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**SUBJECT:** Control of Hazardous Energy Program

**DESCRIPTION:** This program summarizes requirements to prevent injury or death from unexpected start-up or release of stored energy during maintenance or service work on equipment or machinery at the University of Maryland (UMD). This program also describes the duties and responsibilities of employees (“UMD personnel”) who perform or are potentially affected by Control of Hazardous Energy (CHE) activities on campus with respect to the Control of Hazardous Energy regulations that apply to UMD.

The program supersedes the May 2013 date.

**SCOPE:** This program applies to all UMD units across campus where there is the possibility of injury due to unexpected start-up or release of stored energy during maintenance or service work on equipment or machinery.

**OFFICE OF PRIMARY RESPONSIBILITY:** Department of Environmental Safety, Sustainability & Risk (ESSR)

**SUMMARY OF CHANGES:**

Revision of the policy:

- Clarification of roles and responsibilities
- Addition of Acronyms
- Addition of Definitions
- Addition of the Control of Hazardous Energy Checklist
- Establishment of additional procedural requirements for the application and removal of devices for hazardous energy control
- Addition of the Lockout/Tagout Devices
- Addition of the General LOTO Procedures example
- Addition of Regulatory, UMD, and Best Practice Requirements
- Addition of Periodic Inspection requirements
- Addition of Special Requirements
- Clarification of training and re-training requirements for personnel

## PROGRAM OVERVIEW:

The Control of Hazardous Energy Program (CHEP) was created to comply with Lockout/Tagout (LOTO) standards and regulatory requirements to ensure operations performed under UMD campus units are performed safely by UMD personnel and are provided with appropriate controls, including, engineering controls, safe work procedures, training, protective equipment, and any other identified methods necessary to disable machinery or equipment to prevent hazardous energy release (See Figure 1).

The implementation of LOTO practices, procedures, and implementation are generally considered engineering controls used in conjunction with administrative and personal protective equipment (PPE) controls.

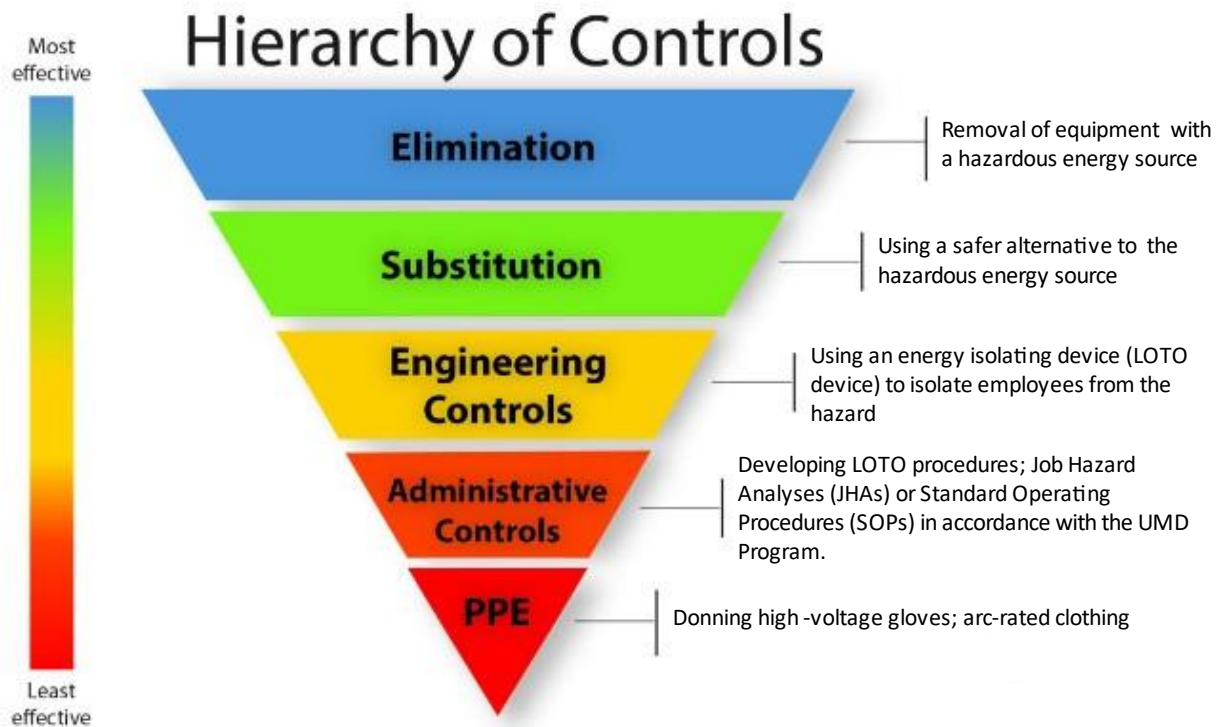


Figure 1 - Hierarchy of Controls with Example that may apply to UMD.

Adapted from National Institute of Occupational Safety and Health: <https://www.cdc.gov/niosh/topics/hierarchy/default.html>.

Note: UMD elements pertinent to controls are provided.

## UMD REQUIREMENTS:

The requirements in this document must be adhered to by all UMD personnel working on or near energized equipment, regardless of voltage. The document is intended to reduce the risk of injury to personnel working within the limited approach boundary on or near exposed energized parts.

## **DUTIES AND RESPONSIBILITIES:**

This program includes responsibilities for the following:

- The Department of Environmental Safety, Sustainability & Risk (ESSR)
- Deans, Directors, and/or Department Heads
- Department Principals
- Operating Unit Coordinators
- Employees
- Researchers and students
- Visitors and contractors

## **TRAINING:**

This program outlines the necessary training requirements for authorized and affected students/employees who may repair or service equipment where unexpected energization or startup may occur without the implementation of adequate control measures, or are affected by such repairs or service. See section IV – Information and Training of this document.

## **RESOURCES AND AUTHORITIES:**

- 29 CFR § 1910.137, Electrical Protective Equipment
- 29 CFR § 1910.147, Control of Hazardous Energy
- 29 CFR § 1910.179, Materials Handling and Storage
- 29 CFR § 1910.333, Selection and use of work practices
- 29 CFR § 1926, Subpart K, Electrical
- 29 CFR § 1926, Subpart V, Electric Power Transmission and Distribution
- Centers for Disease Control (CDC), National Institute for Occupational Safety and Health (NIOSH), National Occupational Research Agenda (NORA),
- ANSI/ASSE Z244.1-2016 (R2020), The Control of Hazardous Energy – Lockout, Tagout and Alternative Methods
- NFPA® 70E, Standard for Electrical Safety in the Workplace, 2021 Edition
- NFPA® 70B, Recommended Practice for Electrical Equipment Maintenance, 2019 Edition

UMD personnel servicing or maintaining machines or equipment as well as working in the vicinity of machines or equipment being serviced or maintained have the potential for serious or fatal injuries if the hazardous energy associated with the machine or equipment is not properly controlled.

The placement of a lockout device on an energy isolating device, in accordance with an established energy control procedure, ensures that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

While the term LOTO includes the placement of a LOTO device onto an energy isolating device, the term encompasses all systematic steps of an established energy control procedure to shut down the machine and/or equipment and effectively isolate any hazardous energy.

UMD's CHEP does not apply to servicing and maintenance when UMD personnel are not exposed to the unexpected release of hazardous energy. Information about opportunities for you to protect UMD personnel who may be put at risk of an injury from electrical hazards is found on the ESSR [webpage for Electrical Safety](#).

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## **I. GENERAL INFORMATION**

### **A. INTRODUCTION**

This program addresses the University of Maryland (UMD) requirements related to the control of hazardous energy (lockout/tagout). The general requirements, safe work practices, and program audit checklists outlined in this program are intended to reduce the risk of injury to UMD faculty, staff, and students (“UMD personnel”) servicing and/or maintaining machines and equipment with potential uncontrolled hazardous energy sources.

This program outlines how UMD must achieve the expectations set in Policy Number: VI-14.00(A); University of Maryland, College Park Policy on Control of Hazardous Energy During Maintenance of Equipment (see APPENDIX C).

