

This document is no longer a CPR. This document implements the requirements of Corporate Procedure [ESH100.2.IS.2](#), Control Hazardous Energy (Lockout/Tagout)

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LOCKOUT/TAGOUT PROGRAM MANUAL

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1.0 APPLICABILITY AND SCOPE

This manual addresses the required safety measures necessary to prevent injury while working on equipment at Sandia National Laboratories that could potentially energize or start up. It provides members of the workforce identified as authorized workers the necessary requirements to perform servicing and maintenance safely.

LOTO is required when a worker is performing servicing and maintenance where there is the potential for injury.

Note: For control of hazardous electrical energy other than servicing and maintenance see [MN471004](#), *Electrical Safety Manual*.

For the purposes of this document, the term “energy source” refers to any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other type of energy. “Servicing or maintenance activities” are workplace activities which include: construction, installation, set up, adjustment, inspection, modification, maintenance, or service of machines or equipment. This pertains to the lubrication, cleaning or un-jamming of machines or equipment, and making adjustments or tool changes, where authorized workers could be exposed to the unexpected energization or startup of the equipment or release of hazardous energy.

This manual establishes performance requirements for the control of such hazardous energy during servicing and maintenance. See the [Safety Engineering Program, LOTO Website](#) for additional information.

For assistance in determining whether or not LOTO is required, please use the [LOTO e-Tool](#) or contact the [LOTO subject matter expert](#).

1.1 Exceptions to LOTO

The following servicing and maintenance activities are **not** covered by or subject to requirements within this manual and do not require LOTO before performing the activity. There are specific conditions that must be satisfied to qualify for exceptions. Consult the [LOTO subject matter expert \(SME\)](#) for assistance.

Servicing and maintenance that falls under the following two exceptions does not require LOTO:

- Minor tool changes and adjustments, and other minor servicing activities that take place during normal production operations; if the activities are **routine, repetitive, and integral** to the use of the equipment for production, provided that the activities are performed using **alternative measures that provide the same level of effective protection as LOTO**.
- Work on single-energy-source, cord- and plug-connected, **electrical** equipment on which the exposure to hazardous energy is controlled by unplugging the equipment from the source while the plug remains in the **exclusive control** (within sight and reach) of the **individual** performing the servicing or maintenance.

Note: Work on cord and plug connected equipment that is over 50 amps or over 250 volts, or equipment that is energized by means other than inserting a standard plug with prongs into a standard wall outlet, does not qualify for exemption. Pin-and-sleeve type connectors do not qualify as standard plugs or wall outlets and must be locked out, regardless of voltage or current.

2.0 TRAINING

Work Activity or Role	Required	Recommended
Members of the Workforce who are authorized workers shall receive training prior to performing any LOTO activities	LTO210 (every five years if the requirements of Exception 1, below, are met)	N/A
Members of the Workforce who are authorized workers shall perform periodic inspections annually.	LOTO RTC Competency – Periodic Inspection (every 12 months)	N/A
Members of the Workforce who administer or oversee LOTO programs, who create or review LOTO procedures, or who act in the observer role for periodic inspections.	N/A	LTO415 (LOTO Administrator) (every 3 years)

Note: Work on specific types of systems may require additional training. For example, locking out and performing zero-energy verification of electrical systems requires either ELC106 or ELC119. ELC 901 is required for operating disconnect switches, circuit breakers, and contactors as energy isolation devices. Work on certain pressure systems requires pressure installer certification.

Exception 1: LTO210 is required every 5 years. Failure to complete the prescribed Periodic Inspection in any year will require the completion of LTO210 before any LOTO activities may be performed. The 12 month requirement for periodic inspection may be extended up to 60 days without requiring LTO210, but the worker may not perform any lockout/tagout activities during that 60 day period except as part of the required periodic inspection.

Exception 2: Occasionally, workers are required to apply LOTO only as part of a group lockout/tagout procedure. The specific training requirement to complete LTO210 and periodic inspections may be eliminated if all the following are true:

The work being performed is controlled under a Group Equipment Specific LOTO Procedure A Sandia LOTO-Authorized Worker applies the primary locks and tags, and completes all steps of the LOTO procedure, including the zero energy verification, and completion of these steps is documented.

The incidental worker receives a pre-work brief, and signs the “Incidental Worker Authorization” form available on the LOTO website.

The Primary Authorized Worker reviews the completed “Incidental Worker Authorization” form, signs in the identified spot, and forwards the form to the organization’s LOTO Administrator or ES&H Coordinator for retention.

The incidental worker may then receive a LOTO lock from the Primary Authorized Worker, complete the information for the tag and sticker, and apply the lock(s) to the appropriate energy isolation point or lockbox for the duration of the exposure period, and retain the key(s) to the lock(s) until completion of the need for LOTO.

