or other hardware for isolating, securing, or blocking of machines or equipment from energy sources.

Lockout devices and tagout devices must be singularly identified and the only device(s) used for controlling energy, and shall not be used for other purposes. In addition lockout and tagout devices shall also be:

- **Durable** - 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.
- **Standardized** - Lockout and tagout devices shall be standardized 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.
- **Substantial**
 - 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.
 - 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 having the general design and basic characteristics of being at least equivalent to a one-piece, all-environment-tolerant nylon cable tie.
- **Identifiable**
 - Lockout devices and tagout devices shall indicate the date installed and the identity of the employee(s) applying the device(s).
 - 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 Energize”, or “Do Not Operate”.
- **Approved by REM** - Only lockout devices and tagout devices approved by the Department of Radiological and Environmental Management (REM) shall be used.

INSPECTIONS

Routine Inspections

The supervising department shall continually monitor employee performance with regard to compliance with this program and shall correct any deviations or inadequacies observed.

Periodic Inspections

At least annually, supervising departments shall conduct a periodic inspection. This periodic inspection shall include:

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1. A separate review of each written energy control procedure. This will ensure that the procedures are adequate to provide the necessary protection and to identify what changes, if any, are needed.
2. Observing the implementation of an energy control procedure(s).

An authorized employee other than the one(s) utilizing the energy control procedure being inspected shall perform the periodic inspection.

The employee performing the periodic inspection does not have to observe every authorized employee implementing the energy control procedure on the machine or equipment on which he or she is authorized to perform servicing and maintenance.

The inspector participating in the review needs to:

1. Observe a representative number of such employees while they are implementing the procedure and
2. Talk with all other authorized employees even though they may not be implementing the energy control procedure.

This review may be completed in one or more meetings in which all authorized employees (as well as affected employees when tagout is used) will be in attendance to review the specific energy control procedures.

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.

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 procedures being inspected.

The supervising department shall certify in writing 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. The inspection certification shall be maintained on file in the supervising department. See Periodic Inspection of Energy Control Procedures form in Appendix D.

TRAINING AND COMMUNICATION

Initial Training

The supervising department 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 energy controls are acquired by employees. Training shall include the following:

1. 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.

2. Each affected employee shall be instructed in the purpose and use of the energy control program.
3. 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.
4. Supervising departments shall maintain a current list of authorized employees. A copy of the list of authorized employees shall be forwarded to the Safety Coordinator, Department of Radiological and Environmental Management.

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 presents a new hazard, or when there is a change in the energy control procedure.

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

The training shall reestablish employee proficiency and introduce new or revised control methods and procedures, as necessary.

Record Keeping

The supervising department will maintain all Lockout/Tagout records. These records must include:

- Certification that employee training has been accomplished and is being kept up-to-date. The certification shall contain, as a minimum, each employee's name and dates of training and a training summary. A copy of the training record shall be provided to Safety Coordinator, REM. A sample training record form is appended.
- Specific written lockout/tagout procedures for equipment/machines covered by the program (see "WRITTEN ENERGY CONTROL PROCEDURES" Section).
- Completed Periodic Inspection of Energy Control Procedures forms for this equipment/machinery conducted annually (see "PERIODIC INSPECTIONS" Section and Appendix D3).
- Any completed Exchange of Lockout/Tagout forms (see "OUTSIDE PERSONNEL" Section and Appendix D4).

OUTSIDE PERSONNEL (Contractors, etc.)

Whenever outside servicing personnel are to be engaged in activities covered by the scope and application of this procedure, the supervising department and the outside employer shall inform each other of their respective lockout or tagout procedures.

The supervising department shall ensure that his/her personnel understand and comply with restrictions and prohibitions of the outside employer's energy control procedures. Use the Exchange of Lockout/Tagout Program form in Appendix D.

GENERAL PROCEDURES

Energy Isolation

Implementation of lockout or the tagout system shall be performed only by authorized employees.

