Control of Hazardous Energy (Lockout)
## REVISION STATUS

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<th>Date</th>
<th>Number</th>
<th>Comments</th>
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<tr>
<td>August 1995</td>
<td>1.0</td>
<td>Initial written program created</td>
</tr>
<tr>
<td>September 2001</td>
<td>2.0</td>
<td>Revised to Update Format and to Update Requirements</td>
</tr>
<tr>
<td>March 2002</td>
<td>2.1</td>
<td>Revised to Update Lockout/Tagout Procedures Form</td>
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<tr>
<td>September 2002</td>
<td>3.0</td>
<td>Conversion to manual, update procedures and ECP form</td>
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<tr>
<td>April 2003</td>
<td>3.1</td>
<td>Clarification of ECP Requirements</td>
</tr>
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<td>December 2003</td>
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<td>August 2006</td>
<td>4.1</td>
<td>Clarification of emergency lock removal</td>
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<td>July 2007</td>
<td>4.2</td>
<td>Incorporation of Appendices</td>
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</tbody>
</table>
## TABLE OF CONTENTS

**Background** ........................................................................................................................................1  
  Purpose ................................................................................................................................................1  
  Scope ....................................................................................................................................................1  
  Application ............................................................................................................................................1  

**Glossary** .............................................................................................................................................2  

**Requirements** ....................................................................................................................................3  
  Lockout Authorized Employee Training .................................................................................................3  
  Energy Control Procedures ........................................................................................................................3  
  Energy Isolating Devices ..........................................................................................................................3  
  Locks, Tags, and Lockout Devices ............................................................................................................4  
  Group Lockout/Tagout Procedures ...........................................................................................................4  
  Shift or Personnel Changes .......................................................................................................................4  
  Contractors and Other Outside Personnel ...............................................................................................5  
  Emergency Lock Removal .......................................................................................................................5  
  Annual Review Process .............................................................................................................................5  

**Appendices** 
  General Lockout Procedures ....................................................................................................................6  
  Energy Control Procedures .......................................................................................................................7  
  Emergency Lock Removal ..........................................................................................................................8  
  Annual Review ........................................................................................................................................9
BACKGROUND

PURPOSE
This manual and the associated tools were developed to support departmental efforts to control employee exposure to hazardous energy sources and meet requirements established by regulatory and industry standards.

SCOPE
This program establishes expectations regarding the following activities performed on machinery or equipment:

- Service or maintenance where the unexpected start-up, activation or release of hazardous energy could cause injury,
- Operations where an employee is required to remove or bypass a guard or other safety device,
- Operations where an employee is required to place any part of his or her body into an area of the machine where work is actually performed upon the material being processed, or where a similar danger zone exists during the machine operating cycle,
- Work on equipment where an energy source itself poses a hazard to the employee (e.g., electrical systems) that must be controlled for the work to be performed safely,
- Entry into confined spaces, such as vats or tanks, where the supply lines for chemicals, gases or other materials into the space must be blocked and locked to prevent the introduction of these materials into the space while employees are performing work.

APPLICATION
The requirements of this manual apply to work activities conducted by university personnel without regard to work location.
GLOSSARY

Affected Employee means an employee whose job requires him/her to work in the vicinity of or operate a machine or equipment on which servicing or maintenance is being performed under the guidelines of this manual.

Lockable means that an energy isolating device has a hasp or other means of attachment to or through which a lock can be affixed or has an individually keyed locking mechanism built into it. Other energy isolating devices are capable of being locked out if it can be achieved without the need to dismantle, rebuild, or replace the energy isolating device or permanently alter its energy control capability (e.g. with the use of a lockout device).

Energized means connected to an energy source or containing residual or stored energy.

Energy Isolating Device means a mechanical device that physically prevents the transmission or release of energy such as: manually operated electrical circuit breaker; a disconnect switch; a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors, and, in addition, no pole can be operated independently; a line valve; a block; and any similar device used to block or isolate energy. Push buttons, selector switches and other devices that operate solely on a control circuit are not energy isolating devices.

Energy Source means any source of energy that could cause injury. This includes energies such as electrical, mechanical, hydraulic, pneumatic, and gravity where the energy source(s) could cause injury through the motion or operation of machinery or equipment. This also includes energies where injury may be caused by the direct transfer of the energy to the person such as electrical, pressure energies (e.g. hydraulic or pneumatic above 12 pounds per square inch), chemical, or thermal.

