

CITY AND COUNTY OF DENVER

Lockout/Tagout/Verify Policy		
Occupational Safety and Health Management System No. 65.5.2 This policy was developed and shall be implemented under the authority of Executive Order No. 65 and the Risk Management Office.	January 1995 Revised – January 1, 2008	Prepared / Revised By: Risk Management – Safety Unit

1.0 Introduction

The City and County of Denver's Lockout/Tagout/Verify Policy has been developed to ensure that all equipment is de-energized and physically removed and isolated from external and internal power sources prior to servicing and maintenance activities in which the accidental start-up or the release of energy could cause injury or death. The primary purpose of this document is to protect personnel from injury or death. A secondary purpose is to protect equipment from damage.

2.0 Scope

This Citywide procedure is to be used by all departments and agencies. If an individual department or agency has developed its own procedure then that procedure will be acceptable to use as long as it provides the same level of worker protection.

This procedure applies to all energy sources including but not limited to: electrical, hydraulic, mechanical, chemical, thermal and pneumatic. Internal energy sources such as charged capacitors, coiled springs, raised load, thermal sources, etc. are also covered under this procedure and must be properly relieved or restrained before activities begin.

This procedure encompasses citywide activities and is to be referenced by and/or incorporated into Safe Operating Procedures (SOPs) when necessary. SOPs and/or equipment specific shutdown procedures that may be developed for individual pieces of equipment shall provide detailed procedures that must be followed for isolating energy sources.

Contractors working for the City and County of Denver must adhere to this procedure or be able to demonstrate that they have a program in place which provides an equivalent level of protection.

3.0 Definitions

Affected Employee: Employees whose jobs require them to operate or use a machine or equipment on which servicing or maintenance is being performed under the lockout/tagout/verify procedure, or whose job requires them to work in an area where servicing and maintenance work is being performed

Alternative Measures: These are OSHA's terms for providing operator safety without completely de-energizing the system. Alternative measures include circuits, pins, valves, or blocks, which provide adequate safety and include verification, for the affected personnel that the system is safe.

Approved Electrical Devices: These are specifically identified electrical switches that may be operated by any employee, including non-electrical personnel, as their work requires. These switches have been approved by the appropriate personnel for operation by non-electrical employees. Approved Electrical Devices include the following:

"Authorized Switches" - Switches that are typically associated with building service receptacles and crane grabs. Any employee may operate these switches, as their work requires.

Authorized Employee: A person (Supervisor, Engineer or Operator) who locks out or tags out machines or equipment in order to perform servicing or maintenance. An affected employee becomes an authorized employee when that employee's duties include performing servicing and maintenance.

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 if it has a locking mechanism built into it.

Control Circuit: A circuit which contains switching devices that control the activation and/or specific operations of a piece of equipment. Control circuits are poor locations to apply lockout devices since they do not necessarily disconnect input power.

Disconnect Switch: A lockable electrical switch which physically disconnects equipment from its input electrical power source.

Energized: Equipment and/or machinery still connected to an energy source or containing residual pressure or stored energy.

Energy Isolation: Removal of energy of all types from a system by electrical and mechanical means.

Energy Isolating Device: A mechanical device that physically prevents the transmission or release of energy. (Examples: manually operated electrical circuit breaker, a disconnect switch, slide gates, valves, blocks, pins and blind flanges.) This term does not include control circuit devices such as push buttons, toggle switches, pressure switches, solenoid valves and similar devices. If a slip blind is used, it's presence as an isolating device shall be readily discernible.

Energy Source: Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, gas, water, steam, air, or other energy.

External Energy Source: Energy sources which are external to equipment such as electrical, hydraulic, pneumatic, gas, vacuum, high temperature, cryogenic temperature, mechanical, etc. that could cause harm to personnel or equipment.

Group Lockout: When servicing and/or maintenance is performed by a group, they shall use a procedure that gives them a level of protection equivalent to that of a personal lockout or tagout device.