Notification of Employees

Affected employees shall be notified by the supervising department 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.

Tagout

OSHA has determined that lockout is a more effective means of ensuring the de-energization of equipment; it is the preferred method. However, OSHA recognizes that tagout must be used where the energy control device cannot accept a lock. If the energy isolating device is capable of being locked out, the standard requires that a lockout be used unless the employer can demonstrate that tagout will provide "full employee protection," ("Tags Plus") – i.e., a level of protection that is equivalent to lockout. Refer to "Responsibilities" Section for clarification of responsibilities in making this determination.

After November 1, 1994, whenever replacement, 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 machines or equipment must be designed to accept a lockout device.

When tagout systems are used, employees shall also be trained in the following:

1. 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.
2. 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.
3. 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.

4. Tags and their means of attachment must be made of materials, which will withstand the environmental conditions encountered in the workplace.
5. Tags may evoke a false sense of security, and their meaning needs to be understood as part of the overall energy control program.
6. Tags must be securely attached to energy-isolating devices so that they cannot be inadvertently or accidentally detached during use.

Preparation for Lockout or Tagout

Make a survey to locate and identify all isolating devices to be certain which switch(s), valve(s) or energy-isolating devices apply to the equipment to be locked or tagged out. More than one energy source (electrical, mechanical, or others) may be involved. See “Equipment Lockout Work Plan” in Appendix D.

Sequence of Lockout Tagout System Procedures

1. Notify all affected employees that a lockout or tagout system is going to be utilized and the reason therefore. The authorized employee shall know the type and magnitude of energy that the machine or equipment utilizes and shall understand the hazards thereof.
2. If the machine or equipment is operating, shut it down by the normal stopping procedure (depress stop button, open toggle switch, etc.).
3. Operate the switch, valve, or other energy-isolating device(s) so that the equipment is isolated from its energy source(s). Stored energy (such as that in springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, water pressure, etc.) must be dissipated or restrained by methods such as repositioning, blocking, bleeding down, etc.
4. Lockout and/or tagout the energy-isolating devices with assigned individual lock(s) and/or tag(s).
 - a. After ensuring that no personnel are exposed, and as a check on having disconnected the energy sources:
 - b. Operate the push button or other normal operating controls to make certain the equipment will not operate.
5. If the equipment may be operated from a remote station or computer control system the authorized employee **MUST verify that the equipment will not start remotely.**
CAUTION: Return operating control(s) to “neutral” or “off” position after the test.
6. The equipment is now locked out and/or tagged out.

Restoring Machines or Equipment to Normal Production Operations

1. After the servicing and/or maintenance is complete and equipment is ready for normal production operations notify the affected employee(s) and check the area around the machines or equipment to ensure that no one is exposed.
2. After all tools have been removed from the machine or equipment, guards have been reinstalled and employees are in the clear, remove all lockout and tagout

devices. Operate the energy-isolating devices to restore energy to the machine or equipment.

Procedures Involving More Than One Person

In the preceding steps, if more than one individual is required to lockout or tagout equipment, each shall place his/her own personal lockout device or tagout device on the energy-isolating device(s). When an energy-isolating device cannot accept multiple locks or tags, a multiple lockout or tagout device (hasp) may be used. If lockout is used a single lock may be used to lockout the machine or equipment with the key being placed in a lockout box or cabinet which allows the use of multiple locks to secure it. Each employee will then use his/her own lock to secure the box or cabinet. As each person no longer needs to maintain his or her lockout protection, that person will remove his/her lock from the box or cabinet (see "Group Lockout/Tagout" Section).

Basic Rules for Using Lockout or Tagout System Procedures

All equipment shall be locked out or tagged out to protect against accidental or inadvertent operation when such operation could cause injury to personnel. Do not attempt to operate any switch, valve, or other energy-isolating device where it is locked or tagged out.

Removal of Lockout or Tagout Device by Others

Each lockout or tagout device shall be removed from each energy isolating device by the employee who applied the device.