Lockout means the placement of a lock and, if necessary, a lockout device on an energy isolating device in accordance with the General Lockout Procedure ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lock and lockout device are removed.

Lockout Authorized Employee means a person who performs activities covered by this manual and has attended the Lockout Authorized Employee training from EHSS.

Lockout Device means a device such as chains, gang locks, valve protectors, self-locking fasteners or blanks that utilizes a positive means to hold an energy isolation device in a safe position and prevent the energizing of a machine or equipment.

Normal Production Operations means the utilization of a machine or equipment to perform its intended production function.

Servicing and/or Maintenance means workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, troubleshooting, and maintaining and/or servicing of machinery or equipment. These activities include lubrication, cleaning or unjamming of machines or equipment, and making adjustments or tool changes where the employee may be exposed to the unexpected energization or startup of the equipment or release of hazardous energy.
REQUIREMENTS

Employees are expected to use work practices developed in accordance with this manual to prevent injuries that could result from the unexpected start-up of equipment or the release of stored energy.

Work performed within the scope of this manual may only be conducted by a Lockout Authorized Employee following the General Lockout Procedure. Parts of machinery or processes not verified as deenergized using approved procedures must be treated as energized.

LOCKOUT AUTHORIZED EMPLOYEE TRAINING

Each employee who will conduct work covered by this manual must attend Lockout Authorized Employee training offered by EHSS prior to beginning such work. Additionally, each Lockout Authorized Employee must receive specific training on each Energy Control Procedure (ECP) to be used. This training is to be conducted by a department Lockout Authorized Employee familiar and experienced with the procedure and the system, machinery, or equipment.

Attendance records (e.g. sign in sheets) for Lockout Authorized Employee training provided by EHSS will be maintained by EHSS as long as administratively necessary. EHSS will provide Lockout Authorized Employee cards to employees who complete the Lockout Authorized Employee training.

Due to incident, observation of unsafe work practice(s), update of this manual, or changes to operating guidelines, EHSS may require refresher training for Lockout Authorized Employees.

ENERGY CONTROL PROCEDURES

Where ECPs are required, the department must maintain them in written form. These ECPs must be available for Lockout Authorized Employees to use when work covered by the ECP is to be performed. ECPs must be retained by the department until superceded by annual review or update. Lockout Authorized Employees who have been trained on a specific ECP may be included on the ECP as a person authorized to use the ECP. If this is not done, the department must document which of the department’s employees have been trained on each ECP in another manner.

It is preferred that each ECP be posted at the location of fixed machinery and equipment to make users aware of persons able to provide service support. If this is not achievable, ECPs may be maintained at a location in proximity to the covered machinery and equipment provided the ECPs are readily available to the Lockout Authorized Employees and Affected Employees are able to request service or maintenance work covered by this manual. Where access to machinery and equipment is controlled such that only Lockout Authorized Employees have access, ECPs may be maintained in another format provided that the ECPs are readily available to Lockout Authorized Employees when needed. Contact EHSS for additional support on acceptable methods to achieve this.

EHSS will maintain and make available the General Lockout Procedure and the Energy Control Procedure form for use by departmental Lockout Authorized Employees.

ENERGY ISOLATING DEVICES

Energy isolation devices not installed directly on the machine or equipment or located such that the purpose is obvious must be labeled to indicate the machinery or equipment served. A
lockable energy isolation device must be installed with equipment as part of a new installation, major replacement, repair, renovation, or modification. Departments must make the effort to retrofit machinery and equipment with lockable energy isolation devices.

**LOCKS, TAGS, AND LOCKOUT DEVICES**

Virginia Tech requires that both a lock and a tag be used for lockout. Locks, tags, and lockout devices may not be used for any purpose other than lockout. Locks, tags, and lockout devices must be durable enough to withstand the environment in which they will be used. Locks, tags, and lockout devices must be provided by the department as needed for isolating, securing, blanking or blinding machines, equipment or processes from energy sources.

Locks must be assigned, issued, and individually keyed for each Lockout Authorized Employee such that only the employee can install or remove their lock. Locks may be permanently assigned to an employee or locks may be generally available to employees provided the above conditions are met. Employees may use only their assigned lock(s). Locks, tags, and lockout devices must not be removed without permission from the Lockout Authorized Employee who applied them and are not to be bypassed, ignored, or otherwise defeated.

