# National High Magnetic Field Laboratory Safety Program

<table>
<thead>
<tr>
<th>TITLE:</th>
<th>Lock, Tag, and Verification Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUBJECT:</td>
<td>Lock, Tag, and Verification of Energy Sources</td>
</tr>
<tr>
<td>PROGRAM NUMBER:</td>
<td>LTV-1</td>
</tr>
<tr>
<td>EFFECTIVE DATE:</td>
<td>July 26, 2016</td>
</tr>
<tr>
<td>REVISION NUMBER:</td>
<td>001</td>
</tr>
<tr>
<td>REVISION DATE:</td>
<td>July 26, 2016</td>
</tr>
<tr>
<td>ISSUING AUTHORITY:</td>
<td>Safety &amp; Admin</td>
</tr>
<tr>
<td>APPROVAL:</td>
<td>NHMFL Deputy Lab Director</td>
</tr>
<tr>
<td>Additional Approval Signatures on Revision and Approval Page in Appendix</td>
<td></td>
</tr>
</tbody>
</table>

## Overall Mission and Overview

The National High Magnetic Field Laboratory (NHMFL) Environmental, Health, and Safety (EHS) program’s mission is to:

Provide support and guidance to all NHMFL departments with the implementation, maintenance and review of a comprehensive environmental, health, and safety program. The primary goal of the MagLab Safety Dept. program is to control, reduce or eliminate work-related injuries, illnesses and loss of NHMFL resources.

The NHMFL is charged by the National Science Foundation (NSF) to safely:

- Promote magnet-related research to serve an interdisciplinary scientific user community.
- Provide unique high-magnetic-field facilities through a competitive and transparent proposal review process.
- Advance magnet and magnet-related technology.
- Partner with universities, other national laboratories and industry to enhance national competitiveness in magnet and related technologies.
- Serve the NSF as a prominent example of its successful stewardship of large research facilities.
- Support science and technology education in the United States.
- Increase diversity in the science, technology, engineering, and mathematics workforce.
- Promote collaboration among our three partner institutions: Florida State University (FSU), the University of Florida (UF) and Los Alamos National Laboratory (LANL).
LOCK-TAG-VERIFICATION PROGRAM INDEX:

1.0 Purpose
2.0 Scope
3.0 Definitions and Acronyms
4.0 Roles and Responsibilities
5.0 General Procedure Summary
6.0 Lockout Equipment
7.0 Transfer of Control
8.0 Program Audit
9.0 LTV Work Processes
   WP-A Centrally Controlled LTV General Rules
   WP-B Exceptions
   WP-C Individually Controlled LTV
   WP-D Group Guidelines
   WP-E Contractor LTV
   WP-F Training and Authorization
   WP-G Administrative Lockout
   WP-H Equipment Specific Procedure
   WP-I Air Gapping
   WP-J Lock Removal
10.0 Appendices
   10.1 SCUD User Guide
   10.2 Mechanical Lockout Guidelines
   10.3 Electrical Lockout Guidelines
   10.4 Issuing Authority Employee List
   10.5 LTV Example Chart
   10.6 Lost Key/Absent Person Lock Removal Form
1.0 PURPOSE:

The purpose of this procedure is to prevent injury from the unexpected start-up or release of energy including electrical, chemical, physical, stored, etc., during equipment service, maintenance, or construction. This program establishes the minimum safety requirements for the Lock, Tag and Verification (LTV) of hazardous energy sources and the verification of energy isolation through the use of isolating devices and techniques during service, maintenance, and construction on equipment and systems to ensure a zero energy state in the portion of the system where work will be performed.

- Conformance to this program ensures that hazardous energy sources are properly isolated and controlled.
- The use of this program will ensure consistent application of the NHMFL LTV requirements across all work activities.
- The use of this program prevents unexpected startup or release of stored energy that could result in injury or hazardous material exposure.
- This program provides a method to protect personnel, equipment, and systems controls from damage, and maintains integrity of physical boundaries.

2.0 SCOPE:

This program is to be used by all personnel at the NHMFL, including employees, students, visitors, and contractors. This program identifies the specific requirements for the protection of employee(s) working on facility machinery, equipment, and systems from the hazards due to the unexpected or accidental release of stored or potential energy.

This program also establishes responsibilities as applicable for the administration and implementation of the program. All contractors will comply with this program unless they have an approved safety plan submitted and approved in advance of performing work and the plan includes more stringent LTV procedures than those described within this document.

It is the intention of this program to ensure that employees, visitors, and contractors who are required to conduct LTV operations:

- Comply with all state and federal regulations regarding LTV.
- Identify, evaluate, and eliminate potential hazards from LTV operations.
- Are trained and have demonstrated competence on proper procedures and techniques.

Employees who fail to follow these established procedures and other applicable regulations for lockout of equipment and machinery or who fail to take appropriate steps to protect the safety of all personnel who are performing work under locked out conditions are subject to disciplinary action in accordance with the NHMFL Safety Disciplinary Policy.
Each job where the workers have the potential for exposure to hazardous energy must have its own unique LTV, created by the Primary Authorized Employee (PAE) performing the work. Every LTV must be independently verified by an Issuing Authority (IA) who is sufficiently knowledgeable of the system/equipment and environment where the work will be performed to ensure adequacy. Every Authorized Employee working under the LTV must receive instruction from the PAE or original IA regarding the portions of the system/equipment where work can be performed safely and how the zero energy state or safe condition may be personally verified by them prior to their conducting any work.

Authorized Employees must specifically be instructed by the PAE or IA, in their absence, the work may only be performed within the portions of systems isolated by their specific LTV, where a zero energy state or otherwise safe condition has been established and confirmed in accordance with authorized LTV protocols. They must also be instructed that no work shall be performed that causes removal or reconfiguration of any of the established isolation points, without either properly clearing locks and tags from the existing LTV or reestablishing new boundaries and performing zero energy state verifications under a new LTV prior to the alteration of any existing isolation boundaries following approved processes authorized under this program.

Valves and other similar devices that are not specifically designed to function as LTV blocks, such as remotely actuated and/or control valves or switches, should not be used for energy isolation if more suitable blocks are afforded in the system. When these must be used, they require special consideration and may warrant a step-by-step procedure to ensure they are adequately placed and maintained in the desired position. The SME, PAE, and IA involved in work planning for LTVs that include these are equally responsible for ensuring that any such devices used will continue to reliably perform the block function until the LTV is cleared. Some of the special considerations that must be considered are:

1. How will residual energy in the control circuit be addressed?
2. When and how are measures to verify isolation and de-energization performed?
3. How must the LTV be done for the activating energy sources (air, hydraulics, and/or electric energy)?
4. How will the device be adequately maintained in the proper position throughout the LTV, without reliance on activating energy or control circuit functionality?