This Exception applies to Sandia Members of the Workforce and vendors/contractors performing work on Sandia locations under the direct supervision of a Sandia LOTO Authorized Worker.

The LOTO Administrator or ES&H Coordinator will retain the “Incidental Worker Authorization” form as required by existing SNL ES&H records retention requirements (75 years).

NOTE: The use of the “incidental worker” exception (Exception 2) is at the discretion of line management. Some considerations when determining whether or not this exception is appropriate include:

- The complexity of the work to be performed
- The time required for the line organization to develop and implement a group procedure, rather than having a vendor/contractor use their own procedure
- The level of involvement of the “incidental worker” in the planning and implementation of the activity – workers who have significant responsibility in development of lockout/tagout procedures, but only limited on-site involvement in work activities – should be current in either LTO210 or LTO415. If current in LTO415 only, the use of the “incidental worker” exception would be appropriate.

3.0 ROLES AND RESPONSIBILITIES

3.1 Management

Requirements

Management (or their designated representative) shall:

- Evaluate their work areas to identify machines and equipment that use energy sources to determine if their staff will be performing any servicing and maintenance on said equipment and the applicability of LOTO [General Requirements](#).
- Provide LOTO devices that meet the “General Requirements.”
- Ensure that procedures are written that implement LOTO requirements, as appropriate (see “[Written LOTO Procedure](#)”).
- Track both active and stored written LOTO procedures to facilitate periodic inspections.
- Ensure that Members of the Workforce follow established energy control procedures.
- Ensure that Members of the Workforce receive proper LOTO training before being assigned to perform service or maintenance tasks.
- Ensure that Members of the Workforce performing activities requiring LOTO are qualified and designated as authorized workers.
- Ensure that each authorized worker involved in servicing and maintenance activities, that require LOTO, applies his or her own lock(s) to each energy control device or, in the case of a group lockout, applies his or her own lock on a multiple lockout device (i.e., group lockbox).
- For group LOTO: Assign an authorized worker the primary responsibility for a set number of authorized workers working under the protection of Group LOTO device(s) (see the [Group LOTO Procedure](#) section for specific information on primary responsibility”).
- Comply with self-assessment requirements in accordance with [ESH100.4.FI.1, Perform ES&H Self-Assessment Activities](#).
Note: See the [LOTO website](#) for additional information.
- Ensure that periodic inspections (as appropriate) are performed (see the [LOTO website](#) for the Periodic Inspection Documentation Form”).
- Ensure the following records are retained by the appropriate organization in accordance with the [Sandia Records Retention and Disposition Schedule](#).
 - List(s) of authorized workers.
 - Periodic inspection records.
 - Training records.
- Ensure that, whenever outside service contractor personnel are to be engaged in activities that meet the requirements of LOTO, management and outside service contractors do the following:

- Inform each other of their respective LOTO procedures.
- Ensure that all individuals involved in the activity understand and comply with the restrictions and prohibitions of the hazardous-energy-control procedures applicable to the activities being performed.

Note: Contractors must also comply with [ESH100.1.GP.1](#), *Manage Safety for Contracted Activities*, when performing LOTO operations on DOE-controlled premises.

- Ensure that any designated representative appointed to perform the above requirements is an authorized worker and is knowledgeable of the equipment within the Manager's scope of authority.
 - Managers may have more than one designated representative.

Guidance

Managers, and/or their designated representatives should complete LOTO training in accordance with requirements identified in this manual to help conduct periodic inspections.

3.2 Members of the Workforce

Authorized Workers

- Follow the requirements found in "[General Requirements](#)."
- Follow the procedures that have been developed for LOTO.
- Apply or remove only their personal locks and tags when performing LOTO.
- Ensure that keys to LOTO locks are under personal control at all times.
- Ensure that a LOTO lock is applied at the energy isolation device or multiple lockout device (i.e., group lockbox) prior to commencing work, when working under a group lockout procedure.
- Report any lost or damaged LOTO equipment to management.
- Participate in the development of equipment-specific energy control procedures and perform periodic inspections when assigned.
- Attend assigned training courses.
- Do **NOT** work at any time under the protection of someone else's lock.

Note: Workers shall **NOT** perform service and maintenance activities under another worker's lock. Each worker involved in a maintenance activity shall apply the appropriate lock(s) and tag(s) specified in the relevant lockout/tagout procedure for protection from the unexpected energization of start-up of equipment or the release of hazardous energy.

Affected Workers

- Be aware of lockout/tagout procedures used in your operations.
- Do **NOT** attempt to operate any machine, equipment or process which is locked and tagged out.