Tags must be securely attached to the lock as a means of identification. Tags must be substantial enough to prevent accidental removal. The tag must show the name of the Lockout Authorized Employee applying the device, the date and time that work began, and phone or radio contact information. Tags must warn about hazardous conditions that may result if the machine or equipment is energized and must include a legend such as: Do Not Start, Do Not Operate, Do Not Close, Do Not Energize, or Do Not Open. Tags must be legible and understandable.

**GROUP LOCKOUT/TAGOUT PROCEDURES**

When more than one Lockout Authorized Employee must lockout more than one energy source, a group lockout procedure may be implemented under the direction of a Primary Lockout Authorized Employee. The Primary Lockout Authorized Employee will have responsibility for control of the group lockout procedure.

Each Lockout Authorized Employee participating in a group lockout has the right to personally verify the effectiveness of the lockout procedure. A Lockout Authorized Employee who opts to verify the lockout may perform this verification only after affixing his or her personal lock, before performing service/maintenance work, and after verifying that no other employees will be adversely affected by the verification process.

**SHIFT OR PERSONNEL CHANGES**

When repair or maintenance work extends beyond one shift, Lockout Authorized Employees entering the work area must affix their locks in place before departing employees remove their locks, or a comparable system of assuring the continuation of lockout conditions must be developed and used. Verification of the lockout must be performed on each shift before any Lockout Authorized Employee begins work. This verification must be performed by a Primary Lockout Authorized Employee for the oncoming shift. This does not reduce the right of any Lockout Authorized Employee to verify.
CONTRACTORS AND OTHER OUTSIDE PERSONNEL

The contractor and the department employing the contractor must coordinate lockout activities in accordance with Virginia Tech’s Safety Requirements for Contractors and Subcontractors.

EMERGENCY LOCK REMOVAL

A Lockout Authorized Employee on campus or at the location where the lock is located retains the sole authority to remove his or her lock, tag, and any associated lockout devices. When an employee is unavailable to remove his or her lock and it is necessary to complete the lockout procedure and restart the machinery or equipment, the Lockout Authorized Employee’s supervisor has the authority to remove the Lockout Authorized Employee’s lock by following and completing the Emergency Lock Removal form. In the case of Group Lockout situations, the Primary Lockout Authorized Employee must also participate in the Emergency Lock Removal Process.

The department must develop an emergency lock removal procedure that identifies supervisory Lockout Authorized Employees who will implement the procedure, whether locks will or will not be destroyed as part of the removal, and the use and control of second keys, if used.

The intent of the Emergency Lock Removal process is to transfer responsibility of the lockout procedure to another Lockout Authorized Employee. When the Emergency Lock Removal procedure has been implemented, the completed form must be maintained by the department for five (5) years.

ANNUAL REVIEW PROCESS

EHSS will conduct an annual review of each department that conducts work within the scope of this manual. The annual review will include the items listed on the Lockout Annual Review procedure/form. EHSS will retain information regarding a Lockout Annual Review for five (5) years.
General Lockout Procedure

This procedure and its steps are to be conducted only by a Lockout Authorized Employee.

1. Notify Affected Parties
   - Notification must include the purpose of the work, to not remove or bypass locks/tags/lockout devices, and to not attempt to start the machinery or equipment.

2. Identify Energy Sources
   - If an ECP already exists for the service or maintenance procedure, follow the ECP.
   - If more than one energy source, type (e.g. hydraulic, pneumatic, electrical), or form (e.g. active, stored) exists, generate an ECP.
   - If machinery or equipment has only electricity with plug connection, no stored energies, and the disconnected plug is maintained under the exclusive control of the Lockout Authorized Employee, the service or maintenance activities may be conducted while those conditions are maintained.

3. Shutdown Equipment/System
   - Follow the manufacturer’s shutdown procedure.

4. Isolate Energy Sources
   - Isolate the energy source (e.g. disconnect switch, circuit breaker, block).
   - If the energy source cannot be isolated or if the energy isolation device is not lockable, contact EHSS for support.

5. Apply Lockout Devices, Locks, and Tags
   - Attach the lockout device, lock, and tag (or similar identification system) to the energy isolation device.

6. Verify
   - Verify isolation (e.g. attempt to start machine, check gauge).
   - If the equipment or system is still energized, begin again with step 1.
   - If the Lockout Authorized Employee cannot verify deenergization on the second attempt, contact supervisor or EHSS for support.

7. Perform Maintenance/Service
   - Conduct service or maintenance operations.

8. Remove Lockout
   - Remove materials, tools, and equipment from vicinity.
   - Notify affected employees of lockout removal and pending startup (remove affected persons from area as necessary).
   - Lockout Authorized Employee(s) may remove their lockout devices and locks.