### **B. PURPOSE**

The purpose of this Control of Hazardous Energy Program (CHEP) is to establish the requirements for compliance with applicable regulations and standards and to protect the safety and health of UMD personnel against the uncontrolled, unexpected energizing, start-up, or release of stored hazardous energy while servicing or maintaining machines or equipment.

These hazards include energy sources such as electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other sources in machines and equipment that can be hazardous to personnel.

### **C. SCOPE**

This program establishes requirements for hazardous energy control. It is to be used to ensure that machines and equipment are isolated from all potentially hazardous energy sources.

This program applies whenever servicing or maintenance activities are in progress or when equipment guards or other safety devices are removed.

This program applies whenever UMD personnel are required to place any part of their body into an area on a machine or piece of equipment where work is actually performed upon the material being processed (point of operation) or where an associated danger zone exists during a machine operating cycle.

This program applies to all UMD personnel that are authorized by Department Principals and ESSR who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment (authorized student/employee), as well as to all UMD personnel whose job requires them to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout or tagout, or whose job requires them to work in an area in which such servicing or maintenance is being performed (affected student/employee).

#### **D. PROGRAM EXCLUSIONS**

1. Normal production operations are not covered by this program if they are routine, repetitive, and integral to the use of the equipment for production purposes provided that the work is performed using alternative measures that provide effective protection. Examples of alternative measures that might offer effective protection would include light curtains, sensing devices, safety interlocks, or the use of extension tools.
2. Normal production operations are not covered by this program if one of the following conditions exists:
  - 2.1 Work on cord and plug-connected equipment is not covered by this policy if unplugging the equipment controls all energy and the plug remains under the continuous control of the UMD personnel performing the service work.
  - 2.2 Hot tap operations involving transmission and distribution systems are not covered by this policy if the Department Principal of the work demonstrates that (1) continuity of service is essential, (2) shutdown of the system is impractical, and (3) documented procedures offering effective protection are followed.

#### **E. BACKGROUND**

##### **1. Definitions and Acronyms**

- 1.1 Acronyms for the CHEP can be found in APPENDIX A
- 1.2 Definitions for the CHEP can be found in APPENDIX B



## **II. REGULATORY, UMD, AND BEST PRACTICE REQUIREMENTS**

### **A. Federal Requirements (OSHA)**

1. 29 CFR 1910 Subpart J – General Environmental Controls, including 29 CFR 1910.147, The control of hazardous energy (lockout/tagout).
2. 29 CFR 1910 Subpart S – Electrical, including 29 CFR 1910.306, Specific purpose equipment and installations, and 29 CFR 1910.333, Selection, and use of work practices.
3. 29 CFR 1926 Subpart K – Electrical, including CFR 1926.417, Lockout and tagging of circuits.

### **B. National Consensus Standards**

1. ANSI/ASSE Z244.1-2016 (R2020), The Control of Hazardous Energy – Lockout, Tagout and Alternative Methods.
2. NFPA® 70E, Standard for Electrical Safety in the Workplace, 2021 Edition.
3. NFPA® 70B, Recommended Practice for Electrical Equipment Maintenance, 2019 Edition.

### **C. Best Management Practices**

1. “Using Lockout and Tagout Procedures to Prevent Injury and Death during Machine Maintenance,” DHHS (NIOSH) Publication Number 2011-156.
2. “Preventing Worker Deaths from Uncontrolled Release of Electrical, Mechanical, and Other Types of Hazards Energy,” DHHS (NIOSH) Publication Number 99-110.

### **D. UMD Requirements**

#### **1. UMD Policy**

UMD Policy, Section VI: General Administration, VI-14.00(A) – University of Maryland, College Park Policy on Control of Hazardous Energy During Maintenance of Equipment, Consolidated USM and UMD Policies and Procedures (Approved by the President March 13, 1996) (See APPENDIX C).

## 2. Control of Hazardous Energy Program

The Control of Hazardous Energy Program addresses practices and procedures necessary to disable machinery or equipment, thereby preventing the release of hazardous energy while UMD personnel perform servicing and/or maintenance activities.

It also details measures for controlling hazardous energies – electrical, mechanical, hydraulic, pneumatic, chemical, thermal, and other energy sources.

See Appendix D – ANSI/ASSE Z244.1-2016: The Control of Hazardous Energy Lockout, Tagout and Alternative Methods and Appendix G – Lockout/Tagout Annual Certification Form to assist in complying with the program requirements.

Within the program, critical activities are to be accomplished to ensure the safety of UMD personnel when they are servicing, performing maintenance, or working near equipment that could expose them to hazardous energy.

### 2.1 Application and Exclusions

This program applies to the control of energy during servicing and/or maintenance of machines and equipment. Normal operations are not covered by this program (see Section I.D. – Program Exclusions).

Additionally, servicing and/or maintenance which takes place during normal production operations **is covered** by this program **only if**:

- 2.1.1 UMD personnel is required to remove or bypass a guard or other safety device; or
- 2.1.2 UMD personnel is required to place any part of their body into an area on a machine or piece of equipment where work is actually performed upon the material being processed (point of operation) or where an associated danger zone exists during a machine operating cycle.

Note: *Exception to section 2.1:* Minor tool changes and adjustments, and other minor servicing activities, which take place during normal production operations, are not covered by this program if they are routine, repetitive, and integral to the use of

the equipment for production, provided that the work is performed using alternative measures which provide effective protection.

## **2.2 Energy Control Procedures**

UMD personnel must detail and document the specific information that an authorized student/employee must know to accomplish lockout/tagout, i.e., the scope, purpose, authorization rules, and techniques to be utilized for the control of hazardous energy.

See section V – Procedures, for further detail.

See Appendix F – General LOTO Procedure to assist in creating and following energy control procedures.

## **2.3 Protective Materials and Hardware**

Protective materials and hardware (locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners, or other hardware) required for LOTO procedures and used for isolating, securing, or blocking machines or equipment from their energy sources must be provided and used by UMD personnel. Locks must be used wherever possible. Tags without locks are used only where it is demonstrable that it is impossible to use a lock to secure the deactivation of the machine.

See Appendix G – Lockout/Tagout Devices, for assistance in selecting LOTO devices.

A LOTO device consists of a locking device and a tagging device. A locking device has the ability to hold the energy-isolating device in the safe position and prevent the energizing of a machine or equipment.

**2.3.1** Lockout devices include a lock (either key or combination type) and a mechanism for preventing hazardous energy activation (examples include bolted slip blinds, circuit breaker lockouts, valve lockouts, plug lockouts, electrical/pneumatic plug lockouts, adjustable cable lockouts, hasps, and group lock boxes or gang boxes).

**2.3.2** Tagout devices are prominent warning devices and are always used with a locking device. The tag is equipped with a means of attachment, which can be securely fastened to an energy-isolating

device in accordance with an established procedure. The tag must identify:

**2.3.2.1** Why the LOTO is required.

**2.3.2.2** Time of application of the lock/tag

**2.3.2.3** Name of Authorize student/employee who attached lock/tag.

**2.3.3** LOTO devices must meet criteria to ensure adequate control and continual presence.

**2.3.3.1 Durable** – capable of withstanding the environment to which they are exposed for the maximum time of the anticipated exposure. For tagout devices, this includes a requirement that the tag be able to withstand exposure to weather conditions that could cause the tag to deteriorate or become illegible.

**2.3.3.2 Standardized** – the LOTO devices used throughout a unit must be standardized within that unit by color, shape, or size. For tagout devices, the print and format must be standardized.

**2.3.3.3 Substantial** – lockout devices must be substantial enough to prevent the removal without the use of excessive force or unusual techniques; tagout devices must have a means of attachment substantial enough to prevent inadvertent or accidental removal; the tagout device attachment must be of a non-reusable type, attachable by hand, self-locking and have a minimum unlocking strength of no less than 50 pounds.