Under certain circumstances, adherence to this LTV program is not required, for example:

- When servicing or maintaining equipment that is powered by a 120V or less electrical cord or plug. Such equipment shall be worked on with the cord unplugged. The employee performing the work must have exclusive control of the plug at all times.
- When service or maintenance is being performed on equipment or systems less than 50 volts and the employee has been trained and qualified by their supervisor.
• When inspecting, adjusting, or testing electrical equipment and the work being performed requires the system to be energized. SP-70 - electrical safe work policy must be followed.

3.0 DEFINITIONS AND ACRONYMS:

Administrative Lock: Any lock that is used for a purpose other than LTV. The lock may serve a safety function other than LTV, a configuration control, or other purpose. An Administrative Lock, unlike an LTV Lock, may be controlled by one or more individuals. Administrative Locks must have a unique appearance.

Affected Employee: Any individual, including visitors or contractors, whose job requires him/her to be near or around the work zone (but not within the work zone) when equipment or apparatus is being maintained or serviced under a locked-out or tagged-out condition. An Affected Employee becomes an Authorized Employee when their job requires them to perform maintenance or service within the work zone on the equipment, machine or system.

Authorized Employee (AE): Any individual with training and system knowledge in the safety related technical aspects of the equipment that is authorized to conduct limited lockout tagging. All AEs shall be trained in the NHMFL LTV Procedures and must be briefed by the PAE, or IA, for each LTV under which they will be performing work to ensure they fully understand the isolation boundaries and methods expected for them to be able to personally verify a zero energy state or otherwise safe condition.

Blocked: A condition where a mechanical device is inserted into the energy path to physically prevent movement; most commonly used with mechanical machinery or fluid filled lines.

Capable of Being Locked Out: An energy isolating device is considered capable of being locked out if it meets any of the following requirements:

• It is designed so an integral part allows a locking mechanism.
• Locking out is accomplished without dismantling, rebuilding, or replacing the energy isolating device or permanently altering its energy control capability.
• Can be locked out with the use of chains, or other blocking mechanisms.

Centrally Controlled LTV: An LTV on equipment that may be part of a larger system or a system controlled by Control Room, Cryogenics or Building Operations. Requires SCUD entry, Operations approval, and Issuing Authority review.

Complex LTV: An LTV which has more than one isolation boundary.

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:
• Manually operated electrical circuit breaker.
• Manually operated disconnect switch.
• 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.
• Line valve, block, or any similar device used to block or isolate energy.

Energy-Isolating Devices must be capable of allowing a lock to be installed. Push buttons, selector switches, software interlocks, control circuit type devices, or devices that require continuous air are not energy isolating devices and cannot be used to isolate hazardous energy.

Energy Source: Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy, including ionizing and non-ionizing radiation.

Equipment Specific LTV Procedure: A written document that contains equipment-specific information and procedural steps that an Authorized Employee must follow in order to safely control hazardous energy during servicing or maintenance of equipment or apparatus.

Gang Lock Box: A box used to contain the lock key(s) of the Primary Authorized Employee during a group LTV procedure. The gang lock box shall be constructed in such a way as to permit multiple individual locks/tags to be attached to the outside of the enclosure, preventing it from being opened except by removal of every individual lock/tag.

Group Lockout: A method to coordinate the servicing or maintenance work assignment of several employees/groups performing LTV on a single piece of equipment.

Hazardous Energy: Energy, that if not controlled is of such a magnitude that it is capable of causing harm to an employee or loss of resources.

Hazard Zone: The area which could be affected by the energy source isolated by the LTV. For electrical work, the minimum Hazard Zone is the limited approach boundary. The Hazard Zone must always encompass the entirety of the expected scope of work. If the scope of work is expected to shift outside of the Hazard Zone, then the work must be stopped and the LTV must be changed in order to accommodate the new scope of work.

Isolated: A condition where all sources of hazardous energy have been controlled by physically isolating the energy path so that the energy cannot flow to workers.

Issuing Authority (IA): An employee designated to approve LTV requests. IA’s must be trained, qualified, and authorized as an IA and have technical competence and familiarity with the equipment, areas, or systems for which the LTV request is covering.
**Individually Controlled LTV:** An LTV wherein individual Authorized/Qualified Employees are responsible for establishing an LTV for an approved single point isolation not requiring a procedure or an entry into the Safety Clearance User Database (SCUD).

**LTV:** Lock, tag and verification.

**LTV Lock:** A lock issued to an Authorized Employee for which no other employee has the key or means of opening without using destructive force. LTV Locks are used for control of hazardous energies. These locks shall be of a distinctive style and shall not be used for any other purpose.

**Lockout:** The method of applying a mechanical lockout device and a tag on an energy isolating device by an Authorized Employee in accordance with established written procedures, in order to control hazardous energies and prevent the equipment from being operated until the lockout device is removed.

**Lockout Device:** A device that utilizes a positive means, such as a single key lock, to hold an energy isolating device in the safe position and prevent the energizing of equipment or apparatus. Included are lockout hasps, valve handle covers, and switch locks.

**Lockout Tag:** A prominent warning device, 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 lockout device is removed. The tag shall include the job description, equipment name, isolation point, name of employee placing the tag, and date the tag was placed. Tags must be durable and able to withstand the environment to which they are exposed for the maximum time exposure is expected. A lockout tag is not a substitute for a lockout device.

**Operations Approver:** An employee who is responsible for the area containing the equipment to be locked out. These employees are defined for various areas of Operations such as DC Magnet, Cryogenics, and Building.

**Primary Authorized Employee (PAE):** An employee with the training and experience to exercise group and system-level judgments, who is authorized to lock, tag, and verify any equipment for which they have approval. If coordinated multiple locks and tags are applied by more than one employee, those of the PAE must be the first to be applied and the last to be removed. The PAE coordinates the affected work forces and ensures the continuity of protection.

**Qualified Employee (QE):** An Employee who has been trained and has demonstrated to have the skills and knowledge related to the equipment, procedures, machine, and system they are
working on. A QE shall know the hazardous energy sources associated with the system and how to control the source(s).

**Safety Clearance User Database (SCUD):** Administrative database used for the authorization to perform LTV work on equipment that has been locked out.

**Simple LTV:** An LTV which has one isolation boundary.

**Site Superintendent (SS):** An employee who has been assigned by line management to oversee the safety aspects of tasks involving complex and hazardous systems and multiple groups.

**Stored Energy Source:** Any device that is capable of holding energy after equipment is shutdown. This includes, but is not limited to, magnets, capacitors, VSDs, cryogenic liquids or gases, tanks, pipes, springs, and flywheels.

**Subject Matter Expert (SME):** The Subject Matter Expert provides the knowledge and expertise in a specific subject for a project.

**Supervisor:** The line manager of the employee.

**Task Hazard Analysis (THA):** A written document that identifies hazards associated with a specific task and identifies the risk and possible mitigations.

**Unqualified Employee:** An employee who has insufficient training regarding the equipment, machine, or system, or insufficient knowledge of the hazardous energy associated with it or how to control the source(s).

