1. **PURPOSE**

This program covers the servicing and maintenance of machines and equipment in which the *unexpected* energization or start-up of the machines or equipment, or release of stored energy could cause injury to employees.

2. **REFERENCE**

29 CFR 1910.147 and NFPA 70E 130.1(B)

3. **DEFINITIONS**

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

*Authorized employee* - A person who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment. An affected employee becomes an authorized employee when that employee's duties include performing servicing or maintenance covered under this section.

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

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

*Energy isolating device* - A mechanical device that physically prevents the transmission or release 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 used to block or
isolate energy. Push buttons, selector switches and other control circuit type devices are not energy isolating devices.

*Energy source* - Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

*Hot tap.* - A procedure used in the repair, maintenance and services activities which involves welding on a piece of equipment (pipelines, vessels or tanks) under pressure, in order to install connections or appurtenances. It is commonly used to replace or add sections of pipeline without the interruption of service for air, gas, water, steam, and petrochemical distribution systems.

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

*Lockout device* - A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy isolating device in a safe position and prevent the energizing of a machine or equipment. Included are blank flanges and bolted slip blinds.

*LOTO* – Abbreviation for Lockout Tagout.

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

*Servicing and/or maintenance* - Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning or un-jamming of machines or equipment and making adjustments or tool changes, where the employee may be exposed to the unexpected energization or startup of the equipment or release of hazardous energy.

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

*Tagout* - The placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

*Tagout device* - A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the Tagout device is removed.
4. RESPONSIBILITIES

Environmental Health and Safety (EHS)

Establish a LOTO program consisting of the development, implementation, and revision of this policy, and to assist departments with scheduling the training.

Supervisors

Develop and maintain LOTO procedures specific to the individual pieces of equipment, machinery and energy fed systems.

It is imperative that all measures be practiced to prevent working on energized equipment / systems; however, if LOTO is not an option and work must be performed on energized equipment / systems, approval must be obtained from the Director of Maintenance and Utilities or designee in case of absence. It is the supervisor's responsibility to obtain approval for energized work to be conducted. This approval must be documented on The Energized Work Permit (Appendix I). The Energized Work Permit is available on EHS’s website: ehs.wfu.edu under forms section and also refer to Appendix I. The Energized Work Permit must be posted at the work site and a copy must be attached to the work order for e-filing. The supervisor will ensure that employee training has been accomplished and is current. The supervisor is responsible to authorize those who meet the OSHA criteria to be deemed competent and authorized to conduct LOTO.

Where LOTO is used for energy control, the periodic inspection will include a review, between the inspector and each authorized employee, of that employee's responsibilities under the energy control procedure being inspected. The supervisor will certify that the periodic inspections have been performed. The certification shall identify the machine or equipment on which the energy control procedure was being utilized, the date of the inspection, the employees included in the inspection, and the person performing the inspection. The supervisor will also ensure a periodic inspection is conducted to correct any deviations or inadequacies identified.

The supervisors will review the effectiveness of the energy control procedures at least annually to ensure the requirements of the OSHA standard are being followed.

Supervisors will ensure employees who are authorized in LOTO procedures will only use Wake Forest University supplied LOTO kits.

Supervisors are responsible for the replacement of lost, damaged, or inoperable equipment and will not allow employees to use dysfunctional equipment.
Employees

Participate in LOTO training as directed by supervisor or EHS Office.

Only authorized employees may use LOTO devices and perform LOTO procedures.

Authorized Employees

LOTO will be performed in every situation that is required to ensure employees safety. The individual LOTO procedures must be followed as instructed.

If conditions present energized work, employees are to inform their supervisor and cannot proceed until the energized work has been approved by the appropriate management in F&CS and an Energized Work Permit has been issued.

Authorized Employees are responsible for the maintenance of the LOTO kit be maintained in good condition. Employees must inform supervisor when the LOTO kit is in need of replenishing or replacement of damaged parts. Only issued kits will be used.

Authorized Employees are responsible to inform affected employees prior and post of the LOTO.

Affected Employees

Affected Employees are to respect the work taking place and confirm to the LOTO Policy.

Do not attempt to remove locks or tags and refrain from starting up the equipment, machinery, or system until all is cleared by the Authorized Employees that the LOTO is complete.

Contractors

Whenever outside servicing personnel are to be engaged in activities covered by the scope and application of this policy, the Wake Forest University Project Manager, WFU Maintenance Supervisor, and the Contractor shall inform each other of their respective LOTO procedures.

The Wake Forest University Supervisor shall ensure that his/her employees understand and comply with the restrictions and prohibitions of the outside employer's energy control program.

Communications about the time and duration of LOTO must be made to the Project Manager / Maintenance Supervisor in order to relay that information to the affected employees.