- Do **NOT** attempt remove any locks and tags from energy control devices.
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4.0 GENERAL REQUIREMENTS

Lockout/Tagout is required whenever servicing and maintenance activities are performed on machines or equipment where the unexpected energization or startup of the equipment, or release of stored energy, could cause injury to a worker, unless subject to one of the exemptions in Section 1.1, above. For any activity where the worker could contact potentially energized electrical conductors or circuit parts, lockout/tagout shall be applied unless appropriate energized work activities have been approved as described in Sections 2.3 and 2.4 of the [Sandia Electrical Safety Manual](#) (MN471004), or one of the exemptions in Section 1.1, above, applies.

4.1 Required Devices

Obtain and use the following Sandia standardized locks and tags:

- Red-banded Master® locks.
- SNL-specific lock labels.
- SNL-specified "DANGER" tags.
- Single key.

Lockout/tagout devices shall not be used for administrative control (see Administrative Control Procedure on the [LOTO website](#)).

Note: Refer to the online [LOTO catalog](#) for information about various LOTO devices, vendors, and associated part numbers. Specific manufacturers are identified to inform the reader about sources believed to have equipment available as of the date of this document. The listings here are not intended, nor should they be interpreted, to reflect Sandia endorsement of any product or manufacturer.

4.2 Use of Devices

The minimum requirements for LOTO locks and tags are:

- Red-banded Master® locks shall have SNL-specific lock labels applied.
- Lock labels shall, at a minimum, include the lock owner's name and contact information (e.g., phone number, pager number).
- SNL-specific "DANGER" tags shall be used whenever a red-banded lock is applied. Information on the tag shall, at a minimum, include the lock owner's name and contact information (e.g., phone number, pager number). More information is allowed and encouraged but **not** required.

Locking devices that are constructed to allow the attachment of locks and tags to energy isolation devices shall:

- Prevent operation of the isolation device under all expected environmental conditions.
- Be constructed to accept a standard SNL red-banded Master® Lock.
- Prevent inadvertent operation of the isolation device when a lock is applied to the device.

Note: The locking device shall be substantial enough to prevent its removal without the use of excessive force or unusual techniques.

4.3 Procedures

General Requirements

Written procedures shall be prepared and approved, prior to commencement of any servicing and maintenance activity and used whenever LOTO operations are performed, unless equipment has been evaluated and meets the eight criteria of the [Equipment Hazard Assessment](#) form. Procedures shall be approved by the appropriate authority, as determined by division policy.

Equipment Hazard Assessment

A record of the equipment hazard assessment shall be maintained by the affected manager, and promulgated to employees as part of the appropriate work package or other work controls document. The **equipment owner or other management designee who has appropriate knowledge of the hazards and sources associated with the equipment should perform this evaluation.** The formal evaluation of the affected machine or equipment shall include:

- The task(s) that may be performed.
- An evaluation of the hazards and energy sources associated with the tasks.
- An acknowledgement by the user(s) that they will follow all applicable steps of the LOTO Checklist, including, but not limited to, shutdown, energy isolation and application of locks and tags, zero energy verification, and startup (if the form is documenting why an undocumented procedure can be used).

A formal written procedure is **NOT** required if the equipment meets the eight criteria described below in "[Unwritten Procedure Criteria](#)" and the equipment hazard assessment has been filled out and signed.

Note: An [Equipment Hazard Assessment template](#) is available to assist in performing and documenting equipment evaluations.

Unwritten Procedure Criteria

In order to be exempt from having a written LOTO procedure, each task / equipment shall meet ALL of the criteria below. **If all criteria are not met, a written LOTO procedure is required.**

- The equipment or machine has no potential for stored or residual energy after shutdown that could endanger employees.

- The machine or equipment has a single energy source that can be readily identified and isolated.
- The isolation and locking of that energy source will completely de-energize and de-activate the machine or equipment.
- The machine or equipment is isolated from that energy source and is locked out during servicing or maintenance.
- A single lockout device will achieve a locked out condition.
- The lockout device is under the exclusive control of the authorized worker who is conducting the service or maintenance.
- The servicing or maintenance does not create hazards for other employees.
- There have been no accidents involving the unexpected activation or re-energization of the machine or equipment during servicing or maintenance.
- There is no transfer of responsibility for the maintenance task.
- An evaluation of the equipment has been completed and documented in accordance with the requirements in “Equipment Evaluation, “above.

Note: Two workers performing work on the same machine or equipment may use the unwritten procedure; however, each authorized worker shall place his or her personal lock and tag on the energy isolation device and remove it upon completion of the assignment. Each authorized worker shall verify or observe the de-energization and verification of zero-energy on the equipment. Servicing or maintenance activities on the same piece of equipment by more than two authorized workers shall require a group LOTO procedure.