**2.3.3.4 Identifiable** – LOTO devices must indicate the identity of the Authorized Student/Employee who applied the device; tagout devices must include a warning on the hazardous conditions that could occur if the machine or equipment is energized. The tag must include a legend such as “do not start,” “do not open,” “do not energize” or “do not operate.”

## **2.4 Group LOTO Devices**

**2.4.1** A Group LOTO device is any device or mechanism that permits each authorized student/employee to use their personal LOTO devices to physically secure the energy-isolating device(s) during the servicing or maintenance work. There are a variety of group LOTO devices that are acceptable for use on UMD operations. Examples of compliant group LOTO devices are group lockout hasps, master lockboxes, and satellite lockboxes. Refer to Appendix F for information on common types of group LOTO devices.

See Section VIII – Special Requirements, Group Lockout/Tagout, for more detail.

## **2.5 Employee Training**

UMD personnel must be trained to know basic hazardous-energy concepts and the purpose of the devices used to control them. They should also know what tasks might expose them to hazardous energy and how it can be controlled.

See section IV – Information and Training, for more detail.

## **2.6 Periodic Inspections**

Inspections help UMD personnel ensure compliance with the CHEP and discover deficiencies. An inspection of each energy control procedure must be done at least annually by an authorized student/employee. Inspections of energy control procedures can be scheduled or random audits.

See Appendix H – Lockout/Tagout Annual Certification Form, to assist in completing the annual inspection.

See section VII – Periodic Inspection, for more detail.

## **3. General Minimum Requirements**

ESSR, Department Heads, and Department Principals must collectively ensure the implementation of appropriate hazardous energy controls process elements, requirements, procedures, and safe practices for all UMD personnel. It is imperative that adequate resources be available and deployed to implement the

LOTO program wherever hazardous energy sources are located. Requirements must address risks associated with exposures to hazardous energy sources such as electrical, mechanical, hydraulic, pneumatic, chemical, or thermal.

In addition to the requirements already mentioned in this program, UMD departments, units, and other organizations should also utilize Standard Operating Procedures (SOPs) and Job Hazard Analyses (JHA). These documents can be used to create a step-by-step process that must be taken to properly perform a routine activity, as well as to identify hazards associated with a job and/or task and develop safe work procedures to follow.

### **III. DUTIES AND RESPONSIBILITIES**

This section outlines responsibilities for ESSR, deans, directors, and/or department heads, department principals, coordinators, and authorized students/employees and affected students/employees.

#### **A. Department of Environmental Safety, Sustainability and Risk (ESSR)**

1. Serve as the Department of primary responsibility.
2. Ensure that the Program is established, maintained and readily available for all UMD employees.
3. Investigate all incidents (injuries and near-misses) related to the Control of Hazardous Energy and coordinate with all involved personnel and subject matter experts who have been trained in incident investigation and root cause analysis.
4. Assistant Director, Occupational Safety and Health
  - 4.1 Ensure that the program is reviewed annually and document the review.
  - 4.2 Develop and maintain oversight of a workgroup dedicated to the control of hazardous energy.
5. Program Manager, Occupational Safety and Health
  - 5.1 Provide consultation to assist in the identification of equipment where LOTO should be utilized.
  - 5.2 Prepare the LOTO Program with periodic review and revisions as needed.

- 5.3 Distribute the LOTO Program to each affected department for distribution to all individuals who are authorized by the department to perform maintenance on energized equipment.
- 5.4 Provide training and retraining to all authorized UMD personnel.
- 5.5 Advise and provide guidance on this program.
- 5.6 Evaluated the UMD Control of Hazardous Energy Program annually using subject matter expertise of the control of hazardous energy workgroup.
- 5.7 Develop plans of action to address deficiencies found during program audits and when regulatory updates require changes to this program.

**B. Deans, Directors, and/or Department Heads**

1. Designate Department Principals and/or Coordinator(s) to implement the Control of Hazardous Energy Program and specific LOTO procedures.
2. Provide the resources necessary to comply with the UMD CHEP.

**C. Department Principal Students/Employees**

1. Maintain this Program and upon request, make readily available for review.
2. Implement all provisions of the LOTO for work areas under their control.
3. Prepare specific LOTO and emergency procedures for hazardous machinery prior to engaging in repairs or maintenance activities applicable to this Program.
4. Identify personnel authorized to implement LOTO procedures and assure that each person attends training provided by ESSR.
5. Report all workplace injuries, unsafe conditions, and near-misses to ESSR.
6. Instruct authorized LOTO personnel regarding the applicability of this plan to their respective shop.
7. Provide proper locking and tagging equipment including locks, tags, multiple lock holders, etc.

8. Direct or perform the periodic Lockout/Tagout Annual Certification Form (see APPENDIX G) safety audits of LOTO procedures to determine regulatory compliance and recommend action to correct conditions of noncompliance.
9. Submit the Lockout/Tagout Annual Certification Form to the Operating Unit Coordinator.
10. Comply with necessary documentation requirements.

**D. Operating Unit Coordinators**

1. Attend CHE/LOTO Training, identifying yourself as a coordinator. The training will include a segment on coordinator responsibilities.
2. Oversee the implementation of this program within their organization.
3. Review and sign the Lockout/Tagout Annual Certification Form (see APPENDIX G) that has been completed by the Department Principal once all controls are implemented to the fullest extent possible.
4. Direct the establishment of a recordkeeping system for maintaining the required written elements of this program.
5. Evaluate the overall effectiveness of the CHEP. Ensure that personnel are made aware of the potential hazards associated with work near potential CHE hazards.
6. Ensure that copies of this program and associated supporting documents are made available to UMD personnel.
7. Coordinate training for UMD personnel. This entails contacting ESSR to provide initial training or conducting the training according to the required elements of this program.
8. Retain individual UMD personnel training records for the duration of the employment.
9. Ensure all program audits, hazard findings, and corrective actions are documented.



10. Participate in incident investigations and track corrective and preventive actions to completion.

#### **E. Authorized Students/Employees**

1. Adhere to the requirements of the CHEP.
2. Follow guidelines referenced in this plan to protect themselves and others from the release of hazardous energy.
3. Ensure the security of their own locking devices.
4. Complete, and ensure understanding of, all safety training conducted for authorized students/employees.
5. Comply with all documentation procedures.
6. Notify all affected personnel, in accordance with the LOTO procedural requirements, prior to the implementation of lockout procedures.
7. Report all workplace injuries, unsafe conditions, and near-misses to their Department Principals and/or ESSR.

#### **F. Affected Students/Employees**

1. Notify the appropriate personnel when equipment needs servicing.
2. Complete, and ensure understanding of all safety training conducted for affected students/employees.
3. Follow LOTO instructions given by the Authorized Students/Employees.

### **IV. INFORMATION AND TRAINING**

All participating UMD personnel must assume an active role in maintaining a safe working environment by reporting any problems or noncompliance with policies to their Department Principal and/or ESSR.

All UMD personnel required to service equipment or machinery with the potential for release of hazardous energy, or affected by such release, must be provided with

information and training regarding the LOTO Program. UMD personnel must be informed of:

1. The contents of the OSHA standard.
2. The location and availability of the CHEP.
3. The procedures covered by the CHEP.
4. Evaluation technique to determine if energy hazards are present.

**A. Authorized Students/Employees**

The individual Department Principals must ensure that all Authorized Students/Employees arrange for their training to ensure that the purpose and function of the CHEP are understood and that the knowledge and skills required for the safe application, usage, and removal of the energy controls are acquired by UMD personnel. The training must include the following:

1. Recognition of applicable hazardous energy sources.
2. Type and magnitude of the energy available in the workplace.
3. Methods and means necessary for energy isolation and control.

**B. Affected Students/Employees**

Affected Students/Employees are those who are authorized by their Department Principal whose job requires them to operate or use a machine or equipment on which servicing, or maintenance is being performed under lockout or tagout, or whose job requires them to work in an area in which such servicing or maintenance is being performed. Training for Affected Students/Employees must include:

1. Purpose and use of the LOTO procedures.
2. How to recognize LOTO equipment.
3. Prohibition on tampering with LOTO equipment.