Exception: The supervisor of an employee may remove a lockout or tagout device provided a documented procedure is followed. At a **minimum**, this procedure shall include, but not be limited to, these actions by the supervisor:

1. Verification that the authorized employee who applied the device is not on site;
2. Making all reasonable efforts to contact the authorized employee to inform him/her that his/her lockout or tagout device has been removed; and
3. Ensuring that the authorized employee has this knowledge **before** he/she resumes work on the site.

For additional information or clarification regarding removal of lockout or tagout by others, contact the Safety Coordinator at Radiological and Environmental Management. See "Lockout/Tagout Emergency Removal Procedure" in Appendix E.

GROUP LOCKOUT/TAGOUT

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

Group lockout shall be utilized where complex Lockout/Tagout (**LO/TO**) operations involve many employees and numerous energy- isolating devices. In such situations the supervising department may designate a **primary authorized employee**, with the primary responsibility for a set number of employees working under the group LO/TO device(s). The **primary**

authorized employee must implement and coordinate the LO/TO of hazardous energy sources and verify that the steps taken, in accordance with the specific written energy control procedure, have in fact isolated the machine or equipment effectively from the hazardous energy sources. This must be accomplished **before** authorized employees participating in the group LO/TO affix their personal lockout device to the group LO/TO box and **before** performing servicing/maintenance activities.

In addition to the **primary authorized employee**, each authorized employee participating in the group LO/TO must be informed of their right to verify the effectiveness of the lockout measures. Each authorized employee must be allowed to personally verify that hazardous energy sources have been effectively isolated, if they so choose. An authorized employee, who opts to verify the effectiveness of the isolation measures, must perform this verification **after** affixing his or her personal lockout device to the lock box and **before** performing servicing/maintenance activities.

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

It is imperative that each authorized employee understands the hazards of the work and how to control the hazards. Furthermore, it is required that authorized employee(s) have knowledge regarding the type and magnitude of the energy, the hazards of the energy to be controlled, and the procedure to be used to control the hazardous energy.

Note: “Authorized Employee” designation does not mean that the employee is able to safely lockout and tagout all machinery and equipment of the employer. Employee is authorized on machinery and equipment on a case by case basis as ability and knowledge dictate.

SHIFT OR PERSONNEL CHANGES

Specific procedures shall be utilized during shift or personnel changes to ensure the continuity of lockout or tagout protection. This shall include 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.

Whenever work is being performed, under group LO/TO, outside the normal shift or working hours a **primary authorized employee** must be present at all times. When changing shifts the supervising department may, through an orderly transfer, designate a new primary authorized employee. This new primary authorized employee must attach their personal lockout device to the group LO/TO box before the previous primary authorized employee removes their lockout device. The primary authorized employee will assume the responsibilities previously described.

Whenever work is performed over a period of time and is not continuous, **the primary authorized employee** shall walk through the affected work area(s) to verify effective isolation

prior to beginning work. It is not sufficient for the primary authorized employee(s), to merely review tests in a job briefing and to rely on a locked box. Rather, each applicable energy isolation device must be verified to assure effective energy isolation.

ADDITIONAL INFORMATION

For additional information regarding this procedure, contact the Safety Coordinator, Department of Radiological and Environmental Management, CIVL, B173B (ext. 41425).

Acknowledgement is made to Iowa State University Environmental Health and Safety for its permission to use the "*Equipment Lockout Work Plan*" form, the "*Periodic Inspection of Energy Control Procedures*" form, and the "*Exchange of Lockout/Tagout Program*" form included in Appendix D of this document.

APPENDICIES

PURDUE UNIVERSITY

LOCKOUT/TAGOUT:
General Procedures for Employees

Preparation for Lockout or Tagout

Make a survey to locate and identify all isolating devices to be certain which switch(s), valve(s) or other energy-isolating devices apply to the equipment to be locked or tagged out. More than one energy source (electrical, mechanical, or others) may be involved. Consult the written, machine-specific lockout procedure for the particular machine or equipment being locked or tagged out.