**Zero Energy State:** A condition that is reached when all energy sources to or within equipment are isolated, blocked, or otherwise relieved, with no possibility of re-accumulation. Equipment is not safe to work on until it is in a zero energy state.

### 4.0 ROLES AND RESPONSIBILITIES:

The **Subject Matter Expert** shall be the definitive source of knowledge, technical skill, understanding, or expertise in a specific subject area for a machine, equipment, area, or system. The SME shall:

- Guide other employees on the project.
- Communicate technical information effectively to the group.

The **Site Superintendent** is designated by management to oversee and coordinate the safety of complex tasks or systems. When assigned, the SS shall:

- Verify that the LTV procedures are adequate, are understood, are followed, and are communicated on a daily basis or as needed to all Authorized and Affected Employees.
- Manage all changes to the scope of work.
- Resolve scheduling conflicts between different LTVs and other scheduled work.
- Ensure all employees performing work under the LTV are Authorized Employees and are locked out for their tasks.

The **Issuing Authority** has the ultimate responsibility for performing a check along with the PAE and AE’s, approving the energy isolation points of equipment, machines, or systems to ensure that the appropriate isolation points have been identified and locked out. IA’s shall:

- Discuss the scope of work with the PAE for each LTV.
- Verify that the energy isolation boundaries are correct for the scope of work.
- Ensure the PAE has a hard copy of the Equipment Specific Procedure and that this procedure is appropriate for the scope of work.
- Audit that the LTV was done according to all requirements of this procedure and the Equipment Specific Procedure if required.
- Physically check that each isolation point(s) is(are) locked and de-energized, and approve the method of verification.
- Approve and issue the LTVs.
- Only review LTV for those equipment, areas, machines, and systems for which they have been trained.
- In the absence of the PAE, brief AE(s) on the LTV including energy control points, scope of the task, and the work to be done within that scope.

An **Operations Approver** shall:

- Approves the removal from service and repositioning of isolation devices.
- Performs or assists with the draining or de-energizing of equipment.
- Coordinates with the Primary Authorized Employee on shutdown and restart activities.
- Reviews all equipment to be locked out, and determine if the equipment is ready to be shut down.

A **Primary Authorized Employee** shall be responsible for coordinating the overall LTV process, whether for a single employee or a group of employees. The PAE shall:

- Identify boundary points for a specific work scope, complete all paperwork, obtain approvals, isolate and lockout energy sources, and verify the effectiveness of the lockout.
- Ensure that AE(s) understand the hazards associated with the task and the area.
- Ensure that the AE(s) understand the energy control points, scope of the task, and the work to be done within that scope.
- Approve or reject AE(s) from joining a lockout to ensure all AE(s) on the lockout are qualified and knowledgeable. One reason to reject an AE from joining a lockout is if the AE will be performing a different job scope, or working on a different time schedule. In these cases the AE must develop their own Safety Clearance.
- Manage all changes to the LTV required by any change in the scope of work.
• Ensure all locks are removed from a group lockout before removing their own locks.
• Coordinate with Operations Approver on shutdown and restart activities.

The **Authorized Employee** is responsible for working on equipment that is properly locked out. The AE shall apply locks and tags to control hazardous energy. The AE shall:

• Recognize the conditions of work that require LTV, assess all hazardous energy sources, and use the correct procedure, PPE, and materials to implement LTV.
• Understand the energy control points, scope of the task, and the work to be done within that scope for each LTV.
• Maintain control over the keys to their Employee LTV Locks.
• Contact the PAE for permission before joining a lockout.
• Apply his or her personal lock and tag when performing servicing, maintenance, or modification work.
• Must NEVER apply or remove a lock for anyone else.
• Work within the scope of the job.

An **Affected Employee** shall:

• Recognize when LTV is being used, the general reason for LTV, and the importance of not tampering with or removing a lock/tag.
• Recognize the Hazard Zone.

**5.0 LOCK, TAG, AND VERIFY PROCEDURE SUMMARY:**

1. Determine the hazards using the THA process.
2. Determine the energy control process (Exempt, Individually Controlled, Centrally Controlled) and the need for an Equipment Specific Procedure.
3. For Centrally Controlled lockouts, the PAE shall create an entry into the Safety Clearance User Database (SCUD) and obtain Operations approval.
4. Notify all Affected Employees of the lockout activities.
5. Isolate and release energy sources.
6. Verify the lockout to ensure the isolation point(s) is(are) correct and effective.
7. Hang locks and tags as appropriate.
8. For Centrally Controlled lockouts, obtain approval from an Issuing Authority.
9. Ensure that any Authorized Employees understand the lockout.
10. Perform the work.
11. Remove locks, and coordinate with Operations for return to service.

For more detailed steps, see section 9:

• Work Process A – Centrally Controlled LTV.
• Work Process B – Exceptions.
• Work Process C – Individually Controlled LTV.

6.0 **LOCKOUT EQUIPMENT:**

The NHMFL Safety Department shall stock and distribute all materials necessary to establish a proper Safety Clearance. This will ensure that all materials meet the requirements in OSHA 1910.147 including:

- Substantial enough to withstand the environment and prevent removal without excessive force or tools.
- Standardized and easily recognizable.
- Contain appropriate labeling.

The lockout of an Energy Isolation Point by a Primary Authorized Employee or an Authorized Employee shall include:

- A lock.
- A ganging device (if needed).
- A Danger Do Not Operate Tag with the date, equipment, energy isolation point, position, name of the primary authorized employee and the safety clearance number.

Each lock shall identify the person who hung the lock, either directly on the lock or on a “Danger Do Not Operate Tag” that shall accompany the lock.

Keys shall be controlled to ensure that no one other than the employee who hung the lock can remove it, unless the procedure in section WP-J Lock Removal is used.

7.0 **TRANSFER OF CONTROL:**

The role and responsibilities of the designated PAE may be transferred from one employee to another. The off-going PAE may transfer control of the LTV to an oncoming PAE at any time after the LTV is completely established. Transfer of control is not permitted while the LTV is being established or during any modification.

The off-going PAE must thoroughly brief the oncoming PAE on the status of the LTV, including all isolations, energy dissipation devices, scope of work, completion status of the work, and expected changes to the LTV that will be required as the work progresses.

The oncoming PAE along with a knowledgeable IA must inspect all isolations related to the LTV and verify that the isolations are in place. At each energy isolation point, the oncoming PAE must apply his or her lock first, and then the off-going PAE may remove his or her lock.

When the oncoming PAE and IA are satisfied that she or he is fully briefed on all aspects of the LTV, the oncoming PAE must agree to assume the role of PAE for the LTV. The off-going PAE must then hand over the LTV procedure to the oncoming PAE as part of the transfer. If
transferring a Group LTV, the off-going PAE must also transfer all related lockboxes and procedures. Once transferred, the oncoming PAE assumes all responsibilities for the LTV.