Internal Energy Source: Energy sources such as capacitors, batteries, hydraulic line pressures, coiled springs, etc. which are internal and could potentially be released and cause injury after all external energy sources have been disconnected and secured.

Lockout: The placement of a lock on an energy-isolating device in accordance with established procedures, ensuring that the energy isolating device and the equipment cannot be operated until the lockout device is removed.

Lockout Device: A device that uses a positive means, such as a lock, to hold an energy isolating device in a safe position to prevent the energizing of a machine or equipment. This includes blank flanges and bolted slip blinds.

Locks: Locks are defined as follows:

- ✓ **Equipment locks** are devices to lockout equipment in the safe position for energy isolation when performing service or maintenance.
- ✓ **Personal locks** are used by an individual to provide his/her personal protection from release of hazardous energy, while performing service and/or maintenance.
- ✓ **Lock/tag:** Locks/tags is equivalent to the phrases “locks and tags”, “locks or tags”, “locks and/or tags” or “locks with tags” and may be used interchangeably throughout this document. The phrase lock/tag signifies that a lock and tag shall always be used together to identify who performed the lockout. This applies unless a tag only situation is appropriate.

Maintenance: See Servicing and/or Maintenance.

Normal Production Operations: The use of a machine or equipment to perform its production functions.

Primary Authorized Employee: This employee is the authorized employee who exercises overall responsibility for adherence to the location's lockout/tagout/verify procedure.

Qualified Employee (for Device Operation): Any properly trained employee is qualified to operate all mechanical isolating devices and any approved electrical isolating devices. Electrical maintenance personnel are qualified to operate all electrical isolating devices.

Repetitive: Performed more than once every shift.

Routine: Happening often, although in random fashion.

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 and cleaning of machines or equipment and making adjustments where the employee may be exposed to the unexpected energization or start up of the equipment or release of hazardous energy.

Setting Up: Work that is performed to prepare a machine or equipment for normal production operation.

Tag: Used: 1) to identify the person being protected by a personal lockout device, 2) to identify who applied the lockout device and who requested the equipment and/or job locks, 3) in lieu of a lock when an energy isolation device is not capable of accepting a lock. The location uses the White Personal Danger Tag and the Yellow Equipment Warning Tag.

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.

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.