Affected students/employees must also utilize the online training module available on the ESSR website.

### **C. Other Employees**

Other employees who work around or otherwise might be in the vicinity of equipment that is under lockout/tagout need to receive awareness-level training regarding the CHEP. It is important that these employees understand that if they see LOTO devices, they should not touch them.

### **D. Registration and Recordkeeping**

UMD personnel must be trained by ESSR in LOTO methods and procedures as well as the requirements of the OSHA Control of Hazardous Energy Standard. Registration for these training sessions can be done on ESSR's training database system.

Documentation of general CHE/LOTO training conducted by ESSR must be maintained within the ESSR training database system. Each department must maintain documentation of department-specific training provided by Department Principals.

### **E. Retraining**

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

Additional retraining must also be conducted whenever a periodic inspection reveals, or whenever a Department Principal has reason to believe that there are deviations from or inadequacies in the UMD personnel's knowledge or use of the energy control procedures.

Retraining re-establishes proficiency and is used to introduce new or revised control methods and procedures, as necessary. Department Principals must certify that training has been accomplished and is being kept up to date. The certification must contain each UMD personnel's name and dates of training.

## **V. PROCEDURES**

Written LOTO procedures must be developed, documented, and used for the control of potentially hazardous energy when UMD personnel are engaged in activities covered by 1910.147.

## **A. Hazardous Energy Sources**

During the servicing and maintenance of machines and equipment, the unexpected startup or release of stored energy can result in serious injury or death to workers.

These hazardous energies may include:

- Electrical
- Mechanical
- Hydraulic
- Pneumatic
- Chemical
- Thermal
- Compressed Gases
- Gravity
- Stored Energy
- Kinetic
- Spring Loaded
- Water Utilities
- Fuels
- Steam

UMD personnel must develop, document, and ensure authorized students/employees use specific written LOTO procedures to control potentially hazardous energy when they perform servicing or maintenance.

## **B. Procedure Minimum Requirements**

At a minimum, well-written energy control procedures accurately instruct authorized students/employees to do all of the following:

1. Inform all affected students/employees of the equipment shutdown.
2. Shut down equipment in the proper order.
3. Identify and engage energy-isolating devices or block hazardous energy.
4. Lockout or tagout the energy-isolating devices.
5. Remove, drain, neutralize, or block any potential (stored) energy.
6. Verify the equipment is isolated from hazardous energy and rendered inoperative.

## **C. LOTO Procedure Scope, Purpose, and Authority**

Written procedures for equipment with one or more sources of energy must clearly and specifically outline the following:

### **1. Scope**

The scope of lockout/tagout procedures may be limited to a single piece of equipment of machinery or a group of similar pieces of equipment or machinery.

### **2. Purpose**

The purpose of the procedures is to ensure that unexpected energization/startup or shutdown does not occur during servicing or maintenance activities.

### **3. Authority**

The responsible Department Principal authorizes the procedures and ensures specific rules/techniques are listed within the procedures.

### **4. Compliance**

The procedures must state the means to be used to enforce compliance. Typically, this requirement is met by stating the procedure is mandatory.

## **D. LOTO Procedure Components**

At a minimum, the procedures must include the points listed below.

### **1. Intent**

A specific statement of the intended use of the procedure.

### **2. Procedure steps**

Specific procedural steps for shutting down, isolating, blocking, and securing machines or equipment to control hazardous energy.

### **3. Devices and authority**

Specific procedural steps for the placement, removal, and transfer of lockout devices or tagout devices, and a description of who has responsibility for them.

#### 4. Testing

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

#### E. New or Modified Equipment

All new machines and equipment, or all machines and equipment that undergo major repair, renovations, or modification, must be equipped with energy-isolating devices capable of accepting a lockout device.

#### F. Working Without a Lock

If a lock cannot be applied to the equipment and the Department Principal can demonstrate that the tagging procedure alone will provide a level of safety **equivalent** to that obtained by the use of a lock, a tag must be used instead. A tag used without a lock must be supplemented by one additional safety measure that provides a level of safety **equivalent** to that obtained by the use of a lock.

Demonstration of full employee protection (providing a level of safety equivalent to using tagout) must include safety methods such as the removal of an isolating circuit element, blocking of a control switch, opening of an extra disconnecting device, or the removal of a valve handle to reduce the likelihood of inadvertent activation. The tagout device must be attached to the same location that the lockout device would have been attached.

Further demonstration of full employee protection must be performed during the periodic inspection and documented on the Lockout/Tagout Annual Certification Form and indicated on the LOTO Procedure.

#### G. Exemption from a Written Procedure

UMD personnel must document and provide LOTO procedures in writing for each particular machine or unique piece of equipment unless **ALL** of the following 8 exceptions exist:

1. The machine or equipment has no potential for stored or residual energy or re-accumulation of stored energy after shutdown which could endanger UMD personnel.

2. The machine or equipment has a single energy source which can be readily identified and isolated.
3. The isolation and locking out of the energy source will completely de-energize and deactivate the machine or equipment.
4. The machine or equipment is isolated from the energy source and locked out during servicing or maintenance.
5. A single lockout device will achieve a lock-out condition.
6. The lockout device is under the exclusive control of the authorized student/employee performing the servicing or maintenance.
7. The servicing or maintenance does not create hazards for other employees.
8. UMD, in utilizing this exception, has had no accidents involving the unexpected activation or re-energization of the machine or equipment during servicing or maintenance.

If there are specific LOTO procedures for equipment, obtain and review procedures. If no equipment-specific procedures exist, complete APPENDIX D – Control of Hazardous Energy Checklist and develop a machine or process-specific procedure. A template for this procedure can be found in APPENDIX F – General LOTO Procedure.

## **VI. IMPLEMENTING LOCKOUT/TAGOUT**

UMD authorized students/employees must implement an orderly shutdown of machinery to avoid any additional or increased hazards resulting from equipment stoppage. The following is a list of steps to be used during shutdown.

### **A. PREPARATION FOR SHUTDOWN**

#### **1. Identification of the Energy Type or Source**

Determine where and how equipment is being energized. Since some equipment is powered by several sources (e.g., electrical, mechanical, pneumatic, chemical, thermal, and hydraulic), all energizing sources must be identified. For complex equipment, refer to the manufacturer's control diagram detailing the locations of all isolating points. These points may include breaker panels, switches, and valves. Furthermore, possible residual energy and methods used to dissipate or restrain that energy must be identified.

In addition to identifying energy sources, UMD personnel must determine the magnitude of the energy, the hazards of the energy to be controlled, and the methods or means to control the energy. Safe procedures for de-energizing circuits and equipment must be determined before circuits or equipment is de-energized. **If authorized students/employees are unable to determine each form of energy, they must consult their Department Principal before work is started.**

## **2. Notification of employees**

Affected Employees must be notified by authorized students/employees of the intent to service equipment. Written notification via email or memorandum must be given before LOTO controls are applied and should contain the name and job titles of Authorized Students/Employees, the location of equipment being serviced, and duration/date of service.

## **B. SHUTDOWN OF THE EQUIPMENT/MACHINE**

The following steps are performed additionally by the UMD authorized student/employee as part of the LOTO procedure.

### **1. Shut Off Equipment**

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

The circuits and equipment to be worked on must be isolated from all electric sources. Control circuit devices, such as push buttons, selector switches, and interlocks, **may not** be used as the sole means for de-energizing circuits or equipment.

### **2. Deactivate the Energy**

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

### **3. Release of Stored or Residual Energy**



Release stored or residual energy, such as that in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, and pressurized systems (air, gas, steam, or water). Capacitors must be discharged, and high capacitance elements must be short-circuited and grounded if the stored electric energy might endanger personnel.

If energy is incapable of being released, UMD personnel must reposition, block, or utilize some other protective measure to prevent the release of residual energy while service is in progress. For stored non-electrical energy in devices that could reenergize electric circuit parts must be blocked or relieved to the extent that the circuit parts could not be accidentally energized by the device.