8.0 PROGRAM AUDIT:

The NHMFL Lock/Tag/Verify Program shall be audited periodically by qualified safety assessment personnel. This audit shall at a minimum review the application of the program and procedures in this document including employee communication, knowledge of the procedures and hazards, applications of locking devices, security of energy isolation, and all other steps provided for in the LTV Program and procedures. The results of this audit shall be communicated to the NHMFL Management in a timely manner.

Source Requirements and References

- OSHA Instruction CPL 02-00-147, The Control of Hazardous Energy – Enforcement Policy and Inspection Procedures
- ANSI/ASSE Z244.1, Control of Hazardous Energy, Lockout/Tagout and Alternative Energy Control Measures
- NFPA 70E, Standard for Electrical Safety in the Workplace
- NHMFL Lock, Tag and Verification Program
- NHMFL Integrated Safety Management Program
- DOE-STD-1030-96
### Revisions

<table>
<thead>
<tr>
<th>Date</th>
<th>Revision #</th>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>001</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>002</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>003</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>004</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>005</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Approvals

<table>
<thead>
<tr>
<th>Title</th>
<th>Reviewer</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Director: DC User Program</td>
<td>Tim Murphy</td>
<td></td>
</tr>
<tr>
<td>Assistant Lab Director: DC Instrumentation/Operations</td>
<td>Scott Hannans</td>
<td></td>
</tr>
<tr>
<td>Assistant Lab Director: Environmental Health &amp; Safety</td>
<td>Laymon Gray</td>
<td></td>
</tr>
</tbody>
</table>
WP-A CENTRALLY CONTROLLED LTV - GENERAL RULES AND STEPS

1.0 SCOPE:

The purpose of this procedure is to establish requirements and performance objectives that protect personnel where injury can occur as a result of the unexpected release of hazardous energy. Unexpected release of hazardous energy can include any unintended motion, energization start up, or release of stored energy, deliberate or otherwise, from the perspective of the employee(s) at risk.

2.0 WP-A: CENTRALLY CONTROLLED LTV GENERAL RULES:

Lockout, Tagout, and Verification (LTV) is the process of establishing a safe work condition on equipment prior to performing work. A safe work condition is when the equipment has been placed in a verified zero-energy state and positively controlled to prevent unexpected re-energization.

- LTV is required whenever construction, service, maintenance, modification, or demolition is being performed on or near equipment, machines, and systems in which the unexpected energization or start-up of the equipment, or the release of stored energy, could cause injury to employees or damage to equipment. This includes access to areas where it would be unsafe unless the equipment were shut down and de-energized.
- All employees performing work on locked out equipment must be trained and authorized as Authorized Employees in accordance with WP-F Training and Authorization Process.
- Authorized Employees must only apply their own personal lockout, tagout device. No employee should ever remove another employee’s personal lockout, tagout device, except under the restrictions of the Lock/Tag Removal Process.
- No employee should ever operate or attempt to operate any energy isolation to which a lock or tag is attached other than during the initial verification when establishing the LTV.
- For all lock and tag devices, the Authorized Employee applying the device(s) must be knowledgeable about the proper use and application of the device(s). Lock and tag devices that are improperly affixed, or that are used on energy isolations for which they were not designed, may fail to prevent actuation of the isolation or fall off entirely. For this reason:
  - Upon initially applying the device(s), the isolation is verified to ensure that it will not operate. (This is to prevent the unintentional energization if the device is improperly applied).
  - After this initial verification, other employees MUST NOT attempt to re-verify the isolation through repeated attempts at operation.
  - If any employee suspects that a device has been improperly applied, they must immediately contact the Primary Authorized Employee (PAE) for resolution. If
necessary, PAE must stop work and have all Authorized Employees remove their personal lock(s) in order to correct the discrepancy.

- The Hazard Zone is the area which could be affected by the energy source isolated by the LTV. For electrical work, the minimum Hazard Zone is the limited approach boundary.
- The Hazard Zone must always encompass the entirety of the expected scope of work. If the scope of work is expected to shift outside of the Hazard Zone, then the work must be stopped and the LTV must be changed in order to accommodate the new scope of work.
- The PAE of a LTV procedure must ensure that the Hazard Zone always matches the scope of work at any given time.
- Only Authorized Employees and Qualified Employees may perform the necessary manipulation and testing required establishing the lockout. This includes equipment shutdown, operation of isolation devices, releasing stored energy, and verification of de-energization. When work is finished, this requirement also includes restoration, re-energization, and start-up of the equipment.
- All lockout(s) and tagout(s) must be established following the requirements in this program. Push buttons, selector switches, EPO buttons, software interlocks, and control circuits are not energy isolations and cannot be used to isolate hazardous energy.

3.0 LTV WP-A GENERAL RULES:

Determine the Hazards

Perform and review the work Task Hazard Analysis (PAE, Supervisor, or SS).

- Conduct a pre-job briefing with the employees involved.
- Evaluate the type and magnitude of all potential and stored hazardous energy and the means of controlling the energy.
- Review specific equipment, written procedures, blueprints, system diagrams, valve lineups, and operating manuals.
- Confer with people who know the equipment (SME).
- Do not proceed until knowledge of the hazard(s) is known.

Determine the Need for an Equipment Specific Procedure

LTV applications require an equipment specific procedure unless all of the following elements exist:

- The equipment has a single energy source which can be readily identified and isolated and a single lock-tag device will achieve a locked out condition.
- The equipment has no potential for residual, stored, or the re-accumulation of stored energy, or energy after shutdown.
- The isolation and locking out of the energy source completely de-energizes and de-activates the equipment.
If an Equipment Specific Procedure is required:

- Print out and review the Equipment Specific Procedure. Verify that the scope of work to be performed is covered by the procedure and that the Hazard Zone is adequate for all planned work.
- If the procedure requires revision or is otherwise inadequate, STOP WORK and revise the procedure. The revised procedure must be reapproved by the Administrative Approver.
- See WP-H Equipment Specific Procedures for more information.

Create an Entry into the Safety Clearance User Database (SCUD)

The PAE will initiate the documentation and approval process using the SCUD system.

- The PAE will fill out the purpose of the LTV and list all energy isolation points.
- The Operations Approver must grant approval prior to de-energizing equipment and applying locks and tags.
- The PAE will list the Equipment Specific Procedure in the notes section of the SCUD if required.
- The PAE must notify all affected employees and inform them that the equipment will be placed out of service until work is completed.
- The PAE must coordinate all work with the system and area managers.

See Appendix 10.1 SCUD User Guide for detailed instructions.

Isolate Energy Sources

The PAE initiates the isolation process following the Equipment Specific Procedure if required. They may request assistance from a Subject Matter Expert if they have a question and enlist qualified personnel to complete the isolation.

- Remove all stored energy following Equipment Specific Procedures.
- Use appropriate Personal Protective Equipment (PPE).
- Put all appropriate energy-isolating devices in a safe state, while following an orderly shutdown sequence.
- Check the system for possible re-accumulation of stored energy. Continue this check until the possibility of re-accumulation no longer exists, or until the LTV is cleared.
- Attach a lockout device.