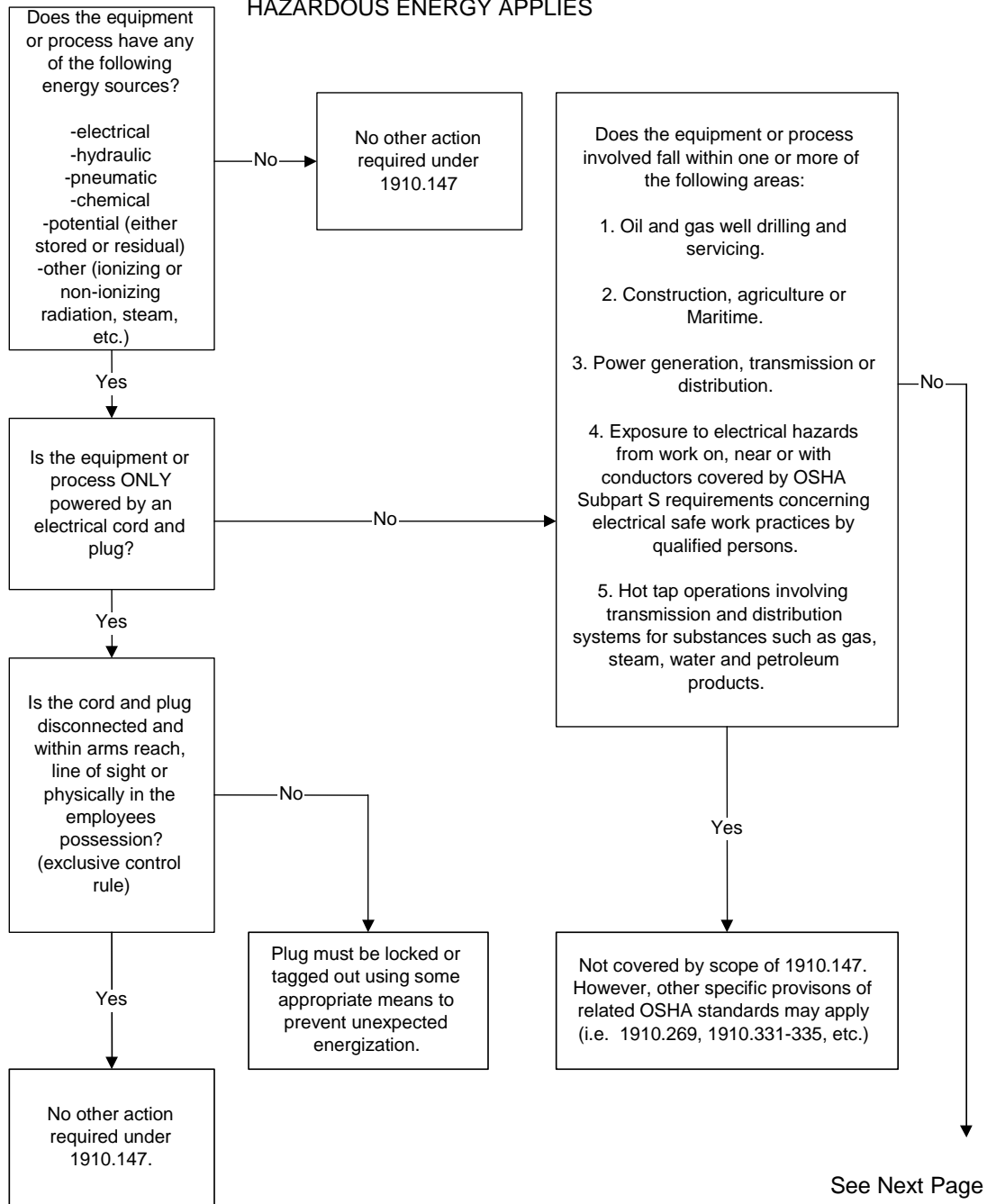
Trouble Shooting, Testing and Positioning: This normally refers to the assessment of equipment problems and performance for maintenance/repair and evaluation purposes. When these activities requires an employee to by-pass a safety device and/or enter a point of operation, or associated danger zone, lockout/tagout procedures shall be followed.

Verification: The process of ensuring that all energy sources for the machine or equipment have been isolated and controlled. Examples: operating start controls, engaging levers, measuring voltage, or inspecting lockout devices in the area.

