



**ENVIRONMENTAL
HEALTH & SAFETY**

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

This page intentionally left blank

UNIVERSITY OF NEW MEXICO
Department of Environmental Health & Safety

Casey B. Hall

Casey Hall
Director

Zachary Peterson
Zachary Peterson (Jun 28, 2024 16:29 MDT)

Zachary Peterson
Safety Manager

Scheryl R. Chinn

Scheryl Chinn (for Melissa Terry)
Safety Specialist

Thanatos VonFox
Thanatos VonFox (Jun 10, 2024 13:13 MDT)

Thanatos VonFox
Unit Administrator

DOCUMENT REVISION LOG

Document: **Lockout / Tagout Program**

Rev. No.	Effective Date	Revision Description	Pages Replaced	Completed by:
0	3/30/20	Initial implementation.	N/A	Zachary Peterson
1	12/1/21	Updated SRS to EHS.	N/A	Zachary Peterson
1	12/1/21	Updated Supervisor to FM Area Manager and implemented FM Area LOTO Log requirement.	N/A	Zachary Peterson
1	2/25/22	Incorporated energy control procedures from HVAC and Plumbing Safety Programs.	N/A	Zachary Peterson
2	4/20/2023	Reviewed. No Changes	N/A	LB, ZP, JG
2.1	4/25/23	Updated formatting to match other SOPs, updated links on page 20 for code references, updated section links on page 19	All	VG
2.2	5/16/24	On Signature page changed name of VG to Thanatos VonFox.	All	JG
2.3	6/10/24	Updated signature page to have Scheryl Chinn replace Melissa Terry as Melissa is out of the office	iii	TV

ACRONYMS & DEFINITIONS

Affected employee	An employee whose job requires them to operate or use a machine or equipment where maintenance or servicing is being performed under the lockout/tagout, or whose job requires them 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 them.
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 built-in locking mechanism. 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.
Contractor	A person or company hired by UNM for a job or purpose of completing work for a specified job. When any outside servicing personnel are engaged in activities covered by the scope and application of this standard, UNM and the outside contractor shall inform each other of their respective lockout and tagout procedures.
Energized	Connected to an energy source 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 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; or 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 repair, maintenance, and services activities which involves welding on a piece of equipment (pipeline, vessels or tanks) under pressure, in order to install connections or appurtenances.
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.
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, unjamming, adjusting, and changing tools for use on machines and equipment where the employee may be exposed to an unexpected energization, startup, or release of hazardous energy.
Setting up	Any work performed to prepare a machine or equipment to perform its normal production operation.
EHS	The Environmental Health & Safety Department at UNM.
Supervisor	The person responsible for the action, starting the process or directing any and all activities particular to the maintenance, production, set-up, or clean up processes.
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.

TABLE OF CONTENTS

1. Introduction 1

2. Scope..... 1

3. Roles & Responsibilities 1

 3.1. Environmental Health & Safety 1

 3.2. Facilities Management..... 2

 3.3. FM Area Managers..... 2

 3.4. Employees..... 2

4. Training Requirements..... 2

5. Machine Specific Lockout/Tagout Procedures 3

6. Isolating Energy Systems..... 4

7. Lockout Devices 4

8. Lockout Process 4

 8.1. Machinery & Equipment..... 5

 8.1.1. De-Energizing Process 5

 8.1.2. Electrical Test Verification of De-energized Circuits..... 6

 8.1.3. Work on Energized Circuits..... 6

 8.1.4. Re-Energizing Process 6

 8.2. Natural Gas Distribution Systems 6

 8.2.1. De-energizing Process..... 6

 8.2.2. Re-Energizing Process 7

 8.3. Hot and Cold-Water Distribution Systems..... 8

 8.3.1. De-Energizing Process 8

 8.3.2. Re-energizing Process 8

 8.4. Electric Pumps..... 9

 8.4.1. De-energizing Process..... 9

 8.4.2. Re-energizing Process 10

 8.5. Pressurized Air Systems 10

 8.5.1. De-energizing Process..... 10

 8.5.2. Re-energizing Process 11

 8.6. Steam Distribution Systems..... 11

 8.6.1. De-energizing Process:..... 11

8.6.2. Re-Energizing Process: 12

8.7. Lab Fume Hoods..... 12

 8.7.1. De-Energizing Process 12

 8.7.2. Re-energizing Process 12

8.8. Boilers 13

 8.8.1. De-energizing Process 13

 8.8.2. Re-energizing Process 13

8.9. Air Handlers..... 14

 8.9.1. De-energizing Process 14

 8.9.2. Re-energizing Process 14

8.10. Chillers..... 15

 8.10.1. De-energizing Process 15

 8.10.2. Re-energizing Process 15

8.11. Cooling Water Towers..... 16

 8.11.1. De-energizing Process 16

 8.11.2. Re-energizing Process 16

9. Tagout Process 17

10. Release from Lockout or Tagout 17

11. Lockout or Tagout Devices Removal 18

12. Special Situations 18

 12.1. Lockout Interruption 18

 12.2. Group Lockout or Tagout 18

 12.3. Shift or Personnel Changes 19

 12.4. Authorized Employee Unavailable 19

13. References 20

Attachment A: Example LOTO Log Book 21

1. INTRODUCTION

This program contains requirements for the control of energy during servicing and/or maintenance of machines and equipment. The safety of all UNM employees is the foremost objective of the program as set forth by the University and as defined by OSHA in 29 CFR 1910.147.