Sequence of Lockout or Tagout System Procedures

1. Notify all affected employees that a lockout or tagout system is going to be utilized and the reason thereof. The authorized employee shall know the type and magnitude of energy that the machine or equipment utilizes and shall understand the hazards thereof.
2. If the machine or equipment is operating, shut it down by the normal stopping procedure (depress stop button, open toggle switch, etc.).
3. Operate the switch, valve, or other energy-isolating device(s) so that the equipment is isolated from its energy source(s). Stored energy (such as that in springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure, etc.) must be dissipated or restrained by methods such as repositioning, blocking, bleeding down, etc.
4. Lockout and/or tagout the energy-isolating device(s) with assigned individual (locks) and/or tag(s)
5. After ensuring that no personnel are exposed, and as a check on having disconnected the energy sources:
 - a. Operate the push button or other normal operating controls to make certain the equipment will not operate.
 - b. If the equipment may be operated from a remote station or computer control system the authorized employee **MUST verify that the equipment will not start remotely.**

CAUTION: Return operating control(s) to “neutral” or “off” position after the test.
6. The equipment is now locked out and/or tagged out.

Restoring Machines or Equipment to Normal Production Operations

1. After servicing and/or maintenance is complete and equipment is ready for production operations, check the area around the machines or equipment to ensure that no one is exposed.
2. After all tools have been removed from the machine or equipment, guards have been reinstalled and employees are in the clear, remove all lockout and tagout devices. Operate the energy-isolating devices to restore energy to the machine or equipment.

Procedures Involving More than One Person

In the preceding steps, if more than one individual is required to lockout or tagout equipment, each shall place his/her own personal lockout device or tagout device on the energy-isolating device(s). When an energy-isolating device cannot accept multiple locks or tags, a multiple lockout or tagout device (hasp) may be used. If lockout is used, a single lock may be used to lockout the machine or equipment with the key being placed in a lockout box or cabinet which allows the use of multiple locks to secure it. Each employee will then use his/her own lock to secure the box or cabinet. As each person no longer needs to maintain his or her lockout protection, that person will remove his/her lock from the box or cabinet.

Basic Rules for Using Lockout or Tagout System Procedures

All equipment shall be locked or tagged out to protect against accidental or inadvertent operation when such operations could cause injury to personnel. Do not attempt to operate any switch, valve, or other energy-isolating device where it is locked or tagged out.

Additional Information

For additional information regarding this procedure, contact the Safety Coordinator, Department of Radiological and Environmental Management, B713 CIVL, (ext. 41425).

PURDUE UNIVERSITY

LOCKOUT/TAGOUT:
Summary of Group Lockout/Tagout**Primary Authorized Employee Definition:**

Individual designated by the supervising department with the primary responsibility for a set number of employees working under the group LO/TO device(s).

Responsibilities

The primary authorized employee must:

1. Implement and coordinate the LO/TO of hazardous energy sources.
2. Verify that the steps taken, in accordance with the specific written energy control procedure, have in fact isolated the machine or equipment effectively from the hazardous energy sources.
 - a. This must be accomplished **before** authorized employees participating in the group LO/TO affix their personnel lockout device to the group LO/TO box and **before** performing servicing/maintenance activities.
3. Inform each authorized employee participating in the group LO/TO of their right to verify the effectiveness of the lockout measures, and allow each authorized employee to personally verify that hazardous energy sources have been effectively isolated, if they so choose.
 - a. In addition to the primary authorized employee, An authorized employee, who opts to verify the effectiveness of the isolation measures, must perform this verification **after** affixing his or her personal lockout device to the lock box and **before** performing servicing/maintenance activities.
4. Provide for an orderly exchange of group LO/TO with a new primary authorized employee when work continues over multiple shifts.
5. whenever work is performed over a period of time and is not continuous, the primary authorized employee shall walk through the affected work area(s) to verify effective isolation prior to beginning work.