Verify Isolation (Attempt to Restart)

- Determine whether you are a Qualified Employee who has been trained to perform the isolations and zero-energy verifications described in the procedure. If not, contact a trained
Authorized and Qualified Employee and have him or her assist you in executing the procedure.

- Use appropriate PPE assuming the equipment is energized or charged until it has been determined to be de-energized.
- The PAE shall perform or witness the verification of the de-energized state.
- Any AE may request to witness the lockout verification.
- Verify the integrity of your lockout by trying to restart the equipment for each isolation point.

For Mechanical Energies

- Consider the potential for re-accumulation of energy. Assume that all valves will leak through. If valve leakage is observed or suspected past any locked or tagged valve, work must not begin until engineering has been consulted and a determination has been made regarding the suitability of that valve as an isolation point.

For Electrical Energies

- Verify that the incoming power has been de-energized using a verified portable volt meter per SP-70.
- Test the metering equipment for proper operation (immediately before and after verifying a de-energized state).
- Remove and release stored energy:
  - Use a grounding/shorting stick to dissipate any stored/residual energy.
  - Ground the electrical components/circuits as required for the duration of the job or task.
  - Verify that the stored/residual energy has dissipated.

Obtain Approval to Work

- The PAE will request approval from an Issuing Authority.
- The IA and PAE will discuss the scope of work, Hazard Zone, isolation points and verification methods.
- If required, the PAE must show the IA the Equipment Specific Procedure hardcopy used to execute the lockout.
- The IA will personally visit each isolation point and check for effectiveness and any errors.
- The IA will approve the LTV in the SCUD once they are satisfied that the lockout is appropriate for the work scope, effective, and properly done.

Perform the Work

- Periodically re-verify the integrity of the LTV. Reverification must be done daily, or before work recommences for jobs which are not continuously active.
• Other Authorized Employees may join the lockout after obtaining approval from the Primary Authorized Employee (PAE). The Authorized Employees must then apply their personal locks and tags to each of the energy isolations listed in the procedure.
• If an AE requests to join the lockout for a task that is a separate job, the PAE may cite the “One Job per Lockout” rule and refuse to allow the AE to join the LTV.
• The PAE of the lockout must remain vigilant and ensure that the scope of work does not extend beyond the Hazard Zone. If the employee performing work identifies a task that falls out of the Hazard Zone, then work will be stopped and a decision will be made either to submit a new or revised procedure for approval or to forego the work until the LTV can be modified.

Release the LTV

• Confirm That It Is Safe to Re-energize
  o Confirm that the work, for which the LTV was applied, has been completed and that it is safe to re-energize equipment.
  o Clear all tools and personnel. Check the work area to ensure that all tools, debris, and personnel are at a safe distance from the equipment. Replace safety guards. Check the equipment to ensure that any removed guards are reinstalled.
  o Confirm that all personnel are in a safe position. Confirm that all locks except the PAE’s locks have been removed.

• Remove Locks and Tags
  o Remove lock(s) and tag(s). Personal lock(s) and tag(s) must only be removed by the Authorized Employee(s) who applied them, with the following exception:
    • If the employee who placed the lock and tag is not available, the procedure for LTV Lock Removal of devices shall be followed (WP-J Lock/Tag Removal Process).
  o Communicate with appropriate Operations groups concerning the desired status of all breakers, valves, controls or other items which were manipulated during the maintenance.

• Notify
  o Sign off the Safety Clearance (SCUD) to indicate that the LTV has been cleared and released back to Operations.
  o Notify all affected employees that the LTV has been released and equipment will be re-energized.
  o An Operations Approver will sign off on the SCUD accepting the equipment and confirming that they are aware of the status.

• Re-energize and Restore the Equipment to the Normal Condition
WP-B LTV EXCEPTIONS

1.0 SCOPE:

An LTV process is required whenever construction, service, maintenance, modification, or demolition is being performed on or near equipment, machines, and systems in which the unexpected energization or start-up of the equipment, or the release of stored energy, could cause injury to employees or damage to equipment.

The following tasks, which have been identified as low risk repetitive tasks performed by skilled workers may be done without an LTV process.

2.0 LTV WP-B EXCEPTIONS:

All employees working on a service or maintenance project must agree that an exception condition exists before deciding not to use the lockout/tagout procedure. The specific exceptions are:

Cord and Plug ≤120V

Work on plug and cord-connected electrical equipment ≤120V AC is exempted from the LTV process if the plug is under the exclusive control of the employee performing the service or maintenance. Exclusive control means in the physical possession of the employee, in line of sight of the employee, or if the employee has affixed a lockout/tagout device on the plug.

Hot Tap/Hot Work Operations

Hot tap operations involving transmission/distribution systems for electricity, air, water, compressed gas.

- Cryogens provided continuity of service is essential.
- Shutdown is impractical.
- Documented procedures are followed; and protective equipment is used.

When inspecting, adjusting, or testing electrical equipment and the work being performed requires the system to be energized. SP-70 - Electrical Safe Work Policy must be followed.

Operations

The following Operations are exempted from the LTV process:

- Normal production operations including lubrication, cleaning, adjustments, filling, or draining or tool changes provided that these operations do not require the removal of a safeguard or the exposure of an employee to any hazardous energy. These exemptions assume that the equipment was designed for this purpose.
- Service or maintenance without the potential for exposure to hazardous energy.
• Keeping equipment out of service for non-safety reasons using the Administrative Lockout Process (WP-G).

Allowable Task/Equipment Exceptions

• Draining or filling equipment.
• Changing filters in an AHU if filters are not near moving parts.
• Changing light bulbs.
• Breaking or making quick connects on compressed air systems.
• Transferring liquid helium or nitrogen into portable dewars.
• Portable tools or equipment containing a cord.
• <50V exposed conductors.
• Changing tools on a milling machine, drill press, or lathe.
• Stand alone, portable vacuum pumps < 120V.

Task/Equipment Requiring a LTV Process

• Working on lighting, wiring, ballasts.
• Opening covers on a 480V welding machine.
• Opening or maintaining hydraulic systems.
• Oil change on 480V vacuum pumps.
• Opening or maintaining compressed air systems.

See Appendix 10.5 - LTV Example Chart for more specific work tasks.
WP-C INDIVIDUALLY CONTROLLED LTV

1.0 SCOPE:

The purpose of this procedure is to establish requirements and performance objectives that protect personnel where injury can occur as a result of the unexpected release of hazardous energy. This section covers the circumstances and process through which an Authorized Employee may lockout equipment without the additional layers of review and approval in the Centrally Approved LTV process, and without entering the lockout in the SCUD.