2. SCOPE

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

This program does not apply to:

- 1) Routine servicing and/or maintenance (i.e., adjusting, lubricating, and unjamming) which takes place during normal production operations unless:
 - a. An employee is required to remove or bypass a guard or safety device
 - b. An employee is required to place any part of their body into an area on 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.
- 2) 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.
- 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 employer demonstrated that:
 - a. Continuity of service is essential
 - b. Shutdown of the system is impractical
 - c. Documented procedures are followed and special equipment is used which will provide proven, effective protection for employees

3. ROLES & RESPONSIBILITIES

3.1. Environmental Health & Safety

- 1) Implements and maintains this program
- 2) Provides Lockout/Tagout hazard awareness training

- 3) Performs periodic inspections of facilities containing machinery and equipment
- 4) Initiates corrective action if program is not being followed

3.2. Facilities Management

- 1) Develops and implements lockout/tagout procedures for specific specialty equipment
- 2) Implements and enforces this program with all personnel and vendors
- 3) Performs maintenance and repair on UNM machinery and equipment

3.3. FM Area Managers

- 1) Implement and enforce this program with all personnel and vendors
- 2) Instruct their employees to the content of this program
- 3) Ensure that formal training is provided as required by the program
- 4) Develop specific training and procedures for equipment with multiple energy sources that reside in their area of control
- 5) Annually review the Lockout/Tagout Program to ensure the procedures and requirements are being followed
- 6) Maintain the FM Area Lockout/Tagout Logbook in accordance with this procedure.

3.4. Employees

- 1) Adhere to the requirements and restrictions set forth by this program

4. TRAINING REQUIREMENTS

- 1) Each employee who may be required to work on electrical/mechanical equipment shall be instructed in the safety significance of the lockout/tagout procedures.
- 2) Each new or transferred employee and other employees whose work operations are or may be in the area shall be instructed in the purpose and use of the lockout or tagout procedures.
- 3) UNM will 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 program.

- 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 dangers relating to attempts to restart or re-energize machines or equipment which are locked out or tagged out.
 - d. Employees shall also be trained in the following limitations of tags.
 - i. When a tag is attached to an energy isolating device means, it is not to be removed without permission of the authorized person responsible for the tag, and it is never to be bypassed, ignored or otherwise defeated.
 - ii. 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.
 - iii. Tags and their means of attachment must be made of materials which will withstand the environmental conditions encountered in the workplace.
 - iv. Tags may evoke a false sense of security, and their meaning needs to be understood as part of the overall energy control program.
 - v. Tags must be securely attached to energy isolating devices so that they cannot be inadvertently or accidentally detached during use.
- 4) All authorized and/or affected employees shall be trained in the Lockout/Tagout Program. The record of training will be maintained in the UNM Learning Central system and will include the employee's name, designated department and dates of training.
- a. Retraining shall be provided for all authorized and affected employees on an annual basis or 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 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. Retraining shall re-establish employee proficiency and introduce new or revised control methods and procedures as necessary.

The Supervisor is responsible to ensure that employee training has been accomplished and is being kept up to date.

5. MACHINE SPECIFIC LOCKOUT/TAGOUT PROCEDURES

Equipment-specific written procedures shall be developed, documented and utilized for the control of potentially hazardous energy when any of the following elements exist

- 1) The equipment or machine has the potential for stored or residual energy, or the re-accumulation of stored energy after shut down, that may injure employees.
- 2) The equipment or machine has more than a single energy source that is required to completely de-energize the unit (steam, electrical, pneumatic, etc.).

The specific written procedures shall clearly outline the scope, purpose, authorization, rules and techniques to be utilized for the control of the equipment's hazardous energy and shall include:

- 1) A specific statement of the intended use of the procedure.
- 2) Specific steps to shut down, isolate, block and secure the equipment or machine to control the hazardous energy.
- 3) Steps for the placement, removal and transfer of the lockout devices and the responsibility for the devices.
- 4) Specific requirements for testing the equipment or machine to ensure the effectiveness of the lockout devices and other energy control devices.

6. ISOLATING ENERGY SYSTEMS

Whenever existing major equipment or a machine is repaired, renovated, replaced, and modified, and whenever new machines or equipment are installed, energy isolating devices for such machines or equipment shall be designed to accept a lockout device.

7. LOCKOUT DEVICES

- 1) Each authorized employee shall be issued or have access to a padlock for lockout use. This padlock will only be used for lockout conditions and only by the employee who signed for it. The basis for this policy is one person, one lock, one key.
- 2) No person may utilize another's lock, use another's key, or work under another's lock.
- 3) Each lock shall be properly identified to the individual user with permanent identification, phone number, and assigned area.
- 4) Whenever new or different work is assigned where the item is on loan to a different department, the lock shall have the following information: date, time started, any phone number changes.

8. LOCKOUT PROCESS

Before an authorized or affected employee turns off a machine, equipment, or energized system, 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.