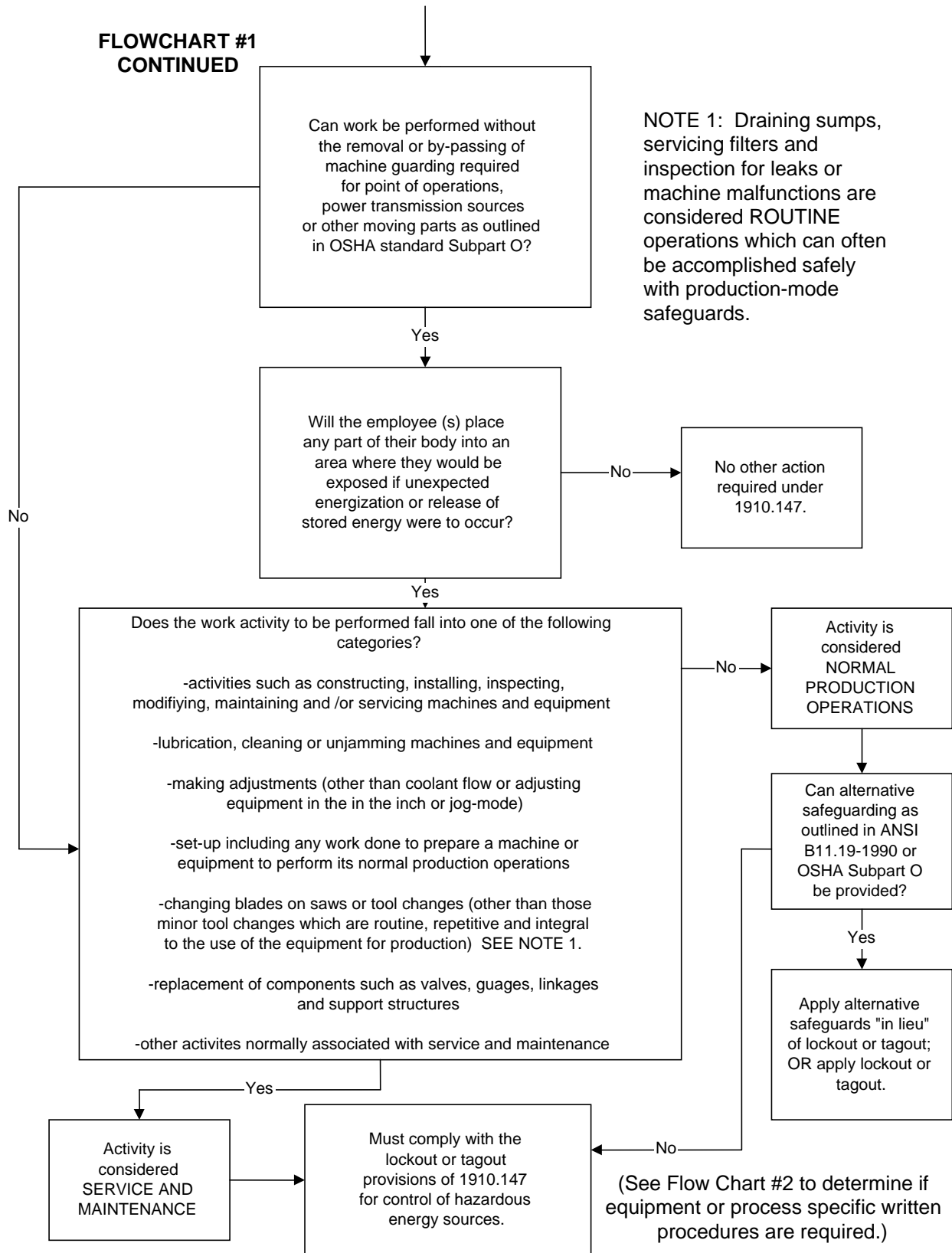
Zero Energy: All equipment is isolated from its energy sources and stored energy is dissipated or restrained.