#### **4. Attach a Lock and Tag**

A lock and identifier, of a designated color, with a descriptive warning, to serve as an energy isolating device is attached to machinery or equipment to which work is to be performed. The lock is used to prevent personnel from operating the equipment. Tags must be securely attached to energy-isolating devices so that they cannot be inadvertently or accidentally detached during use.

Additionally, tags must be attached to all points where equipment or circuits can be energized. If multiple UMD personnel are servicing the same equipment, each must attach their own lock to a multiple lock plate or hasp.

For electrical, each tag must contain a statement prohibiting unauthorized operation of the circuit or breaker.

**Note: No attempt must be made to remove another UMD personnel's lock unless the requirements listed in Section C - PREPARING TO RETURN EQUIPMENT TO SERVICE of this document are satisfied.**

#### **5. Special Provision for Electrical Lockout/Tagout**

If a lock cannot be applied, or if UMD can demonstrate that tagging procedures will provide a level of safety equivalent to that obtained by the use of a lock, a tag may be used without a lock.

A tag used without a lock, as permitted by OSHA, (refer to 29 CFR 1910.333(b)), must be supplemented by at least one additional safety measure that provides a level of safety equivalent to that obtained by use of a lock. Examples of

additional safety measures include the removal of an isolating circuit element, blocking of a controlling switch, or opening of an extra disconnecting device.

## 6. Verify that equipment is secure and deactivated

Confirm the energy is isolated by performing an Isolation Test which ensures equipment cannot be energized, and potential energy sources are secured. This should be done by:

1. **Visual** – A visual inspection to ensure absence of energy between energy sources and isolation devices.
2. **Test equipment** (for electrical lockout) – The use of instrumentation to verify electrical energy sources are isolated. Voltage meters and noncontact voltage detectors that alarm in the proximity of voltage applications are acceptable, based on the skills and training of the qualified person. All devices must be properly rated for voltage. DC circuits and shielded cables must be tested at termination points.
3. **Test/try** – A test performed by attempting to operate a piece of equipment either remotely or locally to ensure the equipment will not operate.
4. **Drain/de-pressurize** – Verification that a system or component is drained, depressurized, and safe for work.

For electrical sources, a qualified person must use test equipment to test the circuit elements and electrical parts equipment to which UMD personnel will be exposed and must verify that the circuit elements and equipment parts are de-energized.

The test must also determine if any energized condition exists as a result of inadvertently induced voltage or unrelated voltage back feed even though specific parts of the circuit have been de-energized and presumed to be safe. If the circuit to be tested is over 600 volts, nominal, the test equipment must be checked for proper operation immediately after testing.

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

## **C. PREPARING TO RETURN EQUIPMENT TO SERVICE**

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

### **1. Inspect the machine and work area**

Inspect the machine(s) to ensure that non-essential materials have been removed and the machine is in operating order. Visual inspections must be conducted to ensure:

- 1.1 tools and equipment are removed and secure safeguards are in place.
- 1.2 blocks, pins, and chains (used during the lockout) are removed.
- 1.3 electrical jumpers, shorts, grounds, and other such devices have been removed, so that the circuits and equipment can be safely energized.

Additionally, UMD personnel must verify all equipment components are fully assembled and operational. Finally, UMD personnel must inspect the work area to ensure that all UMD personnel have been safely positioned or removed from the area.

### **2. Inspect the controls**

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

### **3. Remove the energy-isolating devices**

Each lock must be removed by the authorized student/employee that applied it or under his/her direct supervision. If the authorized student/employee is absent from the workplace, then the lock or tag may be removed by a Department-Specified Person designated to perform this task provided that the immediate Department Principal:

- 3.1 verifies that the UMD authorized person is not present and therefore unable to remove the lock.
- 3.2 ensures that the Department-Specified Person has verified that lock or tag removal presents no hazard to any affected students/employees.

- 3.3 makes all reasonable efforts to inform the authorized student/employee that the lockout/tagout device has been removed.
- 3.4 ensures that the affected employee knows the lockout/tagout device has been removed before work resumes.

#### **4. Re-energize the machine**

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

For electrical, UMD personnel exposed to the hazards associated with reenergizing the circuit or equipment must be warned to stay clear of circuits and equipment. There must be a visual determination that all UMD personnel are clear of the circuits and equipment.

#### **5. Notify Affected Students/Employees**

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

### **VII. PERIODIC INSPECTION**

To ensure that the procedure and the requirements of this standard are being followed, the designated Department Principal shall direct or conduct periodic inspections of the energy control procedure at least annually.

1. Inspections must be performed by authorized employees other than those using the energy control procedure that is being inspected if they are performed by personnel other than the Department Principal.
2. The periodic inspection must be conducted in order to correct any deviations or deficiencies found.
3. Where lockout is used for energy control, the periodic inspection must include a review between the inspector and each authorized student/employee of that UMD personnel's responsibilities under the energy control procedure being inspected.
4. The LOTO Unit Coordinator must certify that the periodic inspections have been performed, documented, and ensure corrective actions have been implemented and are available for inspection and audits. The certification must identify the

machine or equipment on which the energy control procedure was being utilized, the date of the inspection, the UMD personnel included in the inspection, and the person performing the inspection.

5. APPENDIX H – Lockout/Tagout Annual Certification Form to be used.

## **VIII. SPECIAL REQUIREMENTS**

### **A. GROUP LOCKOUT/TAGOUT**

When service or maintenance on a machine or equipment will be conducted by more than one person, then group lockout/tagout devices will be used to provide protection to all authorized students/employees. Each authorized student/employee must have their own individual device as part of the group lockout/tagout device. Locks will be applied to prevent the machine/ equipment from being reenergized until all the individual lockout/tagout devices of each authorized employee have been removed.

One of the authorized students/employees will be assigned primary responsibility for the entire group's lockout/tagout protection.

The authorized student/employee with primary responsibility must be able to ascertain the exposure status of each individual authorized student/employee within the group, with regard to the locked out/tagged out equipment/machine. When more than one group of authorized students/employees are working on a machine or equipment, the authorized student/employee with primary responsibility must be able to coordinate between groups and ensure the continuity of protection for all authorized students/employees in each group.

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

### **B. SHIFT OR PERSONNEL CHANGES**

When work on a locked out/tagged out machine or equipment continues through a change in authorized students/employees servicing and/or maintaining the machine or equipment, the authorized students/employees continuing to service or maintain the machine or equipment will apply their lockout/tagout devices prior to the removal of the lockout/tagout devices of the authorized students/employees ending

their work. At no time will all lockout/tagout devices be removed from a machine or equipment without first implementing the removal procedures listed above.

### **C. OUTSIDE PERSONNEL (CONTRACTORS)**

Whenever outside contractors engage in activities covered by the scope of this Program, the UMD Project Manager and the outside contractor will inform each other of their lockout/tagout programs and procedures which comply with 1910.147 for the job. They will both ensure their personnel understand and comply with any restrictions and prohibitions of the energy control procedures to be used.

General Contractor/Construction Managers, when performing lockout/tagout activities, are to ensure all persons potentially affected by de-energizing or re-energizing of building systems are properly protected and notified. All work shall be performed in accordance with all applicable laws and regulations. In addition, the General Contractor/Construction Manager is responsible for adhering to the following guidelines and communicating the information to their employees and all Subcontractors/Trade Contractors.

The General Contractor/Construction Manager is responsible for:

1. Developing and implementing an Energy Control Program in compliance with 29 CFR 1910.147; 29 CFR 1926.417; and any other applicable regulations
2. Ensuring that all employees and Subcontractors/Trade Contractors submit their own LOTO program to the General Contractor/Construction Manager for review and approval. If the Subcontractor/Trade Contractor does not have a program, they are not authorized to implement work that requires the implementation of energy control procedures.
3. Informing employees and Subcontractors/Trade Contractors of all work requiring the use of lockout/tag out procedures.
4. Having trained employees and Subcontractors/Trade Contractors on all work requiring the use of LOTO. All training must be documented and made available for review upon UMD's request.
5. Ensuring that all persons maintaining or working on the system understand and comply with the LOTO procedure.