Workers performing LOTO operations without written procedures shall follow the requirements of [Table 1](#) as applicable. A [LOTO checklist](#) is provided as a job aid on the [LOTO website](#) to assist workers in performing unwritten procedures.

Written LOTO Procedures

Requirements

Each servicing and maintenance activity performed under the scope of this manual, (see [Applicability and Scope](#)), shall have a written LOTO procedure developed prior to conducting work unless documented in an Equipment Hazard Assessment (See 4.3, General Requirements). The procedure shall be approved or reviewed based on the organization’s process. The same procedure can be used for future work if the scope and hazards of the activity do not change.

Any deviations from the written procedure requirement shall be approved and documented by a senior manager with the concurrence of the [LOTO Program SME](#).

The written LOTO procedure shall clearly and specifically contain the following information:

Scope, purpose, and authorization:

- A statement of intended use of the procedure.
- Identification of the equipment or systems to which the procedure applies.

- Provision for the appropriate authorization for the procedure.

Specific instructions shall be provided in the procedure for each item below:

- Shutting down
- Isolating
- Blocking and securing techniques and devices
- Applying LOTO devices
- Verifying the zero-energy state
- Removing LOTO devices
- Returning to service or maintenance after testing
- Transferring LOTO devices and responsibilities during shift changes, as appropriate
- Start-up.

The procedure shall contain enough detail for authorized workers to have a clear understanding of the LOTO energy control measures for a particular piece of equipment or task. The amount of detail in the procedure will also depend on the complexity of the machine, equipment or process and the information that the authorized worker needs to know to safely control the hazardous energy for the machine, throughout the course of the servicing and maintenance activity. Additional information from the table for [Application and Removal of Locks and Tags](#) may need to be included to help the worker perform LOTO safely.

Note: Any format may be used to document a written LOTO procedure (e.g., a Technical Work Document [TWD] or Electrical Work Permit). See the [LOTO website](#) to access the “LOTO Procedure Template (ESLP)” for developing written procedures. It includes instructions and is suitable for use any time LOTO is applied. In most cases, completing the “Equipment-Specific LOTO Procedure Template” will satisfy the requirements of this section. Also see the LOTO website to access the “[LOTO Checklist](#).” Consult the [LOTO Program SME](#) for assistance.

Grouping of Similar Equipment

Similar equipment may be grouped under a single lockout/tagout procedure if they have similar energy sources, similar shutdown and startup procedures, and similar zero-energy verification requirements. For example, a series of machine tools could be grouped under a single LOTO procedure if they all were shutdown by pushing a “stop” button, if they could be locked out by opening a disconnect near the machine and isolating a local air supply (and locking with an appropriate locking device), and if the zero-energy verification included reading a pressure gauge and attempting to start the equipment by pushing the “start” button, and start up simply required pushing the start button. Note that if one piece of equipment had an air valve, and another one did not, they could not be grouped in a single procedure if locking the air was required. For additional information on grouping of similar equipment contact the [LOTO program SME](#).

Application and Removal of Locks and Tags

Requirements

Authorized or affected workers, as appropriate, shall perform activities associated with LOTO, detailed in [Table 1](#), Application and Removal of Locks and Tags.

Table 1. Application and Removal of Locks and Tags

Step	Responsible Individual	Required Action
1	Authorized Workers	<p>Prepare for shutdown:</p> <ul style="list-style-type: none"> Notify the affected workers about the application of lockout or tagout devices. Notification shall be given before the controls are applied. Authorized workers shall have knowledge of the following: (1) the type and magnitude of the energy, (2) the hazards of the energy to be controlled, and (3) the method or means to control the energy.
2	Authorized or Affected Workers	Shutdown the machine or piece of equipment using the procedures established for that machine or piece of equipment.
3	Authorized Workers	<p>Isolate machine or piece of equipment:</p> <p>Physically locate all energy-isolating devices needed to control the hazardous energy source(s). Operate these devices in such a manner as to isolate the machine or piece of equipment from the energy source(s).</p> <p>Note: ELC 901 is required when operating disconnect switches, circuit breakers, and contactors as energy isolation devices. PPE may also be required.</p>
4	Authorized Workers	<p>Apply LOTO device:</p> <ul style="list-style-type: none"> Lockout includes the placement of the LOTO lock and tag, and may include other energy-isolating devices. Lockout devices shall be affixed at each energy-isolating device (e.g., valve, breaker, disconnect). Lockout devices, wherever used, shall be affixed in a manner that will hold or ensure that the energy-isolating device is in a safe or "off" position.
5	Authorized Workers	<p>Release all stored energy:</p> <p>Follow the application of LOTO devices to energy-isolating devices, relieve, disconnect, restrain, and otherwise render safe all</p>