PURDUE UNIVERSITY

LOCKOUT/TAGOUT: Example of a Complex Lockout/Tagout Procedure

Energy Control Procedure for WADE Utility Plant

Machine Name: Boiler # 1 Electrostatic precipitation
System Name: Boiler #1
Machine Code: ESPB-1
Location: Fan Floor

SPECIAL NOTES: This equipment utilizes a 480-volt transformer input to produce a high voltage on the collector grids of the precipitator. A system of keyed interlocks is provided to prevent personnel from approaching high voltage parts while in operation. These locks are installed on the main circuit breaker, manway doors, and high voltage disconnect/grounding switch. **Entrance into the precipitator or precipitator hoppers will require a confined space entry permit and lockout/tagout of items 6-14.**

Energy Sources Applicable to This Equipment:

<input checked="" type="checkbox"/> Electrical	<input checked="" type="checkbox"/> Thermal	<input type="checkbox"/> Water
<input type="checkbox"/> Hydraulic	<input type="checkbox"/> Pneumatic	<input type="checkbox"/> Springs
<input type="checkbox"/> Mechanical	<input type="checkbox"/> Steam	<input checked="" type="checkbox"/> Air
<input type="checkbox"/> Compressed gas	<input type="checkbox"/> Elevated Machine Members	
<input type="checkbox"/> Radio frequency	<input type="checkbox"/> Other: <u>Natural Gas</u>	

Energy Control Devices Needed:

<input checked="" type="checkbox"/> Locks	<input checked="" type="checkbox"/> Tags	<input type="checkbox"/> Hasps
<input type="checkbox"/> Plug Cover Box	<input checked="" type="checkbox"/> Chain	<input type="checkbox"/> Block
<input type="checkbox"/> Pin	<input checked="" type="checkbox"/> Other: <u>Grounding Cable Set</u>	

Lockout/Tagout procedure:

Notify **all** affected individuals and proceed as follows. Notify management in the event of any abnormal situation.

1. Boiler must be shut down by normal operating procedures, check with operators to be sure precipitator is ready to be shut down and have operators shut down the precipitator.
2. Open, lockout and tag switch “Electrostatic Precipitator #1” on Motor Control Center – F (MCC-F).
3. Open, lockout and tag switch “Precipitator Hopper Vibrator 1A” on MCC-F.
4. Open, lockout and tag switch “Precipitator Hopper Vibrator 1B” on MCC-F.

5. Precipitation Hoppers:
 - a. If work is to be done inside the precipitator or hoppers, vacuum must be pulled on hoppers and breaching cleaned prior to entry. Complete steps 6 thru 14, and complete confined space entry permit forms and procedure.
 - b. If work is outside of precipitator and hoppers, skip to step 15.
6. Open, lockout and tag switch “ Forced Draft Fan No. 1” on Sub-I
7. Close, lockout and tag 125# Main Steam Valve on # 1 Forced Draft Fan Turbine.
8. Close, lockout and tag 15# Main Steam Valve on # 1 Forced Draft Fan Turbine.
9. Open, lockout and tag switch “Induced Draft Fan No. 1” on Sub-I.
10. Close, lockout and tag 125# Main Steam Valve on # 1 Induced Draft Fan Turbine.
11. Close, lockout and tag 15# Main Steam Valve on # 1 Induced Draft Fan Turbine.
12. Open, lockout and tag “Overfire Air Fan No. 1 Electric” on MCC-C.
13. Close, lockout and tag 125# Main Steam Valve on Overfire Air Fan No. 1 Turbine.
14. Close, lockout and tag Main Natural Gas Valve for Boiler # 1 Gas Burners on operating floor.
15. Test controls to verify that all energy has been removed and unit is in a zero energy state.
16. Operate key sequence interlocks to open the precipitator doors.
17. Check to see that grounding switch has operated correctly and that the high voltage grid is grounded.
18. Using high voltage gloves, place a grounding cable set from building ground to high voltage buss on top of precipitator, connecting to the high voltage buss last.
19. Complete work or task with caution and double check work or the adjustment completed.
20. Clear area of tools and equipment; notify all affected employees of impending re-start of equipment or machine.
21. Remove lockout/tagout devices and grounding sets using high voltage gloves and re-energize switches and valves.
22. Notify operators and supervisor of completion of work, to allow equipment to be placed back in service.