9. Energize Equipment/System
   - Reenergize energy sources
   - Startup equipment following manufacturer’s procedure
Energy Control Procedure

**PROCEDURE INFORMATION**

<table>
<thead>
<tr>
<th>Department:</th>
<th>Date Developed:</th>
<th>Developed By:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine/System:</td>
<td>Machine/System Location:</td>
<td></td>
</tr>
<tr>
<td>Purpose</td>
<td></td>
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</tr>
</tbody>
</table>

1. Notify Affected Employees about the purpose of service and maintenance of this equipment and inform them to not remove or bypass the lockout process or attempt to start the machine.

2. Follow the manufacturer’s shutdown procedure.

3. Isolate, lockout, and verify each energy source listed in the following table.

<table>
<thead>
<tr>
<th>ENERGY SOURCE</th>
<th>ISOLATION</th>
<th>LOCKOUT</th>
<th>VERIFY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Magnitude</td>
<td>Device</td>
<td>Location</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Isolate, lockout, release, and verify each stored energy source listed in the following table.

<table>
<thead>
<tr>
<th>ENERGY SOURCE</th>
<th>ISOLATION</th>
<th>LOCKOUT</th>
<th>RELEASE STORED ENERGY</th>
<th>VERIFY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Magnitude</td>
<td>Device</td>
<td>Location</td>
<td>Control Method</td>
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<tr>
<td></td>
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</table>

5. If lockout cannot be performed or deenergization cannot be verified, notify your supervisor before continuing service or maintenance work.

6. Conduct service and maintenance work.

7. Once work is completed, notify Affected Employees, remove lockout devices, and follow manufacturer’s startup procedures.

**PERSONS AUTHORIZED TO USE PROCEDURE (NAME AND PHONE NUMBER)**

<table>
<thead>
<tr>
<th>Name</th>
<th>Phone Number</th>
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Emergency Lock Removal

This procedure may be used to remove the lock of a Lockout Authorized Employee who is not on campus when the machinery or equipment must be restarted prior to the Lockout Authorized Employee’s return to campus. This procedure may only be implemented by the supervisor of the unavailable Lockout Authorized Employee or, in the event of a group lockout, the Primary Lockout Authorized Employee.

<table>
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<th>REMOVAL PROCEDURE INFORMATION</th>
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<tbody>
<tr>
<td>Department:</td>
</tr>
<tr>
<td>Machine/System:</td>
</tr>
</tbody>
</table>

Attempt to contact the employee to whom the lock belongs to determine the status of the lockout procedure and advise that the lock will be removed. Method(s) of contact: _________________

1. The supervisor or Primary Lockout Authorized Employee must inspect the work area to verify the lockout status and work progress on the machinery or equipment.

2. Remove the Lockout Authorized Person’s lock. The supervisor or Primary Lockout Authorized Employee must ensure that lockout integrity is maintained.

3. The supervisor or Primary Lockout Authorized Employee will then assure that the service or maintenance work is completed in order to close the lockout procedure.

4. The supervisor or Primary Lockout Authorized Employee must discuss the status of the work with the Lockout Authorized Employee prior to the Lockout Authorized Employee returning to the work location.

<table>
<thead>
<tr>
<th>AUTHORIZATION</th>
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<tbody>
<tr>
<td>I was informed of the status prior to my return to the work location.</td>
</tr>
<tr>
<td>Signature</td>
</tr>
<tr>
<td>I certify that I have followed and completed this procedure.</td>
</tr>
<tr>
<td>Signature:</td>
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### ANNUAL REVIEW

**ANNUAL REVIEW INFORMATION**

<table>
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<td>Supervisor:</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Yes</th>
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1. Are department personnel who conduct work covered by this manual trained as Lockout Authorized Employees? List those who are trained and those who are not trained but need it.

2. Are department Lockout Authorized Employees familiar with and follow the General Lockout Procedure?

3. Have Energy Control Procedures been developed in accordance with the General Lockout Procedure? List Energy Control Procedures needed and whether they have been developed.

4. Does the department have adequate locks, tags, and lockout devices? List what is needed and whether or not the department has them.


7. Does the department have an Emergency Lock Removal procedure? Review key security method and list persons who will implement the Emergency Lock Removal procedure/form.

8. Have Lockout Authorized Employees demonstrate Energy Control Procedures or General Lockout Procedure as appropriate. List Energy Control Procedures demonstrated and the Lockout Authorized Employee who demonstrated.