		potentially hazardous stored energy or residual energy.						
		<table border="1"> <thead> <tr> <th>If...</th> <th>Then...</th> </tr> </thead> <tbody> <tr> <td>There is a possibility of re-accumulation of stored hazardous energy,</td> <td>Verify the isolation while the service or maintenance activity is underway or until the possibility of such accumulation no longer exists.</td> </tr> <tr> <td>There is not a possibility of re-accumulation,</td> <td>Go to Step 6.</td> </tr> </tbody> </table>	If...	Then...	There is a possibility of re-accumulation of stored hazardous energy,	Verify the isolation while the service or maintenance activity is underway or until the possibility of such accumulation no longer exists.	There is not a possibility of re-accumulation,	Go to Step 6.
If...	Then...							
There is a possibility of re-accumulation of stored hazardous energy,	Verify the isolation while the service or maintenance activity is underway or until the possibility of such accumulation no longer exists.							
There is not a possibility of re-accumulation,	Go to Step 6.							
6	Authorized Workers	<p>Verify energy isolation:</p> <ul style="list-style-type: none"> • Verify that the machine or piece of equipment has been isolated and de-energized prior to starting work on a machine or piece of equipment that has been locked and tagged out. Attempt to start the equipment, if applicable, for non-electrical work (no potential exposure to energized components exists) on equipment powered by electricity. • Verify that all sources of energy have been removed through the use of meters, gauges, telltale drains or other means, for all equipment. <ul style="list-style-type: none"> ○ Specify the means used to verify that each energy source was eliminated in the equipment-specific LOTO procedure. • Perform the zero-energy verification for electrical lockouts, (where, if the lockout is inadequate, the worker may be exposed to energized components) as follows: <ul style="list-style-type: none"> ○ Attempt to start the equipment using the normal means (if applicable). ○ Don appropriate PPE as if the equipment were energized. <ul style="list-style-type: none"> ▪ Use the relevant section of the <i>Energized Work Decision Tool</i> to make the appropriate PPE determination. ▪ Ensure that the specified shock boundaries remain in effect until the zero-energy verification has been performed. ○ Specify the meter to be used, who performs the zero-energy verification, and the boundaries of the work area in the equipment specific LOTO procedure. ○ Test for energized points using an adequately rated voltage meter. <ul style="list-style-type: none"> ▪ Check phase-to-phase and phase-to-ground, 						

		<p>and all points to which the maintenance worker may be exposed, for the absence of voltage.</p> <ul style="list-style-type: none"> ▪ Verify operability of the meter before and after testing the circuit by testing the meter on a known, live source. ○ Specify the alternative methods for performing zero-energy verification when equipment is inaccessible. <p>Independent Verification: Independently verify the position of those components that are critical to ensure safe and reliable operation, when circumstances warrant while performing maintenance and servicing. Contact the LOTO program SME for additional information and guidance on independent verification.</p>
7	Authorized Workers	Perform work activities.
8	Authorized Workers	<p>Release from LOTO:</p> <ul style="list-style-type: none"> • Make work area safe. • Clear tools, equipment, additional authorized workers, and affected workers: • Inspect the work area to ensure that nonessential items have been removed and assure that the machine, piece of equipment, or components are operationally intact. • Inspect the work area to ensure that all Members of the Workforce have been removed from the hazard area. • Remove locks and tags. • Each LOTO device shall be removed from each energy-isolating device by the authorized worker who applied the device. • When the authorized worker who applied the LOTO device is not available to remove it, that device may be removed in accordance with the following steps and shall be documented (see LOTO website for more information on "LOTO Removal of Lock by Other Than Owner"): <ul style="list-style-type: none"> ○ Verify that the authorized worker who applied the device is not at the site. ○ Notify management and obtain management authorization to remove the device. ○ Make all reasonable efforts to contact the authorized worker regarding the removal of his LOTO device. ○ Remove the LOTO device(s). ○ Ensure that the authorized worker has been informed of the removal of the device before resuming work activities at the facility.