4.0 **Decision Flow Chart**

FLOWCHART #1
DETERMINING IF 1910.147 - CONTROL OF
HAZARDOUS ENERGY APPLIES



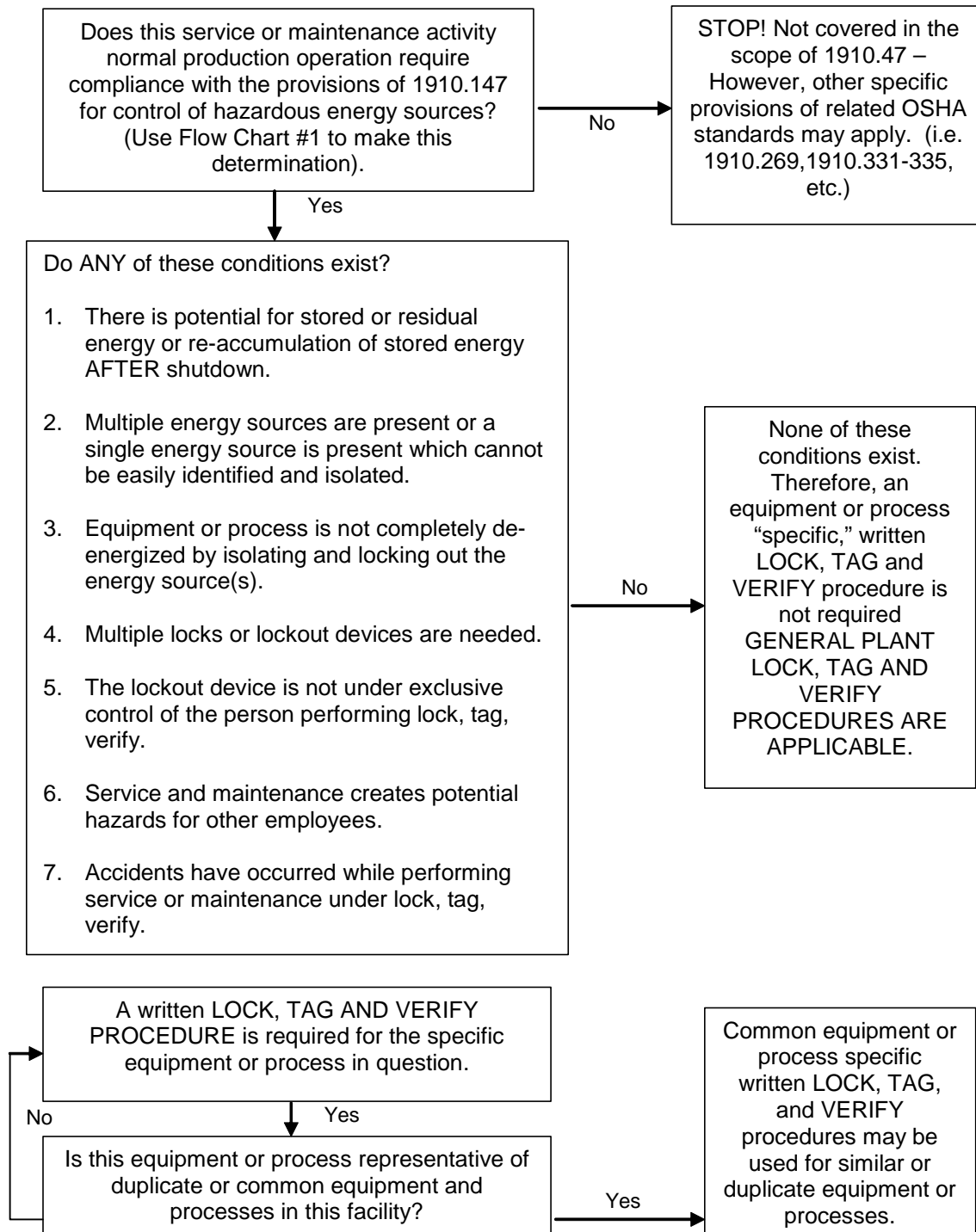
**FLOWCHART #1
CONTINUED**



NOTE 1: Draining sumps, servicing filters and inspection for leaks or machine malfunctions are considered ROUTINE operations which can often be accomplished safely with production-mode safeguards.

FLOWCHART #2

DECISION FLOW CHART-EQUIPMENT/PROCESS SPECIFIC LOCK, TAG AND VERIFY WRITTEN PROCEDURES



5.0 Procedure Guidelines

5.1. Performing a Lockout/Tagout/Verification

Employees are ultimately responsible for ensuring that equipment is disconnected from all hazardous energy sources and secured in a zero-energy state before attempting any work that could expose them to hazardous energy sources, including maintenance and servicing activities. Each exposed employee is responsible for applying their lockout/tagout device to secure the input energy source(s) prior to beginning any work activities. Whenever more than one employee is working on the same piece of equipment or project, multi-lock hasps (gang locks) shall be used and each employee shall apply his/her lock. Another person's lockout shall never be relied on for protection. The following steps must be followed before work begins:

1. *Notify Affected Employees Of Work:* Before beginning work on any equipment or system notify all affected employees in the area of the shutdown. Whenever possible, work shall be scheduled and coordinated with other staff members to minimize interruptions.
2. *Reference Equipment Shutdown and LOCKOUT Procedures:* Large and complex pieces of equipment shall have written procedures which prescribe specific shutdown and lockout methods. These procedures are often included in operating manuals and shall be referenced and followed prior to performing any work activities.
3. *Identify All Internal and External Energy Sources:* Many pieces of equipment have more than one energy source that must be controlled. All external energy sources such as the input electrical supply, compressed air lines, water supplies, etc. must be addressed. In addition, internal energy sources such as charged capacitors, batteries, coiled springs, etc. must be identified. Schematic diagrams and operator manuals shall be available and referenced for assistance in identifying input power requirements and internal energy sources.
4. *Physically Disconnect and Isolate Energy Sources:* Once all energy sources have been identified, the next step is to physically disconnect and/or shut off the source(s) with appropriate energy-isolating-devices and secure them in the off/disconnect position.
5. *Perform Initial Verification:* Before applying the lockout/tagout device, verifications must be made to ensure that the energy sources have indeed been disconnected. Never assume that the proper energy source(s) has been disconnected because of your own or someone else's familiarity with the system or equipment. Depending on the system/equipment and the type of energy source(s), verifications can be made with voltmeters, pressure gauges, etc.
6. *LOCKOUT the Energy-Isolating Device:* Each energy source must be locked out to prevent others from inadvertently reconnecting or reenergizing the equipment. Lockout devices must always be applied at the input power source and **not** at the control circuit. Remember that many pieces of equipment have more than one switch

or switching method from which they can be turned on thereby making control circuits poor places to apply lockout devices.

Note: Exceptions for Cord and Plug Combinations – Equipment that can be de-energized for service by unplugging it from its power source does not require Lockout/Tagout if the unplugged power cord is under the exclusive and immediate control of the person performing the work (i.e., the plug is within sight and within reach of the person performing the work). Lockout/Tagout is required for all other equipment.

7. *TAGOUT the Energy-Isolating Device:* A “Danger Do Not Operate” tag shall be installed at the energy-isolating-device(s). The tag shall be marked with the name and phone number of the person performing the Lockout/Tagout, the date and other necessary and appropriate information.
8. *Perform Final and Periodic Verifications:* Always perform a final verification before proceeding with the work that is to be performed. Verification shall include checking that electrical systems show no voltage present (and are grounded if applicable), fluid and pneumatic systems are depressurized and vented (or drained if applicable) and all isolation devices are properly positioned, inoperable and appropriately tagged. If the work will be performed for an extended time period, periodic verifications must be performed to ensure the integrity of the lockouts which have been applied.

5.2. Performing a Tagout Only

1. Some devices cannot physically be locked out. For these situations, a “Danger Do Not Operate” tag may be used in place of a lock if it is appropriately applied at the energy-isolating-device and at the control panel. The Tagout must be checked frequently when working under a Tagout only, to ensure that it is still in place.
2. Additional measures are necessary to provide the equivalent safety available from the use of a lockout device, such as the removal of an isolating circuit element, blocking of a controlling switch, opening of an extra disconnecting device or the removal of a valve handle to reduce the likelihood of inadvertent energization.

5.3. Removal of a Lockout/Tagout Device

1. *Routine Removal:* Lockout/Tagout devices shall only be removed by, or under the direction of, the individual who applied the device and whose name appears on the tag.
2. *Non-Routine Removal:* If the person who applied the Lockout/Tagout device is unavailable, the direct supervisor of the person who applied the Lockout/Tagout device has authority to remove the device, after verifying the unavailability of the individual who applied the lock and ensuring that removal will not jeopardize the safety of other workers. As part of the removal and restoration process, the supervisor shall ensure that:
 - The equipment is operationally intact.

- Components with the Lockout/Tagout boundary that have been manipulated during maintenance, testing or other work are positioned to permit operation, if required.
- Components that could cause automatic operation of a circuit breaker or a motor/air operated valve when control power or pressure is restored shall be in a position such that automatic operation will NOT occur during removal of Lockout/Tagout.

Upon completion of this verification process, the supervisor shall obtain a backup key and remove the lock.

3. *Emergency Removal:* In emergency situations when a lock must be removed and the individual who applied the lock is not available, the direct supervisor of the individual who applied the lock, or the person in charge of an emergency response, may use forcible means (bolt cutters, etc.) to remove the lock only after ensuring that no hazards exist.