Any employee who performs maintenance, repair, set-up, or any other non-production work on, under, or between equipment which when energized can cause injury, shall locate and use the following steps to lockout the main power source of that equipment: Locate and identify all energy isolating devices that apply to the machine or equipment to be locked out.

8.1. Machinery & Equipment

8.1.1. De-Energizing Process

- 1) Notify all directly affected employees before lockout/tagout controls are applied. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the equipment stoppage.
- 2) Notify the FM Area Manager so the Lockout can be noted in the FM Area Lockout/Tagout Log Book.
- 3) Shutdown the machine or equipment by its normal stopping procedure.
- 4) Operate the disconnect switch, circuit breaker, valve or other energy isolating device to isolate (disconnect) the machine or equipment from its energy source.
 - a. NOTE: Switches, that open only the control circuit, are not positive disconnects and shall not be used for lock out protection.
- 5) Authorized employees shall affix lockout devices to each energy isolating device and other affected equipment.
- 6) If any controls are blocked or fuses removed, be sure the system cannot be readily put back into service by someone else. Each person shall attach their own lock (special multi-type group lockout clamps will be made available). In addition, all equipment not provided with a lockout device should be modified to accept a lock. The lockout devices shall:
 - a. Be singularly, positively identified
 - b. Be used ONLY for controlling hazardous energy devices
 - c. Shall be durable and capable of withstanding all environments
 - d. Shall be substantial enough to prevent removal without the use of excessive force or unusual techniques
- 7) Attach "DANGER- DO NOT OPERATE" tags to all open devices. Annotate with employee name, date, phone number, area, and reason for the disconnect isolation.
 - a. NOTE: When 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.
- 8) Once locked out and after ensuring that no affected employees are exposed, test equipment to make sure that it has been de-energized; this includes pushing control buttons and other pertinent equipment to ensure that there is no pressure build up, no energized circuits are present, and to

inspect for any moving equipment that should be de-energized. Return all switches to the neutral or the "off" position after tests.

- 9) Following the application of lockout or tagout devices to energy isolating devices, all potentially hazardous residual energy must be relieved, disconnected, restrained, blocked or otherwise rendered safe (i.e., hydraulic pressure, spring tension, air pressure, etc.).
 - a. NOTE: If there is a possibility of re-accumulation 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.
- 10) Report any mishaps, unlocked conditions, unsafe conditions and/or any faulty connections to your supervisor immediately.
- 11) Do not close an open disconnect unless you are absolutely certain that it is safe to do so.
- 12) Contractors will furnish and use their own locks. Contractors shall be familiar and use the same lockout/tagout procedures or procedures similar to the one used by University employees.

8.1.2. Electrical Test Verification of De-energized Circuits

A qualified person shall use test equipment to test circuit elements and electrical parts that employees will be exposed to, and shall verify that these are de-energized. This test shall also determine if any energized condition exists as a result of inadvertently induced voltage, or unrelated voltage back feed, even if specific parts of the circuit were de-energized and are presumed to be safe. If the circuit to be tested is over 600 volts, nominal, the test equipment shall be checked for proper operation immediately before and immediately after this test.

8.1.3. Work on Energized Circuits

Work on Energized Circuits shall only be performed in accordance with the UNM Electrical Safety Program.

8.1.4. Re-Energizing Process

When the work is completed, the following steps should be performed in the order indicated:

- 1) Ensure that all tools and equipment are removed from within the workspace, and that all system components are properly connected.
- 2) Remove the locks/tags in accordance with [Sections 10](#) and [11](#) of this procedure.
- 3) Re-energize the equipment and verify operation by pressing the "on" button.

8.2. Natural Gas Distribution Systems

8.2.1. De-energizing Process

- 1) Notify all directly affected employees before lockout/tagout controls are applied. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the system stoppage.

- 2) Notify the FM Area Manager so the Lockout can be noted in the FM Area Lockout/Tagout Log Book.
- 3) Locate the gas control valve that supplies the piping or equipment to be serviced. Determine whether there is a secondary gas supply source as well.
- 4) Close and lock out and tag out the gas control valve. If more than one isolating valve is to be closed, the most upstream valves should be closed first.
- 5) If the natural gas is being shut off to permit servicing or maintenance of adjacent fuel-fired equipment, verify that any pilot or other flame no longer exists within that equipment.
 - a. Attempt to re-start the equipment to verify that natural gas is no longer being supplied to the equipment.
- 6) Verify that the locked valve cannot be re-opened.
- 7) Purge gas system to atmospheric pressure before using any electrical equipment or using power compression tools, (i.e. ProPress).
- 8) Ensure the system cannot be readily put back into service by someone else. Each person shall attach their own lock (special multi-type group lockout clamps will be made available). The lockout devices shall:
 - a. Be singularly, positively identified
 - b. Be used ONLY for controlling hazardous energy devices
 - c. Shall be durable and capable of withstanding all environments
 - d. Shall be substantial enough to prevent removal without the use of excessive force or unusual techniques
- 9) Attach "DANGER- DO NOT OPERATE" tags to all open devices. Annotate with employee name, date, phone number, area, and reason for the disconnect isolation.
 - a. NOTE: When 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.