If conditions present energized work, contract employees are to inform their supervisor and cannot proceed until the energized work has been approved by the appropriate management in Facilities & Campus Services and an Energized Work Permit has been issued.
5. **PROCEDURE**

**Protective Materials and Hardware**

Employees authorized in LOTO procedures will use only the Wake Forest University supplied LOTO kits. If devices become damaged or lost the authorized employee must inform the supervisor for replacement.

**Energy Isolation**

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

**Notification of Employees**

Affected employees shall be notified by the supervisor or authorized employee of the application and also, the removal of LOTO devices. Notification shall be given before the controls are applied, and after they are removed from the machine or equipment.

**Application of Control**

The requirements for the application of energy control (the individualized LOTO procedures) shall cover the following elements and actions and shall be done in the following sequence:

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

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

- *Machine or equipment isolation.* All energy isolating devices that are needed to control the energy to the machine, equipment, or system shall be physically located and operated in such a manner as to isolate the machine or equipment from the energy source(s).
- *LOTO device application.*
- LOTO devices shall be affixed to each energy isolating device by authorized employees.
- Lockout devices, where used, shall be affixed in a manner to that will hold the energy isolating devices in a “safe” or “off” position.
- Tagout devices, where used, shall be affixed in such a manner as will clearly indicate that the operation or movement of energy isolating devices from the “safe” or “off” position is prohibited.
- Where Tagout devices are used with energy isolating devices designed with the capability of being locked, the tag attachment shall be fastened at the same point at which the lock would be attached.
- Where a tag cannot be affixed directly to the energy isolating device, the tag shall be located as close as safely possible to the device, in a position that will be immediately obvious to anyone attempting to operate the device.

**Stored Energy**

Following the application of LOTO devices to energy isolating devices, all potentially hazardous stored or residual energy shall be relieved, disconnected, restrained, and otherwise rendered safe.

If there is a possibility of re-accumulation of stored energy to a hazardous level, verification of isolation shall be continued until the servicing or maintenance is completed, or until the possibility of such accumulation no longer exists.

**Verification of Isolation**

Prior to starting work on machines or equipment that have been locked out or tagged out, the authorized employee shall verify that isolation and de-energization of the machine or equipment have been accomplished.

**Release from LOTO**

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

- The work area shall be inspected to ensure that nonessential items have been removed and to ensure that machine or equipment components are operationally intact.
- The work area shall be checked to ensure that all employees have been safely positioned or removed. After devices have been removed and before a machine or equipment is started, affected employees shall be notified that the LOTO device(s) have been removed.

**LOTO Devices Removal**

Each LOTO device shall be removed from each energy isolating device by the authorized employee who applied the device.

When the authorized employee who applied the LOTO device is not available to remove it, that device may be removed under the direction of the supervisor. The supervisor shall demonstrate that the specific procedure provides equivalent safety to the removal of the device by the authorized employee who applied it. The specific procedure shall include at least the following elements:
Verification by the supervisor that the authorized employee who applied the device is not on campus;

Make all reasonable efforts to contact the authorized employee to inform him/her that his/her LOTO device has been removed; and

Ensure that the authorized employee has this knowledge before he/she resumes work at that facility.

**Additional Requirements**

**Testing or Positioning of Machines, Equipment or Components**

In situations in which LOTO devices must be temporarily removed from the energy isolating device and the machine or equipment energized to test or position the machine, equipment or component thereof, the following sequence of actions shall be followed:

- Clear the machine or equipment of tools and materials
- Remove employees from the machine or equipment area
- Remove the LOTO devices
- Energize and proceed with testing or positioning
- De-energize all systems and reapply energy control measures to continue the servicing and/or maintenance

**Sequence of Lockout**

Notify all affected employees that servicing or maintenance is required on a machine or equipment and that the machine or equipment must be shut down and locked out to perform the servicing or maintenance.

**Restoring Equipment to Service**

When the servicing or maintenance is completed and the machine or equipment is ready to return to normal operating condition, the following steps shall be taken.

Check the machine or equipment and the immediate area around the machine or equipment to ensure that nonessential items have been removed and that the machine or equipment components are operationally intact.

Check the work area to ensure that all employees have been safely positioned or removed from the area.

Verify that the controls are in neutral.

Remove the lockout devices and reenergize the machine or equipment.
Note: The removal of some forms of blocking may require re-energization of the machine before safe removal.

Group LOTO

When servicing and/or maintenance is performed by a maintenance team, department or other group, they shall utilize a procedure which affords the employees a level of protection equivalent to that provided by the implementation of a personal LOTO device.