5.4. Lockout/Tagout Hardware

Whenever possible a padlock must be used to secure the disconnect mechanism or the energy isolating device. The use of a padlock and appropriate key control measures are the most effective way to prevent other workers from inadvertently re-energizing a piece of equipment.

Note: All new equipment installations and existing installations requiring periodic work involving hazardous energy sources shall be equipped with energy-isolating-devices capable of being locked out.

1. *Padlocks:* Most disconnecting devices are capable of being locked out with a standard padlock. Therefore, all persons who perform maintenance or servicing of power operated equipment shall be issued individually keyed padlocks to secure disconnecting devices in accordance with this policy.

Note: Locks used for controlling hazardous energy sources must be accompanied by a "Danger Do Not Operate Tag."

Note: Locking devices must be substantial so that they cannot be removed or bypassed while workers are depending on them for protection.

2. *Key Control:* Keys for locks which are used to control hazardous energy sources must be strictly controlled for the procedure to be effective. Each padlock will have two keys; one key will be assigned to the employee at the time the lock is checked out, and the other key will be retained by the employee's supervisor. Keys that are assigned to the employee must be kept under their control.
3. *Multi-Lock Hasps (Gang Locks):* Whenever more than one employee is working on a system or piece of equipment, multi-lock hasps must be used and each worker must

apply his/her lock to the hasp. Multi-lock hasps are available from commercial suppliers.

4. *Supplemental Locking Devices:* A number of energy isolating mechanisms such as circuit breakers, valves, plugs, etc. may require the use of supplemental equipment before a padlock can physically be applied for the purpose of securing an energy source. Devices are available from commercial suppliers which allow workers to lockout energy sources in lieu of simply applying a tagout.
5. *“Danger Do Not Operate” Tags:* At a minimum tags must include the following information; the name and telephone number of the individual who is applying the tag and the date the tag is applied. It is also helpful to include additional information on the tag as to its purpose.



Note: “Danger Do Not Operate” tags must never be used on equipment that is energized or in service.

Note: Tags used for the purpose of controlling a hazardous energy source shall be durable enough to withstand exposure to the environment where they are installed, for as long as they are expected to be there.

5.5. Working on Energized Equipment

Because of the high level of hazard, work on energized equipment shall be strenuously avoided. Equipment shall be designed and installed in a manner that eliminates the need for energized work, or the work shall be performed outside normal business hours when the equipment can be de-energized, if possible.

Situations may still occur that require work to be performed on equipment that is not in a Zero-Energy-State, such as performing measurements, adjustments, calibration or trouble shooting. In these instances, necessary controls shall be identified and implemented to reduce the risk to an acceptable level. This may include, but is not limited to having a properly trained and equipped observer present during the work, using appropriate personal protective equipment and limiting the volume or strength of the energy source.

Work on energized equipment that must be done on a periodic or routine basis shall be addressed in an approved SOP or other formal procedure.

5.6. Training, Qualifications and Procedure Assistance

All employees who could potentially perform work on power operated equipment or systems that could be energized are required to complete Lockout/Tagout/Verify training. The training is provided by Risk Management-Safety Division. Only those employees who have completed Lockout/Tagout/Verify training will be allowed to perform servicing or maintenance on power operated equipment. Records maintained by departments, agencies or Career Service Authority will be used for verification of training.

As previously mentioned, an effective program requires that workers be knowledgeable of the equipment and systems that they intend to work on so that all internal and external energy sources can be properly secured and the equipment rendered safe. Never attempt to work on equipment if there is any uncertainty as to whether or not all energy sources have been identified and secured. For assistance in identifying energy sources and/or applying Lockout/Tagout devices contact coworkers who are familiar with the equipment, Building Planning and Management technicians or reference Lockout/Tagout procedures for the specific equipment/system that may be available as part of Safe Operating Procedures.

6.0 References

29 CFR 1910.147 (OSHA) – The Control of Hazardous Energy (Lockout/Tagout)