8.2.2. Re-Energizing Process

When the work is completed, the following steps should be performed in the order indicated:

- 1) Ensure that all tools and equipment are removed from within the workspace, and that all system components are properly connected.
- 2) Remove the locks/tags in accordance with Sections 10 and 11 of this procedure.
- 3) Slowly open the gas control valve(s). If the odor of natural gas is detected, immediately close the valve(s) and re-examine all system connections.
- 4) Test all fittings/connections between shutoff valve and equipment.
- 5) Re-start any fuel-fired equipment taken out of service to verify that natural gas is now being supplied to that equipment.

8.3. Hot and Cold-Water Distribution Systems

8.3.1. De-Energizing Process

Should servicing or maintenance be required on these distribution systems, the steps listed below should be completed in the order indicated, prior to starting any work.

- 1) Notify all directly affected employees before lockout/tagout controls are applied. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the equipment stoppage.
- 2) Notify the FM Area Manager so the Lockout can be noted in the FM Area Lockout/Tagout Log Book.
- 3) Identify the control valve(s) that isolate the flow of water through the system component or pipe section being serviced. If the work is to be performed on a piece of equipment, New Mexico plumbing code requirements require that control valves be located directly adjacent to the equipment being serviced.
- 4) Close and lock the control valves identified in step #1.
- 5) Using the applicable bleed valve or drain valve, relieve any residual hydraulic energy. Utilize system pressure gauges wherever possible to verify the release of this residual energy. The discharge of the residual water can also be physically observed.
- 6) Verify that the locked valves cannot be re-opened, and that applicable pressure gauges read "zero".
- 7) Care should be exercise when opening system components. Bolts should all be loosened to confirm the absence of any remaining pressure, prior to removing the bolts.
- 8) Ensure the system cannot be readily put back into service by someone else. Each person shall attach their own lock (special multi-type group lockout clamps will be made available). The lockout devices shall:
 - a. Be singularly, positively identified
 - b. Be used ONLY for controlling hazardous energy devices
 - c. Shall be durable and capable of withstanding all environments
 - d. Shall be substantial enough to prevent removal without the use of excessive force or unusual techniques
- 9) Attach "DANGER- DO NOT OPERATE" tags to all open devices. Annotate with employee name, date, phone number, area, and reason for the disconnect isolation.
 - a. NOTE: When 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.

8.3.2. Re-energizing Process

When the work is completed, the following steps should be performed in the order indicated:

- 1) Ensure that all tools and equipment are removed from within the work space.

- 2) Verify that all bolts and equipment components are properly reattached.
- 3) Remove the locks/tags in accordance with Sections 10 and 11 of this procedure.
- 4) Close drain valves.
- 5) Observe the pressure gauges to confirm the system re-pressurization and check system for leaks.

8.4. Electric Pumps

8.4.1. De-energizing Process

- 1) Notify all directly affected employees before lockout/tagout controls are applied. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the equipment stoppage.
- 2) Notify the FM Area Manager so the Lockout can be noted in the FM Area Lockout/Tagout Log Book.
- 3) Identify whether the electric motor installation has a local horse power rated disconnect switch to isolate energy to the motor and pump. If the disconnect is not horse power rated, contact the electrical department.
 - a. If a local disconnect switch is present, "open" the switch to de-energize the pump.
 - b. If a local disconnect switch is not present, contact the electrician's group to lock out the pump breaker at the distribution panel.
- 4) Once the electric motor has been isolated, attempt to start the motor to verify that it is no longer energized. Once verified, press the stop button.
- 5) Identify the valves located on the suction and discharge side of the pump.
- 6) Close and lock each of the valves.
- 7) Using the applicable drain valve or pressure relief valve, relieve any residual hydraulic energy. Utilize system pressure gauges wherever possible to verify the release of this residual energy.
- 8) Verify that the locked valves cannot be re-opened, and that applicable pressure gauges read "zero".
- 9) Care should be exercised when initially opening system components. Bolts should all be loosened to confirm the absence of any remaining pressure, prior to removing the bolts.
- 10) Ensure the system cannot be readily put back into service by someone else. Each person shall attach their own lock (special multi-type group lockout clamps will be made available). The lockout devices shall:
 - a. Be singularly, positively identified
 - b. Be used ONLY for controlling hazardous energy devices
 - c. Shall be durable and capable of withstanding all environments
 - d. Shall be substantial enough to prevent removal without the use of excessive force or unusual techniques
- 11) Attach "DANGER- DO NOT OPERATE" tags to all open devices. Annotate with employee name, date, phone number, area, and reason for the disconnect isolation.

- a. NOTE: When 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.

8.4.2. Re-energizing Process

Once the work is completed, the following steps should be performed in the order indicated:

- 1) Ensure that all tools and equipment are removed from within the work space.
- 2) Verify that all bolts and equipment components are properly reattached.
- 3) Remove the locks/tags in accordance with Sections 10 and 11 of this procedure.
- 4) Open the isolation valves.
- 5) Re-energize the electric pump, either by closing the local disconnect switch or by contacting an electrician and having them press the “close” button on the pump breaker.
- 6) Verify that the pump is now re-energized by pressing the “on” button, and observing the pressure gauges to confirm the system re-pressurization. Check for leaks.