2.0 INDIVIDUALLY CONTROLLED (IC) LTV:

The Individually Controlled (IC) LTV process is a lockout and tagout that does not require a specific procedure or a SCUD entry. This process may be used by an Authorized Employee to establish a safe work condition prior to performing work. The Authorized Employee is responsible for determining whether the conditions for the Individually Controlled exception process are satisfied. The IC exception is allowed only if all of the following conditions are met:

- The equipment is fed from a single energy source that can be isolated with a single isolation that is lockable, is readily identifiable, and is in the same location as the equipment to be worked upon.
- Stand-alone equipment not part of a larger system.
- Isolation is in line of sight.
- Simple verification.
- The equipment has no capacity for stored energy.
- The equipment shutdown or start-up steps do not require a particular sequence.

The Authorized Employee is responsible for determining what should be isolated and how to establish the lockout and tagout. The employee must therefore be intimately familiar with the steps described in this process.

In order to execute the IC, the Authorized Employee must also be a Qualified Employee on the equipment. After the Qualified Employee establishes a safe work condition, the Authorized Employee shall then apply their personal lock and tag.

- Only Qualified Electrical Employees may perform LTV on electrical equipment for the purpose of working on electrical circuits.
- For other forms of hazardous energy, qualification is confirmed by the authorization of the employees’ supervisor.

This process must follow all other aspects of this LTV program with the exception of the SCUD and Issuing Authority approval process. This includes but is not limited to:
• Locks and Tags used under this process must meet the definition in 3.0 Definitions and Acronyms.
• Each person exposed to the hazard must hang their personal lock and identifying tag.
• All lockouts must be verified to ensure the lockout is effective in isolating all energy sources.

3.0 INDIVIDUALLY CONTROLLED LTV STEPS:

• Determine the hazards utilizing the THA process.
• Determine if the work and equipment meet all of the requirements of WP-C Section 2.0 above.
• Isolate the energy source.
• Hang lock with tag that identifies the lock owner.
• Verify the lockout.
• Perform the work.
• Remove lockout.
• Return to service.
WP-D LTV GROUP GUIDELINES

1.0 SCOPE:

A Group LTV is a process used to perform a Complex LTV with a lockbox. Instead of each Authorized Employee (AE) applying lock(s) and tag(s) to each energy isolation point, the key to each energy isolation lock and tag is placed in the lockbox, which is then locked by the PAE first and then each Authorized Employee who is working under the LTV. The Group LTV is not required although it may present a desirable solution to effectively manage a large number of persons and isolations to better facilitate the coordination of a LTV.

2.0 WP-D LTV GROUP GUIDELINES:

Group LTV

- A lock and tag is applied by the PAE to each energy isolation point during the execution of a LTV process. The keys to the locks are then placed in a lockbox, which is then locked with a PAE lock.
- The locks used on isolation points shall be individually keyed. Do not use multiple locks with any one key or locks with more than one key (i.e. face locks). This could allow someone to remove locks without opening up a lockbox.

Steps to Implement a Group LTV

1. The PAE determines that the group LTV work process is appropriate.
2. The PAE executes the LTV process.
3. The PAE must place all lockout keys inside a lockbox.
4. The PAE must lock the lockbox closed with his or her lock(s) and tag(s) on the outside of the lockbox.
5. The PAE/IA must ensure the energy isolation points in the LTV procedure matches the energy isolation points locked out and secured by the keys in the lockbox.
6. The IA must approve the lockout.
7. The PAE must brief all Authorized Employees before they apply personal lock(s) and tag(s) to the lockbox.
8. All other Authorized Employees performing work on the equipment can request to either witness the verification or re verification of zero-energy state on some or all of the energy isolations. In this case, the PAE must coordinate with a Qualified Employee to perform the requested verifications. Then apply their personal lock(s) and tag(s) to the lockbox in a manner that prevents access to the enclosed key(s) until all locks have been removed from the box.
9. When the work has been completed, and after each worker has removed his/her respective lock from the lockbox, the PAE removes their lock from the outside of the lockbox, obtains the keys from lockbox, removes the locks, and returns the equipment to service.
Location

- Once established, the lockbox must be kept in a location that is accessible to the Authorized Employees participating on the lockout.

Pyramiding

- One or more lockboxes can be referenced under a Complex LTV procedure or another group lockout. There must be only one group safety clearance per lockbox. When pyramiding lockboxes, each lockbox must have its own safety clearance attached to the lockbox.
WP-E LTV CONTRACTOR GUIDELINES

1.0 **SCOPE:**

This procedure incorporates the standard NHMFL Lock, Tag, and Verification Program with a process to verify and ensure that contractors have received the appropriate training and supervision prior to participating in a LTV. All subcontractors performing work at the NHMFL are required to conform to the NHMFL Lock, Tag, and Verification Program. This guideline contains additional requirements to ensure that subcontractors are adequately managed and protected from hazardous energy exposures.

2.0 **LTV CONTRACTOR GUIDELINES:**

Contractors include all construction and non-construction contractors, all vendors, and all manufacturer representatives or other persons performing or participating in a LTV who are not covered under the NHMFL Qualification Program and are therefore not subject to employee LTV training and authorization requirements.

All contractor safety clearance requests require a designated NHMFL PAE. The NHMFL PAE inputs the contractor safety clearance requests into the Safety Clearance User Database (SCUD) as a group LTV. The requests are reviewed and approved by the designated IA who is responsible for the area involved.

The contractors will participate in the LTV as an AE (Authorized Employee). All AE’s must be briefed by the PAE for each LTV under which they will be performing work to ensure they fully understand the isolation boundaries and methods expected for them to be able to personally verify a zero energy state or otherwise safe condition.

Contractors, who wish to use their own LTV program, must first submit their company LTV program or equivalent company policy document to the NHMFL Safety Department. This document must be evaluated for basic compliance to OSHA 1910.147 and NFPA 70E requirements. In the event of gaps in the subcontractor’s LTV program, the NHMFL Safety Department may elect to either reject the submittal or recommend specific corrections prior to acceptance.

In addition, the contractor company must submit a signed statement on company letterhead certifying that all their employees have been trained as Authorized Employees in the context of OSHA 1910.147(e)(7). The statement must further specify that subcontractor employees, whether permanently employed, temporarily employed, or sub-tier contracted, must not participate in a LTV or perform work at the NHMFL without obtaining this training.
Prerequisites for obtaining a contractor LTV Safety Clearance

- A basic understanding of the lockout process and responsibilities.
- An understanding of the equipment or system, the isolation boundaries, the verification process, and what is keeping the employee safe.
- Only electrically qualified contractors who have been authorized by the NHMFL Safety Department may perform the initial verification of zero voltage on electrical lockouts.
- All contractors must additionally receive a Contractor Safety Orientation prior to the start of work that covers the hazards here at the NHMFL.

Contractors/vendors are expected to provide their own lockout and tagout devices. The NHMFL may loan lockout and tagout devices as needed to meet operational necessities. All subcontractor/vendor lockout and tagout hardware must meet the requirements set in OSHA 1910.147.