6. Ensuring all hazardous energy is isolated or “locked and tagged out” before servicing and/or maintenance activities are performed.
7. Following special procedures for jobs requiring multiple lockout devices and those involving shift or personnel changes

## **APPENDIX A – Definitions**

**Affected Student/Employee** – A UMD student/employee, authorized by their Department Principal, whose job requires them to operate or use a machine or equipment on which servicing, or maintenance is being performed under lockout or tagout, or whose job requires them to work in an area in which such servicing or maintenance is being performed.

**American National Standards Institute (ANSI)** – A non-profit, voluntary membership organization that coordinates the U.S. Voluntary Consumers Standards System. Their standards have been adopted throughout government and industry for various types of PPE.

**Authorized Student/Employee** – A UMD student/employee, authorized by their Department Principal, who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment.

**Capable of being locked out** – An energy-isolating device (see definition) 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 has a locking mechanism built into it. Other energy-isolating devices are capable of being locked out if lockout can be achieved without the need to dismantle, rebuild, or replace the energy-isolating device or permanently alter its energy control capability.

**Danger Zone** – An area associated with a piece of equipment that is impacted by a movement arc of rotating equipment, the movement path of actuating equipment, or a pinch or nip point.

**Department Principal Student/Employee** – The UMD authorized student/employee who oversees or leads a group of serving/maintenance UMD personnel (e.g., plumbers, electricians, mechanics).

**Department-specified person** – An individual who has completed Control of Hazardous Energy Training for Authorized Students/Employees and given the responsibility to evaluate conditions for safety to remove locks when directed by a Department Principal during off-normal conditions presented by an Authorized Student/Employee being unavailable after a shift. This is only done after due diligence has been demonstrated in attempts to contact the authorized person.

**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 of a circuit can be disconnected from all ungrounded supply conductors, and, in addition, no pole can be operated independently.
- A line valve, a block, and any similar device are used to block or isolate energy.

*NOTE:* 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.

**Guard** – A barrier that prevents entry of the operator's hands, fingers, or any other body part into the point of operation.

**Guarded** – Covered, shielded, fenced, enclosed, or otherwise protected by means of suitable covers, casings, barriers, rails, screens, mats, or platforms to remove the likelihood of approach to a point of danger or contact by persons or objects.

**Hazardous energy** – Energy including electrical, rotational, mechanical, chemical, hydraulic, and pneumatic that could be released during servicing, maintenance, or modification of a machine.

**Hot tap** – A procedure used in the repair, maintenance, and services activities that 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 pipelines without the interruption of service for air, gas, water, steam, and petrochemical distribution systems.

**Isolate** – To physically separate a machine or equipment from its energy source by the use of an energy-isolating device.

**Isolation Test** – The method used to ensure all stored energy sources cannot create the potential for an incident while servicing or maintenance is being performed on the equipment. The test method is documented in the LOTO Procedure.

**Job** – An action that UMD personnel perform routinely that is made up of a task or a series of tasks. Each job must have an associated JHA.

**Job Hazard Analysis** – A systematic, written evaluation of the potential hazards associated with each step of a given job and recommendations for engineering controls, administrative controls and procedures, and PPE to control the hazards. This procedure helps integrate accepted safety

and health principles and practices into a particular operation. In a JHA, each basic step of the job is examined to identify potential hazards and determine the safest way to do the job.

**Lockout** – The placement of a lockout device on an energy-isolating device, in accordance with an established procedure, ensuring 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. Included are blank flanges and bolted slip blinds.

**Major Repair** – Non-routine repairs that include factors such as scale, complexity, time, materials, and the physical size of parts used or required for the repair.

**Normal Production operations** – The utilization of a machine or equipment to perform its intended production function.

**Personal Protective Equipment (PPE)** – Devices worn by UMD personnel to protect against hazards in the workplace and the environment. Includes personal protective equipment for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers. PPE must be provided, used, and maintained in a sanitary and reliable condition wherever it is necessary.

**Primary Authorized Student/Employee** – The UMD authorized student/employee vested with overall primary responsibility for the implementation and coordination of the LOTO operation for the control of the hazardous energy sources for the equipment to be serviced.

**Qualified Person** – NFPA 70E 110.2(A)(1) Training Requirements. Qualified Person. A Qualified Person is one who has demonstrated skills and knowledge related to the construction and operation of electrical equipment and installations and has received safety training to identify hazards and reduce the associated risk.

**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 UMD personnel may be exposed to the unexpected energizing or startup of the equipment or release of hazardous energy.

**Setting up** – Any work performed to prepare a machine or equipment to perform its normal production operation.

**Tagout** – The placement of a tagout device on an energy-isolating device in accordance with an established procedure to indicate the energy-isolating device and the equipment being controlled may not be operated until the tagout device is removed. This procedure is only implemented when it has been determined that lockout is impossible for the machine.

**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 the energy-isolating device and the equipment being controlled may not be operated until the tagout device is removed.

**Unit** - A defined group within UMD that, for purposes of control of hazardous energy, is comprised of personnel responsible for compliant work with items such as equipment and machines with hazardous energy sources that must be controlled for worker safety.

## **APPENDIX B – Acronyms**

<b>ANSI</b>	American National Standards Institute
<b>ASSE</b>	American Society of Safety Engineers
<b>CFR</b>	Code of Federal Regulations
<b>CHE</b>	Control of Hazardous Energy
<b>CHEP</b>	Control of Hazardous Energy Program
<b>DES</b>	Department of Environmental Safety
<b>DRF</b>	Department of Residential Facilities
<b>ESSR</b>	Environmental Safety, Sustainability & Risk
<b>FM</b>	Facilities Management
<b>LOTO</b>	Lockout/Tagout
<b>NFPA</b>	National Fire Protection Association
<b>OSHA</b>	Occupational Safety and Health Administration
<b>PPE</b>	Personal protective equipment
<b>SOP</b>	Standard Operating Procedure
<b>UMD</b>	University of Maryland

## **APPENDIX C – UMD [Policy Number: VI-14.00\(A\)](#)**

### **University of Maryland, College Park Policy on Control of Hazardous Energy During Maintenance of Equipment**

#### **Consolidated USM and UMD Policies and Procedures (Approved by the President March 13, 1996)**

##### **I. Purpose**

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

##### **II. Scope**

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

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

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

##### **III. Policy**

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

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

#### **IV. Duties and Responsibilities**

1. Department of Environmental Safety (DES) will:
  - a. Provide consultation to assist in the identification of equipment where LOTO should be utilized;
  - b. Prepare the LOTO Plan with periodic review and revisions as needed;
  - c. Distribute the LOTO plan to each affected department for distribution to all individuals who are authorized by the department to perform maintenance on energized equipment;
  - d. Approve locks to be used by individual departments;
  - e. Investigate and document all reported accidents and/or near-miss accidents that are directly or indirectly related to the locking and tagging of equipment; and
  - f. Provide training and retraining to all authorized students/employees.
2. Department Heads will:
  - a. Designate Department Principals to implement specific LOTO procedures; and
  - b. Select appropriate locking and tagging devices for their respective department.
3. Designated Department Principals will:
  - a. Implement all provisions of the LOTO for work areas under their control;
  - b. Inventory and identify all potentially dangerous equipment capable of releasing hazardous energy during maintenance in work areas or facilities under their control;

- c. Prepare specific LOTO and emergency procedures for hazardous machinery (refer to APPENDIX A of the LOTO Plan);
  - d. Identify persons authorized to implement LOTO procedures and assure that each person attends training provided by the Department of Environmental Safety;
  - e. Report all workplace injuries, unsafe conditions, and near-misses to the Department of Environmental Safety;
  - f. Instruct authorized LOTO personnel regarding the applicability of this plan to their respective shop;
  - g. Provide proper locking and tagging equipment including locks, tags, multiple lock holders, etc.;
  - h. Direct periodic safety audits of LOTO procedures to determine regulatory compliance, and recommend action to correct conditions of noncompliance; and
  - i. Comply with necessary documentation requirements.
4. Authorized employees shall:
- a. Adhere to the requirements of the Lockout Tagout Plan.
  - b. Follow guidelines referenced in this plan to protect themselves and others from the release of hazardous energy.
  - c. Ensure the security of their own locking devices.
  - d. Complete all safety training requirements and comply with documentation procedures; and
  - e. Report all workplace injuries, unsafe conditions, and near-misses to their Department Principals and/or the ESSR.
5. Affected employees shall:
- a. Notify the appropriate persons when equipment needs servicing; and
  - b. Follow LOTO instructions given by the authorized students/employees.