8.5. Pressurized Air Systems

8.5.1. De-energizing Process

- 1) Notify all directly affected employees before lockout/tagout controls are applied. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the equipment stoppage.
- 2) Notify the FM Area Manager so the Lockout can be noted in the FM Area Lockout/Tagout Log Book.
- 3) Identify the valve(s) which control the flow of air to the piece of equipment or piping section to be serviced.
- 4) Close and attach locks on each of the isolation valves identified in Step #1.
- 5) Using the applicable bleed valve or drain valve, slowly relieve any residual pneumatic energy. Utilize system pressure gauges wherever possible to verify the release of this residual energy. The discharge of this residual air can also be physically observed.
- 6) Verify that the locked valves cannot be re-opened, and that applicable pressure gauges read “zero”.
- 7) Care should be exercised when initially opening system components. Bolts should all be loosened to confirm the absence of any remaining pressure, prior to removing the bolts.
- 8) Ensure the system cannot be readily put back into service by someone else. Each person shall attach their own lock (special multi-type group lockout clamps will be made available). The lockout devices shall:
 - a. Be singularly, positively identified
 - b. Be used ONLY for controlling hazardous energy devices
 - c. Shall be durable and capable of withstanding all environments

- d. Shall be substantial enough to prevent removal without the use of excessive force or unusual techniques
- 9) Attach "DANGER- DO NOT OPERATE" tags to all open devices. Annotate with employee name, date, phone number, area, and reason for the disconnect isolation.
 - a. NOTE: When 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.

8.5.2. Re-energizing Process

When the work is completed, the following steps should be performed in the order indicated:

- 1) Ensure that all tools and equipment are removed from within the work space.
- 2) Verify that all bolts and equipment components are properly reattached.
- 3) Remove the locks/tags in accordance with Sections 10 and 11 of this procedure.
- 4) Open the isolation valves. Observe the pressure gauges to confirm the system re-pressurization.
- 5) Test system for leaks.

8.6. Steam Distribution Systems

8.6.1. De-energizing Process:

- 1) Notify all directly affected employees before lockout/tagout controls are applied. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the system stoppage.
- 2) Notify the FM Area Manager so the Lockout can be noted in the FM Area Lockout/Tagout Log Book.
- 3) Notify supervisor when steam to systems or multiple devices need to be shut off.
- 4) Locate the control valve(s) that supplies steam to the components being serviced. In most cases there will be local, hand-operated valve. If not, it will be necessary to go back to the boiler and locate the appropriate steam feed line.
- 5) Close and lock the appropriate steam control valve(s). If more than one isolating valve is to be closed, the most upstream valve should be closed first.
- 6) Use the closest applicable trap or vent to relieve any residual steam energy. Utilize system pressure gauges wherever possible to verify the release of this residual energy. The discharge of the residual steam can also be physically observed.
- 7) Verify that the locked valves cannot be re-opened, and that applicable pressure gauges read "zero".
- 8) Care should be exercise when opening system components. Bolts should all be loosened to confirm the absence of any remaining pressure, prior to removing the bolts.

8.6.2. Re-Energizing Process:

When the work is completed, the following steps should be performed in the order indicated:

- 1) Ensure that all tools and equipment are removed from within the workspace, and that all system components are properly connected.
- 2) Remove the locks/tags from the steam control valve(s).
- 3) Slowly open the steam control valve(s). If a leak is detected, immediately close the valve(s) and re-examine all system connections.

8.7. Lab Fume Hoods

8.7.1. De-Energizing Process

- 1) Notify all directly affected employees before lockout/tagout controls are applied. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the system stoppage.
- 2) If the work is to be performed continuously by one technician, and that person has visual contact with the applicable control source for the duration of their work, a lock is not required. Tags are recommended as a general practice under these circumstances. Otherwise, a lock shall be affixed to the isolation source. If applicable, notify the FM Area Manager so the Lockout can be noted in the FM Area Lockout/Tagout Log Book.
- 3) If hazards are not clearly identified, contact lab supervisor or EHS to ensure that conditions within the fume hood are sufficiently controlled and safe to permit fume shutdown. Also let the lab staff know that the hood will be temporarily shut down for repair.
- 4) Identify whether the electric fan motor has a local disconnect switch to isolate energy to the motor.
 - a. If a local disconnect switch is present, "open" the switch to de-energize the motor. Lock the disconnect switch in the open position.
 - b. If a local disconnect switch is not present, contact the electrician's group to lock out the breaker at the distribution panel.
- 5) Once the electric fan motor has been isolated, attempt to start the fan to verify that it is no longer energized. Once verified, press the stop button.

8.7.2. Re-energizing Process

- 1) When the work is completed, the following steps should be performed in the order indicated:
- 2) Ensure that all tools and equipment are removed from within the workspace.
- 3) Remove all locks/tags from the isolation source.
- 4) Close the local disconnect switch, or have the electrician's group close the breaker at the distribution panel.
- 5) Start-up the fan to verify that the hood is now operational.

- 6) Inform lab staff that the job is complete and the fume hood is operational.