PAE Responsibilities for the LTV

- The PAE must ensure that all requirements of this LTV procedure are followed when implementing the LTV.
- In addition, the PAE must in the course of the briefing ensure that all subcontractors participating in the LTV fully understand their responsibilities. Special emphasis must be placed on the following:
  - Clearly defining the scope of work under the LTV.
  - Clearly defining the extent of the Hazard Zone.
  - Specifying that any and all changes to the scope of work must be immediately communicated to the PAE/SS/AE in charge.
  - Specify that all personnel participating under the LTV are personally locked and tagged out for the duration of the work.
  - Specify that no person can participate under the LTV without first contacting the PAE and obtaining the same job briefing.
1.0 SCOPE:

This procedure covers the general requirements for the LTV Program Training and Authorization. Only employees who have received the appropriate level of training may be authorized to perform LTV functions.

Specific training requirements, including NHMFL Safety courses, prerequisites, Qualification Card training programs, required retraining and authorizations are listed in Table I-1. Once the training is complete, specific line management authorization is required to perform the LTV functions.

2.0 LTV WP-F LTV TRAINING AND AUTHORIZATION:

The NHMFL 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 acquired by employees. The 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 procedure.
- 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 LTV procedure, and about the prohibition relating to attempts to restart or reenergize machines or equipment which are locked out or tagged out.

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 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.

The employer shall certify that employee training has been accomplished and is being kept up to date. The certification shall contain each employee's name and dates of training.
Authorized Employees must fulfill the course requirements of the NHMFL Lockout/Tagout for Authorized Employees, to be repeated once every three years.

A person who has not completed the training requirements for Authorized Employees may be considered an Authorized Employee and participate in an established LTV provided that:

- The person is only accessing an area requiring lockout and tagout and is not performing work.
- The PAE/SS performs a briefing.
- The person applies a personal lock and tag under the direction of the PAE.
- The PAE/SS or another AE personally escorts the person 100% of the time the person is in the area requiring lockout and tagout.
- Each instance must require prior approval of the NHMFL Safety Department and the PAE/SS responsible for the LTV. The employee will be considered an Authorized Employee for the specific instance.

**Line Management Authorization**

- Specific authorization is to be provided by the supervisor after the employee satisfies the NHMFL Safety course requirement and has received equipment-specific training. The Supervisor must ensure that the employee is thoroughly familiar with the equipment (within the context of his or her job function) and with the energy-control procedures.
- A practical exercise may be required by the Supervisor to demonstrate proficiency. The content of this exercise will depend on the types of hazardous energy control and the complexity of the procedure’s steps.
- Once the Supervisor is satisfied that both the training and authorization requirements have been met, the Supervisor may authorize an employee to perform a LTV. This authorization stipulates the specific equipment or types of equipment on which the Authorized Employee may perform LTV.

<table>
<thead>
<tr>
<th>Table I-1. LTV Training and Authorization Matrix</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Role</strong></td>
</tr>
</tbody>
</table>
| LTV Affected Person  
Note: All NHMFL Employees and Affiliates are considered Affected Persons. | General Safety Course or Contractor Training | All NHMFL Employees |
| LTV Authorized Employee | Lockout/Tagout (Annually)  
Electrical Online Course (Annually) | Authorized by line management through an approved Task Hazards Analysis and/or Equipment Specific Procedure. |

Operated by Florida State University, University of Florida, and Los Alamos National Laboratory  
Supported by the U.S. National Science Foundation and the State of Florida
<table>
<thead>
<tr>
<th>Role</th>
<th>Training</th>
<th>Authorization</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTV Primary Authorized Employee (PAE)</td>
<td>Lockout/Tagout Course</td>
<td>Authorized by line management through an approved Task Hazards Analysis and/or Equipment Specific Procedure.</td>
</tr>
<tr>
<td>Issuing Authorities</td>
<td>Lockout/Tagout Class Training (Annually)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Equipment Specific Training on hazards and proper isolation.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electrical Online Course</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electrical Work Procedure (Annually - for Electrical Workers)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NFPA-70E/Arch Flash Training for Electrical Workers (Every 2 years)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Qualified Electrical Worker Program</td>
<td></td>
</tr>
</tbody>
</table>
LTV WP-G ADMINISTRATIVE LOCK CONTROL

1.0 SCOPE:

A careful distinction must be made between LTV controls and various other locking practices, collectively referred to as “administrative locking.” While LTV Locks are placed by individual workers to protect themselves against inadvertent energization of equipment, Administrative Locks are used when there is the need to provide “operational control” (control of a system, utility, or facility).

2.0 LTV WP-G LTV ADMINISTRATIVE LOCK CONTROL:

Administrative Locks

- Any lockout and tagout that is used for a purpose other than a LTV is called an Administrative Lockout. Administrative Locks may serve a safety function other than LTV, configuration-control, or any other purpose. Unlike LTV lock keys, the keys to Administrative Locks may be controlled by one or more individuals.
- Administrative Locks can be common locks with more than one key, so that anyone with access to the keys can open the control point as needed. The lock is not specific to an individual, but to a specialized working group or department and do not need to have an individual’s name shown.
- Administrative locking does not provide individual personal protection for workers and is not a substitute for personal LTV lockout and tagout.
- An Administrative Lock must not be labeled with a danger tag or sticker, or any other marking that resembles a LTV marking. Conversely, a LTV lock cannot be used as an Administrative Lock.
- An Administrative Lock must be accompanied by a tag identifying the department, date hung, purpose, and the name of the person who hung the lock.
- Administrative locking may be used in conjunction with LTV Locks and using the same lockout and tagout devices. For example, a controlling department may apply an Administrative Lock to a LTV lockout and tagout for the purpose of controlling the start-up of the equipment.
- Employees who have applied Administrative Locks must not perform work or enter a Hazard Zone without first following one of the safety related LTV processes described as part of this procedure.

Tag On

- Some systems, such as sump pumps, emergency lights, and refrigerators must be shut down in a controlled manner. An informational tag may be placed on their isolations to warn the user against accidental de-energization. The use of a LTV lockout and tagout is not permitted for this purpose.
• When a circuit breaker, disconnect switch, or energy-securing device is readily accessible to any employee, the circuit breaker or disconnect switch may be tagged to indicate that it is not to be turned off.
• The energy-securing device must not be locked by any means that would prevent the device from being used as an emergency disconnect.
• The tag must include the name of the responsible person and an alternate, date, and phone number.
1.0 **SCOPE:**

An Equipment Specific Procedure (ESP) is a formal document detailing all the steps required to establish a lockout. It is specific both to the equipment or system and to the scope of work. An Equipment Specific Procedure is required for all Complex LTVs. These procedures are to be written by Authorized Employees with training and system knowledge of the technical aspects of the equipment to be locked out and reviewed by Subject Matter Experts and an Administrative Authority.

2.0 **EQUIPMENT SPECIFIC LTV PROCEDURE:**

An Equipment Specific Procedure is required for all Complex LTVs. A Complex LTV is one which contains more than one energy isolation point.

The Equipment Specific Procedure fulfills the following purposes:

- It documents the scope of work permitted under the LTV.
- It documents the specific isolations required for the LTV.
- It documents the verification process for each isolation point.
- It formalizes the review and approval process for the ESP.
- It establishes best practices for isolation and verification.