		<p>Note: Voicemail or email alone is not an adequate means of notification.</p> <ul style="list-style-type: none"> • After LOTO devices have been removed and before a machine or piece of equipment is started, notify affected workers that the LOTO devices have been removed. • If all work is complete, authorize the restart of the machine or piece of equipment by using the procedures established for that machine or piece of equipment. • If work is not complete or additional testing/positioning of the equipment is required, proceed to “Testing or Positioning of Machines, Equipment, or Components Procedure.” (Section 5.1) • Re-energize in accordance with operating instructions or technical work documents.
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5.0 ADDITIONAL REQUIREMENTS

Additional requirements are provided below for LOTO situations or activities that include: interim testing, group lockout, shift or personnel changes, outside contractors, and tagout. In these situations, specific procedures or a sequence of actions are required to maintain integrity, continuity and coordination of the LOTO tasks. These actions shall be included as part of the Equipment Specific LOTO Procedure or in the technical work document.

5.1 Procedure for Testing or Positioning Machines, Equipment, or Components

Requirements

If a LOTO device is temporarily removed from the energy-isolating device and the machine or equipment must be energized for testing or positioning, then the authorized workers shall complete the following steps before returning it to service.

Table 2. Procedure for Testing or Positioning Machines, Equipment or Components

Step	Responsible Individual	Required Action
1	Authorized Workers	<p>Clear tools, equipment, and personnel:</p> <ul style="list-style-type: none"> • Inspect the work area to ensure that nonessential items have been removed and to ensure that the machine, piece of equipment, or component is operationally intact. • Check the work area to ensure that no Members of the

		Workforce are within the hazard area.
2	Authorized Workers	Remove locks and tags: <ul style="list-style-type: none"> Remove LOTO devices used during the application.
3	Authorized Workers	Energize: <ul style="list-style-type: none"> Energize and proceed with testing or positioning.
4	Authorized Workers	Re-apply LOTO: Once testing or positioning is completed: <ul style="list-style-type: none"> Shut down the equipment in accordance with existing operating instructions. Isolate or block the energy sources from the machine or piece of equipment. Re-apply LOTO devices. Release any stored energy that may have accumulated during the testing or positioning. Perform the same zero-energy verification that was performed when the device was originally locked out.

5.2 Group LOTO Procedure

Requirements

When two or more [authorized workers](#) are performing servicing or maintenance activities on a single piece of equipment or system, then the authorized workers shall follow a group LOTO procedure. The group LOTO procedure shall afford each worker a level of protection equivalent to that provided by the implementation of a personal LOTO. The group LOTO procedure shall include the requirements of the equipment specific LOTO procedure. The group LOTO procedure shall also include the following to address group-related requirements:

- Designate primary authorized workers:
 - A primary authorized worker shall always be designated for any group procedure. The primary authorized worker shall be responsible for the safety of all authorized workers working under the group LOTO procedure. The primary authorized worker is responsible for overall LOTO control; coordinating the affected workers, and ensuring protection during the work task. In addition, where Incidental Workers are included, and the Incidental Worker Authorization form is required (see Section 2, Exception 2, above), the Primary Authorized Worker shall ensure that the requirements of the form and this manual are met. The continuity of protection

shall include the use of a JOB LOCK by the primary authorized worker.

Note: When two authorized workers are performing servicing and maintenance activities on a piece of equipment, no primary authorized worker is required if each worker applies his or her own lock and tag and verifies or observes the de-energization and verification of zero-energy on the equipment.

- Designate principle authorized workers when required:
 - The designation of principle authorized workers shall be determined based on the number of authorized workers, the complexity of the procedure, and the number of trades involved in the work. Principle authorized workers may be team or trade leads with delegated responsibility for secondary group lock boxes as determined by the primary authorized worker. Consult the LOTO program manager for additional information on designating primary and principle authorized workers.
- Perform a pre-work brief:
 - The primary authorized worker shall conduct a pre-work brief that includes, at a minimum, the specific roles and responsibilities of each team member, and the method(s) used to manage the group locking.
- Apply a lock to the group lockbox or other specified location:
 - Each authorized worker working under the group LOTO procedure shall apply a lock to the group lockbox or other specified location to prevent the removal of locks from energy-isolation points while that worker is actively involved in the servicing or maintaining activity.
- Assure that the locks and tags installed on the energy isolation devices remain in place until all work has been completed and all authorized workers are protected from the hazardous energy.

Note: Zero-energy verification is required to be performed by the primary authorized worker or his designee immediately following the application of the locks installed on the energy isolating devices. Each authorized worker may perform zero energy verification without retribution or fear of reprisal, but they are not required to.

Incidental Workers

An “Incidental Worker” is a worker who is either

- a Sandia Member of the Workforce who is not directly involved in the planning and initial implementation of the group LOTO procedure, but requires access to a controlled area. One example is a confined space entry into an environmental chamber to deliver and setup test equipment – the worker is not involved in the maintenance of the thermal chamber, but simply requires entrance to set up unrelated test equipment

- a contractor/vendor who does not have a LOTO procedure provided by the contracting company, and requires LOTO under Sandia / OSHA regulations

In each of these cases, the primary authorized worker is responsible for determining the appropriate use of the “Incidental Worker” designation, the performance of the associated briefing, and collection/retention of the paperwork required by Section 2.0, above.