8.8. Boilers

8.8.1. De-energizing Process

- 1) Notify all directly affected employees before lockout/tagout controls are applied. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the equipment stoppage.
- 2) Notify the FM Area Manager so the Lockout can be noted in the FM Area Lockout/Tagout Log Book.
- 3) Locate the valve(s) that control the supply of steam to the piping or section of the boiler that is being serviced.
- 4) Using drain valves or bleed valves, relieve any residual steam pressure in the lines to be serviced. Observe the system pressure gauges as an indicator of the energy being relieved.
- 5) Isolate the steam supply by closing and locking the steam control valve.
- 6) If the work to be performed will involve the natural gas system (i.e. piping or safety shutoff valves), locate the gas control valve that supplies the piping or shutoffs to be serviced. Determine whether there is a secondary gas supply source as well.
- 7) Close and lock the gas control valve. If more than one isolating valve is to be closed, the most upstream valves should be closed first.
- 8) If the work being performed will also involve electrically energized equipment, determine whether there is a local disconnect switch to isolate electrical energy.
- 9) If a local disconnect switch is present, "open" the switch.
- 10) If a local disconnect switch is not present, contact your supervisor for electrician support to lock out the circuit breaker at the distribution panel.
- 11) Once the electric energy has been isolated, attempt to start the equipment to verify that it is no longer energized. Once verified, press the stop button.
- 12) Verify that each of the locked valves cannot be either re-opened or switched to the close position.

8.8.2. Re-energizing Process

- 1) Once the work is completed, the following steps should be performed in the order indicated:
- 2) Ensure that all tools and equipment are removed from within the work space.
- 3) Verify that all bolts and equipment components are properly reattached.
- 4) Remove all locks and tags from the isolation valves, and assure that all drain valves and pressure relief valves are closed.
- 5) Open the isolation valves. If any leaks are detected, immediately close the valves and tighten up system components.

- 6) Re-energize the system by closing the local disconnect switch or by contacting an electrician and having them close the circuit breaker.
- 7) Verify that the equipment is now re-energized by pressing the “on” button, and observing the pressure gauges to confirm the system re-pressurization.

8.9. Air Handlers

8.9.1. De-energizing Process

- 1) Notify all directly affected employees before lockout/tagout controls are applied. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the equipment stoppage.
- 2) Notify the FM Area Manager so the Lockout can be noted in the FM Area Lockout/Tagout Log Book.
- 3) Identify whether the electric motor has a local disconnect switch.
- 4) If a local disconnect switch is present, "open" the switch to de-energize the motor.
 - a. Note: Some local disconnect switches are only adequate in de-energizing the control circuit. They do not prevent an individual from going to the circuit breaker and circumventing the control circuit and starting the machine. Therefore, unless it can be verified that the local disconnect switch can fully isolate the motor, the local disconnect switch shall not be used as the energy isolation device.
- 5) If a local disconnect switch is not present, or if it is present but does not fully isolate the motor, contact the electrician’s group to lock out the circuit breaker at the distribution panel.
- 6) Once the electric motor has been isolated, attempt to start the motor to verify that it is no longer energized. Once verified, press the stop button.
- 7) For work performed on, or in the vicinity of the fans or dampers, any residual potential energy should be relieved by either disengaging the coils or belt, or by providing a restraint mechanism sufficient to prevent the fans or dampers from any inadvertent movement.

8.9.2. Re-energizing Process

- 1) When the work is completed, the following steps should be performed in the order indicated:
- 2) Ensure that all tools and equipment are removed from within the workspace.
- 3) Remove all locks and tags from the isolation source.
- 4) Re-connect any coils or belts that were disengaged, and remove any restraint mechanism that was used.
- 5) Close the energy isolation device, whether it be located at a local switch or a breaker at the distribution panel.
- 6) If the energy isolation device was a breaker at the distribution panel, it should now be closed. Close the local disconnect switch.

- 7) Start-up the motor to verify that the unit is now operational.

8.10. Chillers

8.10.1. De-energizing Process

- 1) Notify all directly affected employees before lockout/tagout controls are applied. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the equipment stoppage.
- 2) Notify the FM Area Manager so the Lockout can be noted in the FM Area Lockout/Tagout Log Book.
- 3) Identify whether the chiller has a local disconnect switch to isolate electrical energy to the unit.
- 4) Identify the valve(s) which control the flow of water and refrigerant to the chiller unit.
- 5) Close and attach locks and tags on each of the isolation valves identified in Step #1.
- 6) If a local disconnect switch is present, "open" the switch to de-energize the unit.
 - a. Note: Some local disconnect switches are only adequate in de-energizing the control circuit. They do not prevent another individual from going to the circuit breaker and circumventing the control circuit and starting the unit. Therefore, unless it can be verified that the local disconnect switch can fully isolate the motor, the local disconnect switch shall not be used as the energy isolation device.
- 7) If a local disconnect switch is not present, or if it is present but does not fully isolate the motor, contact the electrician's group to lock out the circuit breaker at the distribution panel.
- 8) Once the electrical energy has been isolated, attempt to start the unit to verify that it is no longer energized. Once verified, press the stop button.
- 9) Using the applicable bleed valve or drain valves, relieve any residual pressure within those sections of the unit to be serviced. Observe system pressure gauges wherever possible to verify the release of this residual energy.
- 10) Verify that the locked valves cannot be re-opened, and that applicable pressure gauges read "zero".
- 11) Care should be exercised when initially opening system components. Bolts should all be loosened to confirm the absence of any remaining pressure, prior to removal.