PURDUE UNIVERSITY

**LOCKOUT/TAGOUT PROGRAM:
Equipment Lockout Work Plan**

Equipment: _____ Location: _____

Work Scope: _____

Contact Person: _____

Energy Flow to be Controlled (Check All that Apply)

- | | | | |
|---|---|---------------------------------------|------------------------------------|
| <input type="checkbox"/> Steam | <input type="checkbox"/> Natural Gas | <input type="checkbox"/> Moving Parts | <input type="checkbox"/> Chemicals |
| <input type="checkbox"/> Electric Power | <input type="checkbox"/> Compressed Air | <input type="checkbox"/> Pneumatic | <input type="checkbox"/> _____ |
| <input type="checkbox"/> Control Power | <input type="checkbox"/> Water | <input type="checkbox"/> Hydraulic | <input type="checkbox"/> _____ |

Lockout Checklist

- Complete an Equipment Lockout Plan
- Identify all energy sources
- Notify affected employees
- The equipment has been removed from service
- The equipment has been isolated
- Apply lockout devices
- Reduce equipment to a zero energy state
- Test and Verify equipment isolation
- Perform Task
- Notify Supervisor when equipment is available for service
- Return all lockout devices to proper storage

Lockout Points

<u>Hazard</u>	<u>Action Required</u>	<u>Lock #</u>	<u>Name</u>	<u>Lock On</u>	<u>Lock Off</u>

The official version of this information will only be maintained in an on-line web format. Review the material on-line prior to placing reliance on a dated printed version.

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**LOCKOUT/TAGOUT PROGRAM:
Periodic Inspection of Energy Control Procedures**

This form is used to inspect energy control procedures for the following equipment/machines:

Basic Information: (Complete/Compare with Existing Energy Control Procedures)

Department: _____ Building: _____ Date: _____

Location/Area: _____

Inspector: _____

Authorized Employee(s) Involved: _____

Other Employees Affected: _____

Service/Maintenance Activities Requiring Lockout/Tagout: _____

Review the current lockout/tagout procedures and indicate whether procedures are satisfactory. Any procedures marked NO must be explained under Comments/Deficiencies below.

a. Control Methods:	Satisfactory?	<input type="checkbox"/>	Yes	<input type="checkbox"/>	NO
b. General Review of Responsibilities and Procedures:	Satisfactory?	<input type="checkbox"/>	Yes	<input type="checkbox"/>	NO
c. Energy Identification:	Satisfactory?	<input type="checkbox"/>	Yes	<input type="checkbox"/>	NO
d. Lockout Device:	Satisfactory?	<input type="checkbox"/>	Yes	<input type="checkbox"/>	NO
e. Energy Release Methods:	Satisfactory?	<input type="checkbox"/>	Yes	<input type="checkbox"/>	NO
f. Lockout Steps:	Satisfactory?	<input type="checkbox"/>	Yes	<input type="checkbox"/>	NO
g. Comments/Deficiencies:					
<hr/>					
<hr/>					
<hr/>					

Certification:

This energy control procedure is adequate (or modified as noted above). The inspector has reviewed appropriate responsibilities with the Authorized Employee(s). Tag limitations were inspected and appropriate affected employees included in this review where tagout devices are used.