## **V. Information**

Assistance will be provided by the Department of Environmental Safety to any Department or individual requesting guidance or training to satisfy implementation of this policy.

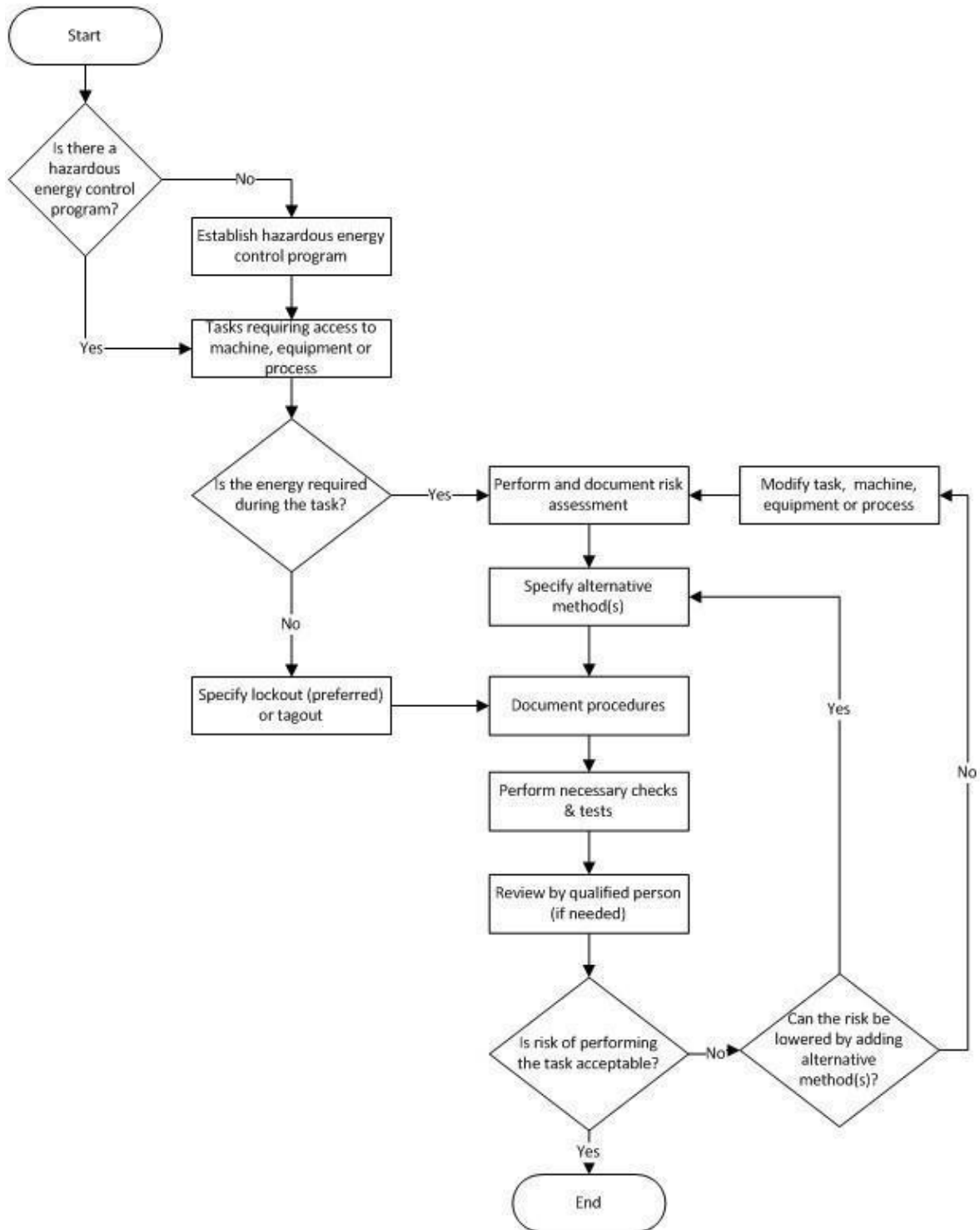
(Departmental telephone number is (301) 405-3960; electronic mail (E-Mail) address is [Safety@UMDACC.UMD.EDU](mailto:Safety@UMDACC.UMD.EDU); WWW Home Page address is <http://www.wam.umd.edu/~safety>).

A complete copy of the LOCKOUT TAGOUT PLAN may be obtained from the Department of Environmental Safety.



**APPENDIX D – ANSI/ASSE Z244.1-2016: The Control of Hazardous Energy Lockout, Tagout, and Alternative Methods**

**Figure 1**  
**Decision matrix for safeguarding hazardous energy.**



## APPENDIX E – General LOTO Procedure

### Lockout/Tagout Procedure

Electrical	Compressed Air/Other Inert Gas	Hydraulic	Water	Natural Gas/LP, Other Fuel Gas, or Oxidizer	Steam	Chemical	Temperature (Thermal)	Mechanical, Kinetic, Gravity, Spring Loaded, or Stored Energy
<b>Number of Locks Required:</b>		3	<b>Location:</b>		<b>Equipment Information:</b>		Hot Water Pump	
<p><b>Purpose:</b> This procedure establishes the minimum requirements for the lockout/tagout of the energy-isolating devices whenever maintenance or servicing is done on machines or equipment. It must be used to ensure that the machine or equipment is stopped, isolated from all potentially hazardous energy sources, and locked/tagged out before UMD personnel 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.</p>								
<p><b>Compliance With This Program:</b> The Authorized Students/Employees are required to perform the lockout/tagout in accordance with this procedure. or the equivalent, which meets the minimum requirements of 29 CFR 1910.147. All UMD personnel, upon observing a machine or piece of equipment which is locked out to perform service or maintenance must not attempt to start, energize, or use that machine or equipment.</p>								
<b>Lockout/Tagout Application Process</b>								
<ol style="list-style-type: none"> <li>1. <b>NOTIFY</b> – Alert all Affected Employees on what equipment is to be locked/tagged out.</li> <li>2. <b>SHUTDOWN</b> – Power down the equipment with the normal shutdown procedure.</li> <li>3. <b>LOCK</b> – Disconnect and lockout ALL energy sources and release any stored energy.                             <ol style="list-style-type: none"> <li>a. All personnel involved <b>MUST</b> have an individual, identifiable lock on equipment.</li> <li>b. Locks must be swapped out during shift change.</li> </ol> </li> <li>4. <b>TAG</b> – Ensure that the tag is clearly marked.</li> <li>5. <b>ISOLATION TEST</b> – Verify all energy sources are isolated by TRYING to operate the equipment.</li> <li>6. <b>RETURN</b> – Place controls back to the off or neutral position.</li> </ol>				<p>(Picture of Equipment)</p>				
<b>Lockout Steps</b>								
<b>Identification</b>	<b>Magnitude</b>	<b>Isolation Apparatus</b>	<b>Location</b>	<b>Procedure</b>	<b>Test</b>			
E-1	Electrical, 480 Volt	Lockout/Tagout Lock	Side of Equipment	Flip the main power disconnect to off. Lock/Tag out.	Verify with a voltmeter and attempt to start.			

W-1	Water, 50 psi	Chain and lock/tag	Side of Equipment	Turn the valve to the off position and chain and lock the valve.	Verify zero pressure on the water line.
W-2	Water, 50 psi	Chain and lock/tag	Side of Equipment	Turn the valve to the off position and chain and lock/tag the valve.	Verify zero pressure on the water line.