8.10.2. Re-energizing Process

- 1) When the work is completed, the following steps should be performed in the order indicated:
- 2) Ensure that all tools and equipment are removed from within the work space.
- 3) Verify that all bolts and equipment components are properly reattached.
- 4) Remove all locks and tags from the isolation valves, and assure that all drain valves and bleed valves are closed.
- 5) Open the isolation valves.

- 6) Close the energy isolation device, whether it be a local switch or a breaker at the distribution panel.
- 7) If the energy isolation device was a breaker at the distribution panel, it should now be closed. Close the local disconnect switch.
- 8) Press the start button to verify that the unit is again operational.

8.11. Cooling Water Towers

8.11.1. De-energizing Process

- 1) Notify all directly affected employees before lockout/tagout controls are applied. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the equipment stoppage.
- 2) Notify the FM Area Manager so the Lockout can be noted in the FM Area Lockout/Tagout Log Book.
- 3) Identify whether the electric motor has a local disconnect switch.
- 4) If a local disconnect switch is present, "open" the switch to de-energize the motor.
 - a. Note: Some local disconnect switches are only adequate in de-energizing the control circuit. They do not prevent another individual from going to the circuit breaker and circumventing the control circuit and starting the unit. Therefore, unless it can be verified that the local disconnect switch can fully isolate the motor, the local disconnect switch shall not be used as the energy isolation device.
- 5) If a local disconnect switch is not present, or if it is present but does not fully isolate the motor, contact the electrician's group to lock out the circuit breaker at the distribution panel.
- 6) Once the electric motor has been isolated, attempt to start the motor to verify that it is no longer energized. Once verified, press the stop button.
- 7) If work is to be performed on the sprayer heads, locate the isolation valve that controls water flow to those heads. Close and lock that isolation valve.
- 8) Using the applicable drain valve, relieve any residual hydraulic energy if work is to be performed on the sprayer heads.
- 9) For work performed on the belts or fans, any residual potential energy should be controlled by either disengaging the belt, or providing a restraint mechanism sufficient to prevent the fan from inadvertent movement.

8.11.2. Re-energizing Process

- 1) When the work is completed, the following steps should be performed in the order indicated:
- 2) Ensure that all tools and equipment are removed from within the work space.
- 3) Close the energy isolation device, whether it be a local switch or a breaker at the distribution panel.
- 4) If the energy isolation device was a breaker at the distribution panel, it should now be closed. Close the local disconnect switch.

- 5) If work was performed on the sprayer heads, open the isolation valve.
- 6) Re-start the unit to verify that it is operational.

9. TAGOUT PROCESS

Tagging out an energy source is NOT an acceptable alternative to a lockout device. Tags are essentially warning devices affixed to energy isolating devices and do not provide the physical restraint on those devices that are provided by a lock. However, when absolutely necessary to use only a tagout device, the following will apply:

- 1) Specific written procedures, approved by the supervisor and EHS, will be developed for each circumstance and/or piece of equipment requiring a tagout device in lieu of a lockout lock.
- 2) Tags shall be placed at the start control panel and where possible at the isolating device where the lock would have been placed.
- 3) Where possible, an additional means of protection shall be employed, i.e., the physical blocking of a control switch, removal of a valve handle, the removal of a circuit element, etc.
- 4) Tagout Devices shall:
 - a. Be printed and constructed 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
 - b. Be capable of withstanding the environment to which they are exposed for the maximum period of time that exposure is expected
 - c. Be substantial enough to prevent inadvertent or accident removal and require a minimum of 50lbs of pressure exerted to remove.
 - d. Not deteriorate when used in corrosive environments such as areas where acid and alkali chemicals are handled and stored
 - e. 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

10. RELEASE FROM LOCKOUT OR TAGOUT

Before lockout or tagout devices are removed and energy is restored to the machine or equipment, the following actions shall be taken by the authorized employee(s) to ensure the following:

- 1) Affected employees shall be notified that the lockout or tagout devices are to be removed.
- 2) The work area shall be inspected to ensure that non-essential items have been removed and to ensure that machine or equipment components are operationally intact.

- 3) The work area shall be visually checked to ensure that all employees have been safely positioned before lockout or tagout devices are removed.

11. LOCKOUT OR TAGOUT DEVICES REMOVAL

Once the system has been thoroughly inspected in accordance with Section 9, the following steps shall be taken when removing the lockout device:

- 1) Each lockout or tagout device shall be removed from each energy isolating device by the authorized employee who installed the lock and tag.
 - a. If the authorized employee who installed the lock and tag is unavailable, see Section 12: Special Situations.
- 2) Remove the lock and tag and turn them into their supervisor for documentation of the completed project and update in the FM Area LOTO Log Book.
 - a. NOTE: If any locks are left on the completed project, do not remove the tag; inform the supervisor immediately.
- 3) After lockout and/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.