Inspector's Signature: _____ Date: _____

Authorized Employee's Signature: _____ Date: _____

PURDUE UNIVERSITY

LOCKOUT/TAGOUT PROGRAM: Exchange of Lockout/Tagout Program

The lockout/tagout standard requires that the department exchange energy control procedures with outside employers who service and/or maintain Purdue equipment/machines that require lockout/tagout. This form is used to notify both parties that they must comply with the restrictions and prohibitions of those procedures. It should be completed by the departmental contact person in conjunction with the outside employer's representative. The exchange of information must occur before service/maintenance activities begin. If Purdue employees will also be working on this equipment or in surrounding areas, attach this to the Energy Control Procedures form.

I. Identification of Outside Employer:

Name: _____ Phone: _____
 Address: _____
 Project Name/Equipment: _____

 II. Check here to indicate that energy control procedures for the equipment/machine have been exchanged.

Comments: _____

III. After comparing the two Lockout/Tagout programs, note any additional restrictions/prohibitions below:

IV. Affected Personnel (listed below) shall understand and comply with these differences.

(Printed Name)	(Signature)
_____	_____
_____	_____
_____	_____
_____	_____

V. Acknowledged acceptance of the provisions of this form:

Outside Employer Representative: _____ (Signature) _____ (Date)

Purdue Departmental Contact: _____ (Signature) _____ (Date)

PURDUE UNIVERSITY

LOCKOUT/TAGOUT PROGRAM: Lockout/Tagout Emergency Removal Procedure

Physical Facilities Procedure for Removal of Lockout/Tagout (LO/TO) Device by Personnel Other Than Maintenance Worker Who Applied It

THIS PROCEDURE SHOULD ONLY BE USED IN AN EMERGENCY TO PROTECT LIFE, LIMB, AND PROPERTY!

(See "Enforcement" Section for disciplinary action for failure to comply.)

Preface

The Maintenance Worker who attached the LO/TO device should always be the first person contacted. If contacted, the Maintenance Worker will be the person to decide if it is possible to safely remove the LO/TO device. If able to respond, the Maintenance Worker will be the person to remove the lock. When determining if the situation warrants an emergency designation and if after-hours response or overtime is required to perform the work, the Maintenance Worker will follow their respective departmental guidelines and consult with their supervisor as appropriate.

During Working Hours

1. Attempt to contact the Maintenance Worker who applied the LO/TO device from the contact information on the Lock Out tag.
2. If the Maintenance Worker who applied the LO/TO device cannot be reached, attempt to contact the Maintenance Worker's supervisor. The Maintenance Worker's shop is listed on the LO/TO tag. The name of the supervisor can be found using Purdue Telephone Directory or the Physical Facilities Organizational Charts at this link:
<http://www.purdue.edu/physicalfacilities/pdf/Bldgs&Grds.pdf>
3. If the Physical Facilities Supervisor cannot reach the Maintenance Worker who applied the LO/TO device, the supervisor will decide if the LO/TO device should be removed and what work is necessary to put the equipment or system into a safe condition to do so.
4. If the LO/TO device is removed without the knowledge of the Maintenance Worker who applied it, that worker must be notified that the LO/TO device has been removed prior to resuming work on campus.

After Working Hours or On Weekends

1. Attempt to contact the Maintenance Worker who applied the LO/TO device from information on the LO/TO tag and Purdue Directory.
2. If the worker cannot be reached, call Purdue Police Department to have the Physical Facilities 1st responder contact the person requesting removal of LO/TO device to receive the name, department and shop of the Maintenance Worker who applied the LO/TO device.
3. From that information, the Physical Facilities 1st responder should attempt to contact the Maintenance Worker who applied the LO/TO device.
4. If the worker cannot be reached by the 1st responder, then the Supervisor of the Maintenance Worker who applied the LO/TO device should be contacted.
5. The Supervisor should attempt to contact the Maintenance Worker who applied the LO/TO device to determine if the LO/TO device should be removed and what work is necessary to put the equipment or system into a safe condition to do so.
6. If the Maintenance Worker cannot be reached, the Supervisor should decide if it is possible to safely remove the LO/TO device and whether to do so. If the supervisor decides to have the LO/TO device removed, the Maintenance Worker must be notified of the LO/TO device removal prior to resuming work on campus.