**Lockout/tagout Removal Process**

**Machine Testing and Positioning**

1. CLEAR all tools and items away from the machine.
2. NOTIFY all Affected Students/Employees regarding reactivation.
3. REMOVE safety lock/tag and restore power.
4. PERFORM testing of equipment
5. RETURN to zero energy state after testing is complete by following the lockout/tagout steps in the procedure.

**Final Lockout/Tagout Removal Procedure**

1. INSPECT work area; remove all nonessential items and replace all guards.
2. VERIFY that all Affected Students/Employees are in a safe location.
3. NOTIFY all Affected Students/Employees of lockout/tagout release.
4. REMOVE lockout/tagout devices only by those who applied them.
5. NOTIFY all Affected Students/Employees of normal resumption

## APPENDIX F – Lockout/Tagout Devices



### Lockout Hasps

- Universal applications
- Equipped for multiple locks during group lockout situations.
- Strong, durable, and resistant to corrosion



### Wall Switch Lockout

- Prevents the operation of standard wall switches.
- Allows for both “on” and “off” locking functions.
- Plastic construction is non-conductive



### Electrical Panel Lockout

- Pertinent mounting rails.
- Adjustable to fit various sizes of switches.
- Plastic construction is non-conductive



### Cable Lockout

- Feed the cable through the device intending to lockout, cinch tight, and remove slack.
- Fully adjustable
- Secure fit
- Steel cable



### LOTO Locks

- Either assigned to individual UMD personnel, used by a group, or part of a Group Lockout Tagout
- Durable
- Standardized/identifiable (school/department)



### Pneumatic Lock Device

- Eliminates the need for an inline valve.
- Affixes to the male end
- Prevents it from engaging with a female fitting.
- Strong, durable, and resistant to corrosion



### Valve Lockout

- Covers the valve with two flattened half-moons which encloses the valve handle.
- ANSI designated color-coded: Red: Fire protection; Blue: Low hazard gas; Green: Low-hazard liquid; Yellow: Life or property hazards



### Group Lockout Box

- Allows for multiple lockouts for a device that is only designed for one lock.
- The key to the lockout device is stored in the box



## Lockout Kits

- Multiple functions for standard industrial work environment



## LOTO Tags

- May be used by single UMD personnel or part of a group LOTO process.
- Durable
- Standardized/identifiable (school/department)

**APPENDIX G – Lockout/Tagout Annual Certification Form**

Dept./Unit/Shop Inspected: \_\_\_\_\_ Date: \_\_\_\_\_

Is this an equipment/machine specific LOTO procedure or general LOTO procedure?  Specific  
 General

Specific Equipment/Machine Name (Serial #): \_\_\_\_\_

Location (Building & Room #): \_\_\_\_\_

ANNUAL INSPECTION ITEMS	Yes	No	NA
1. Is the written LOTO program readily available for employee review upon request? <i>(section III.A.2)</i>			
2. Has a LOTO Program Coordinator been assigned? <i>(section III.D)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Has the Dept./Unit/Shop implemented a current written SOP? <i>(section II.D.3)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Have previous inspections of energy control procedures been performed? <i>(section VII)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Are copies of previous inspections and findings available? <i>(section VII.A.5)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Has initial LOTO training been documented for the affected & authorized students/employees in this Dept./Unit/Shop? (Attach training records.) <i>(section IV.A &amp; B)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Has initial LOTO training on the equipment or machine specific LOTO Procedure been documented by the Dept./Unit/Shop? (Must show records with names & dates of attendance.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Has there been a change in job assignments, machines, equipment, or processes that present a new hazard, or has there been a change in the LOTO procedure? <i>(section VIII.B)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
a. If YES to #8, has there been re-training of UMD personnel to make them aware of the change? <i>(section IV.E.)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. When <b>Lockout</b> is used to control energy, is the authorized student/employee aware of and understands the responsibilities? (Required to be asked of <b>each</b> authorized student/ employee by the inspector.) <i>(section VII.A.3)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
a. To report to their Department Principal any unsafe conditions concerning the control of hazardous energy sources.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. To follow safe work procedures while performing work on or near equipment with hazardous energy sources.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. To ask their Department Principal for assistance or clarification of work procedures, as necessary.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. To accurately label and prominently attach lock-out/tag-out devices when required.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. To utilize their own padlock and key when applying and removing lock-out devices.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. To remove <b>ONLY</b> their <b>OWN</b> lock-out/tag-out devices at the completion of the task.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10. When <b>Tagout</b> is used to control energy, is the Authorized/Affected student/employee aware of and understands the responsibilities and the limitations of tags? ( <i>section VII.A.4</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
a. The tagout program must provide equivalent protection to that obtained by using a lock-out program.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Tags are warning devices affixed to energy isolation devices and do NOT provide the physical restraint on those devices provided by a lock.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Tags must NOT be removed except by the Authorized student/employee responsible for it and never bypassed, ignored, or otherwise defeated. This includes the contractor's danger tags.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Tags must be legible and understandable by all UMD personnel in order to be effective.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Tags must be made of durable materials.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Tags must be securely attached to energy-isolating devices at the same location a lock-out device would have been attached.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. That tags may provide a false sense of security, and their meaning needs to be understood as part of the LOTO program.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1. Does the Authorized student/employee have their own lock? (Each UMD personnel must have their own lock-out device in a group lock-out.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Is the lock individually keyed? ( <i>section II.D.2.3.5</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<b>Assessment of Performance of Lockout Procedure</b>			
1. <b>Based on direct observation</b> , are the LOTO devices being used only for controlling energy, durable, substantial, identifiable, legible, securely attached, and understandable, to all Affected & Authorized students/employees? (Are non-English speaking UMD personnel present in the workplace?) ( <i>section II.D.2.3</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. <b>Based on direct observation</b> , are lock-out/tag-out procedures performed correctly? (Following the written program or Equipment/Machine Specific procedure.) ( <i>sections V &amp; VI</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
a. <b>Prepare: Identify</b> the energy type or sources - where and how equipment is being energized.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. <b>Inform/Notify</b> any affected students/employees of the intent to service equipment and the shutdown.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. <b>Shut Down</b> machine or equipment that will be serviced or maintained.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. <b>Deactivate/Disconnect</b> the machine or equipment from any source of energy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. <b>Release Stored or Residual Energy</b> (e.g., capacitors, springs, rotating wheels, hydraulics, pressurized systems).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. <b>Attach LOTO</b> energy isolating devices on machinery or equipment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



* <b>Special Electrical Provision</b> If a lock cannot be applied or if UMD can demonstrate that tagging procedures will provide a level of safety equivalent to that obtained by the use of a lock, a tag may be used without a lock.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. <b>Verify</b> that equipment is secure and deactivated through an <b>Isolation Test</b> .	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. <b>Based on direct observation</b> , are lock-out/tag-out removal procedures performed correctly? (Following the written program or Equipment/Machine Specific procedure.) (sections V & VI)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
a. <b>Inspect</b> the machine and work area to ensure the machine is in operating order.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. <b>Inspect/Verify</b> that the controls are in neutral or “off” position.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. <b>Remove</b> the energy-isolating devices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. <b>Re-energize</b> the machine or equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. <b>Notify</b> the affected students/employees that the servicing or maintenance is completed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Has documentation of audit findings and recommendations been generated and provided to Management for corrective action? (section VII.A.4)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Are shift changes appropriately documented in the LOTO Logbook? (section X.B)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Have adequate resources been provided to implement the LOTO program? (section II.D.3)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Is a lockout device inventory being maintained within the Dept./Unit/Shop?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Authorized and Affected Students/Employees Observed**

1.	2.
3.	4.
5.	6.
7.	8.
9.	10.
11.	12.

**Deviations or Inadequacies Observed**


**Corrective Action(s) and Due Date(s)**


Certified by: \_\_\_\_\_ Date: \_\_\_\_\_