12. SPECIAL SITUATIONS

12.1. Lockout Interruption

In situations where 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 sequences shall be followed:

- 1) Clear machine or equipment of tools, materials and personnel.
- 2) Clear the controls of locks and/or tags.
- 3) Visually ensure all personnel are clear.
- 4) Energize the equipment for testing or positioning.
- 5) De-energize all systems and reapply energy control measures in accordance to [Section 7](#), Locking Out Energy Sources, to continue servicing and/or maintenance.

12.2. Group Lockout or Tagout

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.

Group lockout or tagout devices shall be used in accordance with this program, in addition to the following specific requirements:

- 1) Primary responsibility is vested in an authorized employee for a set number of employees working under the protection of a group lockout or a tagout device (such as an operations lock).
- 2) Provide the authorized employee information to determine the exposure status of individual group members with regard to the lockout or tagout of the machine or equipment.
- 3) When more than one (1) crew, craft, department, etc., is involved, assignment of the group program is directed by one (1) authorized employee. The job associated lockout or tagout control responsibility given to an authorized employee is designated to coordinate all affected work forces and ensure continuity of protection.
- 4) Each authorized employee shall affix a personal lockout or tagout device to the group lockout device, group lockbox or comparable mechanism when they begin work. They shall remove those devices when they stop working on the machine or equipment being serviced or maintained.

12.3. Shift or Personnel Changes

Specific procedures shall be utilized during shift or personnel changes to ensure the continuity of lockout or tagout protection. Provisions for the orderly transfer of lockout or tagout device protection between off-going and on-coming employees shall be included. The program goal is to minimize exposures to hazard(s) from the unexpected energization or start-up of the machine or equipment or from the release of stored energy. The program shall include at least the following elements:

- 1) If the job has not been completed prior to shift change or a personnel change, the supervisor and/or authorized employee shall affix their lock(s) to ensure lockout and tagout of the machine or equipment.
- 2) Affected personnel will remove their lock(s).
- 3) Complete and understandable information about work and any encountered problem(s) shall be directed to the on-coming person or group.

12.4. Authorized Employee Unavailable

When the authorized employee who applied the lockout or tagout device is not available to remove it, that device may be removed only under the direction of the Area Manager, provided that specific procedures and training for such removal have been developed, documented and incorporated into the energy control program. The program shall include the following elements:

- 1) Verification by the supervisor that the authorized employee who applied the device is not at the facility.
- 2) Make all reasonable efforts to contact the authorized employee to inform them that the lockout or tagout device is still on the affected machine or equipment, and that it needs to be removed (log time, date, if any one contacted).

- 3) With the supervisor's direction and presence at the lockout panel, remove the lock with necessary equipment.
- 4) Ensure that the authorized employee is informed of this action before they resume work at the facility.
- 5) The remaining steps from Section 10: Release from Lockout/Tagout.

13. REFERENCES

[29 CFR 1910.147 Control of Hazardous Energy \(Lockout/Tagout\)](#)

[29 CFR 1910.333 Lockout/Tagout Electrical Safe Work Practice Standard](#)












Control of Hazardous Energy Program R2.3

Final Audit Report

2024-06-28

Created:	2024-06-10
By:	Thanatos VonFox (vgough@unm.edu)
Status:	Signed
Transaction ID:	CBJCHBCAABAAS9DId1zuwDCSNf4Y2URsxxwJ8MuaxnvEC

"Control of Hazardous Energy Program R2.3" History

-  Document created by Thanatos VonFox (vgough@unm.edu)
2024-06-10 - 7:12:33 PM GMT- IP address: 206.192.168.19
-  Document emailed to Thanatos VonFox (vgough@unm.edu) for signature
2024-06-10 - 7:13:13 PM GMT
-  Document emailed to Scheryl Chinn (schinn@unm.edu) for signature
2024-06-10 - 7:13:13 PM GMT
-  Document emailed to Zachary Peterson (zpeterson@unm.edu) for signature
2024-06-10 - 7:13:14 PM GMT
-  Document emailed to Casey Hall (cbhall4@unm.edu) for signature
2024-06-10 - 7:13:14 PM GMT
-  Document e-signed by Thanatos VonFox (vgough@unm.edu)
Signature Date: 2024-06-10 - 7:13:25 PM GMT - Time Source: server- IP address: 206.192.168.19
-  Email viewed by Scheryl Chinn (schinn@unm.edu)
2024-06-10 - 7:13:34 PM GMT- IP address: 129.24.33.86
-  Document e-signed by Scheryl Chinn (schinn@unm.edu)
Signature Date: 2024-06-10 - 7:13:53 PM GMT - Time Source: server- IP address: 129.24.33.86
-  Email viewed by Casey Hall (cbhall4@unm.edu)
2024-06-10 - 7:22:25 PM GMT- IP address: 129.24.33.98
-  Document e-signed by Casey Hall (cbhall4@unm.edu)
Signature Date: 2024-06-10 - 7:22:40 PM GMT - Time Source: server- IP address: 129.24.33.98
-  Document e-signed by Zachary Peterson (zpeterson@unm.edu)
Signature Date: 2024-06-28 - 10:29:52 PM GMT - Time Source: server- IP address: 174.28.161.231

✔ Agreement completed.

2024-06-28 - 10:29:52 PM GMT