Incidental Workers may only be used in a group LOTO application.

5.3 Procedure for Shift or Personnel Changes

Requirements

Specific steps for shift or personnel changes shall be included in the group LOTO procedure and implemented to ensure the continuity of LOTO protection and to minimize exposure to hazards from the unexpected energization or start-up of a machine or piece of equipment; and the release of stored energy. Provisions shall be included for the orderly transfer of LOTO device protection between [authorized workers](#) from succeeding shifts.

The following four options provide for the orderly transfer of LOTO protection:

- **Option 1:** All authorized worker(s) leave their personal LOTO devices in place until the job is completed. Energy cannot be restored until all the authorized workers have removed their locks.
- **Option 2:** During overlapping shifts, the on-coming authorized worker(s) apply their personal LOTO devices before the off-going authorized workers remove their personal LOTO devices. The on-going workers must verify energy isolation before continuing the job.
- **Option 3:** A “JOB LOCK” can be applied to maintain continuity during the period prior to the off-going worker removing their personal LOTO device. At a later time, the on-coming worker(s) applies their personal LOTO device and must verify the energy isolation before continuing the job and the “JOB LOCK” removed.
- **Option 4:** Each on-coming authorized worker starts the LOTO procedure at step one, see Table 4.3.3.1, Application and Removal of Locks and Tags. This requires the restoration of the equipment to a safe condition at the end of each shift before off-going workers can remove their locks.

If shift changes are expected during the course of servicing or maintenance tasks, the procedure shall specify the method chosen for managing the shift change. The option selected should reflect the type of maintenance and working conditions in effect. For additional assistance in determining the appropriate method of shift change, contact the [LOTO program SME](#).

5.4 Outside Contractor LOTO Requirements

All outside contractors performing service or maintenance shall perform LOTO procedures when required in accordance with 29 CFR 1910.147 (OSHA Standards for General Industry) and shall comply with the following additional requirements:

- The outside contractor shall be briefed on SNL-specific LOTO devices and procedures applicable to the equipment under maintenance.
- The outside contractor shall inform the SNL equipment owner and other authorized or [affected workers](#) of the outside contractor's energy-control procedure or process, including any differences between that process and SNL-specific requirements.
- The outside contractor shall comply with [ESH100.1.GP.1](#), *Manage Safety for Contracted Activities*, when performing LOTO activities on SNL locations.

5.5 Tagouts

Requirements

The use of tagouts for worker injury prevention (in accordance with the requirements within this manual) is **not** allowed unless specifically authorized by the LOTO program SME and the Safety Engineering program manager.

Note: If tagout procedures are authorized, additional training on the duties and responsibilities of authorized workers is required, and a formal tagout procedure shall be required which demonstrates protection equivalent to that provided by a lockout.

Equipment and machines that have been purchased or have undergone extensive repair, renovation or modification since January 2, 1990 shall be provided with lockout capability.

6.0 PERIODIC INSPECTION

6.1 Requirements

The purpose of conducting periodic LOTO inspections is to determine if existing procedures are adequate, understood, and followed. The inspector performing the inspection shall be an [authorized worker](#), LOTO administrator, ES&H Coordinator, or safety engineer. The inspector may not be directly involved with the LOTO procedure under inspection. Additionally, research has demonstrated that workers who perform LOTO activities regularly (those who are able to actually perform LOTO on at least an annual basis) are more aware of LOTO requirements and less likely to make an error, as compared to those less frequent users. As a result, personnel are required to take LOTO210 every year *unless* there is a documented periodic inspection submitted, in which case the periodicity for the training can be extended to 5 years (based on annual periodic inspection performance).

Performance of periodic inspections shall be completed on the "[Periodic Inspection Documentation Form](#)". The completed inspection shall be documented with the associated procedure in ILMS (procedure review), and then sent to the assigned training coordinator for entry into TEDS.

- If the LOTO Procedure is used more often than once per year:
 - An annual inspection is required.
Periodic inspections do not need to be conducted for each procedure. Inspections can be conducted for groups of procedures as described in the above section under Written LOTO Procedures.
- If the LOTO procedure is used less often than once per year:
 - An inspection is required before the procedure is used again.

Note: LOTO procedures that are not required to be documented, per "Unwritten Procedure Criteria," above, still need to be inspected and reviewed to ensure that they are adequate and being properly utilized.