Group LOTO devices shall be used following these specific requirements:

- Primary responsibility is vested in an authorized employee for a set number of employees working under the protection of a group LOTO (such as an operations lock)
- Provision for the authorized employee to ascertain the exposure status of individual group members with regard to the LOTO of the machine or equipment
- When more than one team, department, etc. is involved, assignment of overall job-associated LOTO control responsibility to an authorized employee designated to coordinate affected work forces and ensure continuity of protection
- Each authorized employee shall affix a personal LOTO device to the group lockout device or group lockbox when he or she begins work, and shall remove those devices when he or she stops working on the machine or equipment being serviced or maintained

Shift or Personnel Changes

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

Individual LOTO Procedures

Individual LOTO procedures will be maintained in Facilities and Campus Services Spaces.

The information below must be included in the individual LOTO Procedures.

- Name of Unit for LOTO, Location (building name and space #), and Manufacturer’s Name and UL # if available.
- Define type(s) and magnitude(s) of energy, its hazards and the methods to control the energy.
- Describe the normal stopping procedure (depress stop button, open switch, close valve, etc.).
- Define type(s) and location(s) of machine or equipment operating controls.
• De-activate the energy isolating device(s) so that the machine or equipment is isolated from the energy source(s).
• Define type(s) and location(s) of energy isolating devices.
• Lock out the energy isolating device(s) with assigned individual lock(s).
• Stored or residual energy (such as that in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure, etc.) must be dissipated or restrained by methods such as grounding, repositioning, blocking, bleeding down, etc.
• Define type(s) of stored energy—methods to dissipate or restrain.
• Ensure that the equipment is disconnected from the energy source(s) by first checking that no personnel are exposed, then verify the isolation of the equipment by operating the push button or other normal operating control(s) or by testing to make certain the equipment will not operate.
• Caution: Return operating control(s) to neutral or “off” position after verifying the isolation of the equipment.
• Define method of verifying the isolation of the equipment.
• The machine or equipment is now locked out.
• Name(s) of affected employees and how to notify.

Compliance

All employees are required to comply with the restrictions and limitations imposed upon them during the use of lockout. The authorized employees are required to perform the lockout in accordance with this procedure. All employees, upon observing a machine or piece of equipment which is locked out to perform servicing or maintenance shall not attempt to start, energize or use that machine or equipment.

6. TRAINING

General Training Requirements

Wake Forest University shall provide training to ensure that the purpose and function of the energy control program are understood by employees and that the knowledge and skills required for the safe application, usage, and removal of the energy controls are necessary for Authorized Employees. Refresher training will be conducted on an annual basis. Initial and Refresher Training shall include the following:

• Each authorized employee shall receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for energy isolation and control.
• Each affected employee shall be instructed in the purpose and use of the energy control/LOTO Policy.
• All other employees whose work operations are or may be in an area where energy control procedures may be utilized, shall be instructed about the procedure, and about the prohibition relating to attempts to restart or reenergize machines or equipment which are locked out or tagged out.
Employee Retraining

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

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

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

7. REVISIONS

<table>
<thead>
<tr>
<th>REVISION</th>
<th>REVISION DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revision to format. Removed outdated information from supervisor responsibilities.</td>
<td>11/28/2016</td>
</tr>
<tr>
<td>Revision to format. Additional information in responsibilities. New Signing Authority: Associate Vice President of Strategy and Operations.</td>
<td>1/29/2015</td>
</tr>
</tbody>
</table>
ENERGIZED WORK PERMIT

Authorized: _____   Declined: _____

Work Order Number: ______________ Date: ______________ Duration Time: ____________

Part I: APPROVAL(S) TO PERFORM THE WORK WHILE ENERGIZED:

(7) Do you agree the described work can be done safely? YES (circle and check Authorized) / NO (circle and check Declined and return to requester). Only the following management representatives can authorize: Maintenance Manager, Associate Director of Utilities, or Director of Maintenance & Utilities.

_________________________    _______________________
Signature                     Job Title

Part II: TO BE COMPLETED BY THE REQUESTER

(1) Description of energy /equipment/job location:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

(2) Description of work to be done:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

(3) Justification of why the equipment / system cannot be de-energized or the work deferred until the next scheduled outage:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

(4) Are there other energy sources involved? If so, define what they are.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Part II: TO BE COMPLETED BY QUALIFIED PERSONS DOING THE WORK:

(1) Description of the Safe Work Practices to be employed:


(2) Shock Hazard Analysis as applicable: Voltage Level Phase to Phase 

Approach Boundaries: Limited _________ Restricted _________ Prohibited _________

(3) Results of Flash Hazard Analysis as applicable:

Flash Protection Boundary: _________ (Assumed or Calculated)

Hazard/Risk Category _________ OR Calculated Flash Hazard at 18” _________

(4) Necessary personal protective equipment to safely perform the assigned tasks:


(5) Means employed to restrict the access of unqualified persons from the work area:


(6) Evidence of completion of a Job Briefing including discussion of any job-related hazards:


Qualified Person(s) Date Qualified Person(s) Date

NOTE: Once work is complete, attach a copy to work order.