- Each authorized worker shall be observed performing a LOTO activity as part of the periodic inspection process. Where this requirement cannot be met due to infrequent LOTO activities or large numbers of authorized workers, contact the LOTO Program SME for guidance.
- Each periodic inspection shall include the following:
 - Identification of any deficiencies or deviations and methods or strategies used for corrections or updates.
 - Review of the responsibilities of the authorized worker being observed by the inspector.
 - Certification that the periodic inspection has been performed for all applicable LOTO procedures. Acceptable documentation of certification for this activity includes:
 - A description of the machine that was inspected.
 - The date of inspection.
 - The name of the worker(s) included in the inspection.
 - The name of the inspector.

If during a periodic inspection, a deficiency within the content of the written LOTO procedure is found, work shall be stopped and management informed. The procedure shall be corrected prior to performing any maintenance on the equipment during the inspection.

If an authorized worker is observed inadequately performing LOTO procedures during a periodic inspection then the authorized worker performing the inspection shall do the following:

- Stop work.
- Inform management.
- Resume work with a properly trained authorized worker after management is notified and with management permission.

- The authorized worker that was observed improperly performing LOTO Procedures during the periodic inspection shall, at a minimum, complete LTO210 training before performing additional LOTO activities. The manager may specify additional retraining.
- Information concerning the inadequacies found during the inspection should be reviewed and documented with the authorized workers involved in the procedure inspected.

6.2 Guidance

Additional periodic inspections should be conducted as frequently as possible to allow authorized workers to validate and evaluate the quality of LOTO procedures. See the [LOTO website](#) to access the "Tool for Performing Periodic Review of LOTO Procedures." All authorized workers do **not** have to be observed performing each LOTO procedure. However, the supervisor or manager should evaluate LOTO activities while monitoring routine work.

7.0 RELATED HAZARDS AND ACTIVITIES

7.1 Electrical Safety Practices

To protect Members of the Workforce from electrical hazards during construction, installation, operation, and maintenance of electrical systems and associated equipment, additional requirements are mandatory. These requirements involve training, personal protective equipment (PPE), limited approach boundaries and specific verification steps. Details can be found in [MN471004](#), *Electrical Safety Manual*. Some of these requirements will be reiterated in this manual.

7.2 Confined Spaces

To protect the Members of the Workforce from release of energy and material into the confined space during servicing and maintenance of machines, equipment, or processes, the energy must be isolated. The means of isolation shall be blanking or binding; misaligning or removing sections of lines, pipes or ducts; a double block and bleed system in confined spaces; lockout of all sources of energy; or blocking or disconnecting all mechanical linkages. Appropriate lockout/tagout (LOTO) devices shall be applied at the isolation points

Hazard or Activity	Reference
Electrical safety	MN471004 , <i>Electrical Safety Manual</i>
Pressure safety	ESH100.2.PS.1 , <i>Control Pressure Safety Hazards</i>
Cranes, hoists, and elevating work platforms	ESH100.2.IS.21 , <i>Manage Hazards for Overhead and Mobile Cranes and Hoists</i> ESH100.2.IS.22 , <i>Manage Hazards for Forklifts</i>
Personal protective equipment (PPE)	ESH100.2.IS.8 , <i>Assess Workplace Hazards and Provide and Maintain Personal Protective Equipment</i>
Machines and tools	ESH100.2.IS.10 , <i>Manage Industrial Machine and Portable Power Tool Safety</i>
Lasers	ESH100.2.IH.7 , <i>Evaluate and Control Lasers</i>
Confined spaces	ESH100.2.IH.9 , <i>Enter Confined Spaces Safely</i>
Local exhaust ventilation systems	ESH100.2.IH.15 , <i>Control Hazards Using Local Exhaust Ventilation and High Efficiency Particulate Air Filters</i>
Administrative controls	Administrative Control Procedure

8.0 REFERENCES

8.1 Requirements Source Documents

[10 CFR 851](#), *Worker Safety and Health Program*.

[29 CFR 1910.147](#), *The Control of Hazardous Energy (Lockout/Tagout)*.

[29 CFR 1910.333](#), *Selection and Use of Work Practices*

ANSI/NFPA 70E, *Electrical Safety Requirements for Employee Work Places*, 2004 Edition.

8.2 Related Documents

[29 CFR 1910, Subpart O](#), *Machinery and Machine Guarding*.

[29 CFR 1910.269](#), *Electric Power Generation, Transmission, and Distribution*.

[29 CFR 1926.417](#), *Lockout and Tagging of Circuits*.

ANSI/ASSE Z244.1-2003, *Control of Hazardous Energy*.

[DOE-STD-1030-96](#), *Guide to Good Practices for Lockouts and Tagouts*.

Safety Engineering Program, [LOTO website](#)



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