Procedures can be written by anyone familiar with the equipment. However, they must be reviewed and approved by an Approver with suitable competency in the equipment or systems for which the procedure is written.

3.0 **USING AN EQUIPMENT SPECIFIC LTV PROCEDURE:**

**Using an existing LTV**

- A Primary Authorized Employee (PAE), will determine the work scope, identify potential hazards using the THA process, and identify the hazard zone. From this information, they will determine if an existing ESP will meet the needs of their isolation process.
- The NHMFL Facilities department maintains a spreadsheet containing an index of existing equipment specific procedures. This index is available at: Z:\Lab-Wide Use\Safety\Equip Specific LTV Procedures\LTV PROCEDURE INDEX.xlsx
- This list contains hyperlinks to scanned, signed copies of approved ESPs.
- If uncertain whether an Equipment Specific Procedure meets the LTV requirements for a specific work scope, contact an Issuing Authority or the Author, Subject Matter Expert or Administrative Authority who signed the ESP.
- If an existing ESP does not exist for the work scope, one will need to be developed.
When following an ESP, the PAE must have a hard copy of the LTV in hand and use as a checklist. The hard copy must be made available to the Issuing Authority and any Authorized Employees.

4.0 DEVELOPING AN EQUIPMENT SPECIFIC LTV PROCEDURE:

The procedure writer must thoroughly investigate the scope of work and perform a detailed Task Hazard Analysis in order to establish the appropriate isolations. After writing the procedure, it must be submitted for approval by an Authorized Approver.

The Equipment Specific Procedure must contain the following information:

- A specific statement of the scope of work permitted under the LTV.
- Type(s) and magnitude(s) of energy, its hazards, and the methods to control, dissipate, or restrain the energy.
- Type(s) and location(s) of operating controls.
- Type(s) and location(s) of energy isolating devices.
- Specific steps for shutting down, isolating, and blocking to control hazardous energy.
- Specific steps for placement, removal, and transfer of lockout devices or tagout devices and the responsibility for them.
- Notification of affected employees.

Determine the Scope of Work

- Every procedure is dependent on properly identifying the scope of work. The procedure writer must perform the following to ensure that scope of work is properly understood and defined:
  - Contact the lead worker in charge of the job.
  - Have the lead worker describe in detail the scope of work, including all preparations and testing required.
  - Walk down the job site to identify other hazards in the area that may need to be addressed.
  - Ask detailed questions to determine whether other considerations are warranted.

Perform a Hazardous Energy Analysis

- The procedure writer must perform a THA to identify the required isolations. Available documentation should be consulted, such as equipment drawings, schematics, manuals, panel schedules, and process and instrumentation diagrams (P&IDs). In addition, the system should be visually inspected to ensure all hazards are properly identified.
  - Identify hazardous energy sources and associated energy isolations.
  - Identify proper test points for each of the energy isolations (to verify the absence of energy).
Determine PPE requirements for each of the energy isolations.
- Identify any source of stored energy.
- Determine suitable method to dissipate the stored energy.

**Determine Suitable Energy Isolations**

- Energy isolations shall be positive isolation devices such as a disconnect switch, circuit breaker, block valve, or blocking pin.
  - Control actuators such as the emergency stop or the equipment controller shall not be used as lockout isolation points.
  - Contactors, diodes, interlock switches, check valves, and automatically controlled valves are not positive isolation devices.
  - Energy isolations must be labeled clearly and uniquely, such as with an alphanumeric designator or a word description of its function.

**Determine Methods to Dissipate Stored Energy**

- Releasing Stored Energy
  - In the case of stored mechanical energy, vent valves, drains, spring releases, blocking devices, or equipment repositioning (as appropriate) must be utilized.
  - In the case of stored electrical energy, approved grounding or discharge devices must be used.
- Preventing the Re-accumulation of Stored Energy
  - If there is a possibility of re-accumulation of stored energy to a hazardous level, a method to continuously discharge the energy shall be installed and maintained for the duration of the lockout.
  - For electrical systems >600 V, temporary personal protective grounds are required.
  - For fluid systems over 500 psig, use a double-block-and-bleed method to prevent undetected repressurization from slow leakage past an energy isolation point.
  - For all other fluid systems, use a single block and bleed arrangement.
- Unless specifically stated otherwise steps in the procedure must be performed in series. Use the procedure as a checklist to ensure that all steps are positively completed for every energy isolation.
- Specific requirements for testing to determine and verify the effectiveness of lockout devices, tagout devices, and other energy control measures.
- Restoring equipment back to service.
- Notification of affected employees to indicate that the servicing or maintenance is complete and system is ready for use.
Procedure Approvers

- An Administrative Authority is a competent person who has been designated by the NHMFL Senior Management to approve procedures based on his or her level of technical knowledge and familiarity with the systems involved.
- The people qualified to sign and approve as Administrative Approvers are as follows:
  
  John Kynoch - Head of Facilities

  Scott Hannahs - Associate Lab Director, DC Field

  Tim Murphy - Director DC Magnet Operations

- The Author may obtain technical assistance as required from Subject Matter Experts (SME) who are more familiar with the systems involved.
- The Administrative Authority will examine in detail every aspect of the procedure, and become familiar with the scope of work and Hazard Zone established by the procedure.
- Once the Administrative Authority is certain that the Hazard Zone adequately matches the scope of work, and all questions concerning the details of the LTV are resolved, the Approver may approve the procedure.

Grouping of Procedures

- Many of the ESP’s written for equipment with many different energy sources and many different possible work scopes, are written based on particular energy sources and not on equipment. An example of this is a resistive magnet which is connected to magnet power supplies and the magnet cooling water system. Some jobs will expose the worker to both energy sources, some will only expose the worker to one. The PAE will determine which procedures need to be grouped together. The IA will check that the appropriate procedures were used.
- Multiple scopes of work may be performed under the same procedure provided that each scope is reviewed by the Issuing Authority and PAE to ensure the boundaries and methods are applicable.
- If uncertain how to group multiple ESPs contact an Issuing Authority or the Author, Subject Matter Expert, or Administrative Authority who signed the ESP.

5.0 PROCEDURE DOCUMENT CONTROL PROCESS:

The NHMFL Facilities Department manages the ESP document control process.

Template

- Equipment Specific LTV Procedures are to be written using the MS Word template on the Z-Drive:
  
  Z:\Lab-Wide Use\Safety\Equip Specific LTV Procedures\Lock Tag Verify Template.docx.
• Existing procedures may also be modified but require separate approval by Subject Matter Experts and Administrative Authorities.

**ESP Index, ESP Numbering**

• Each procedure is assigned a specific number. To obtain this number, submit your procedure to the Facilities Coordinator. They will assign the number and make appropriate edits before submitting the procedure to an Administrative Approver.

• Numbering convention LTVP-LOCATION CODE-###-REVISION
  
  ○ BUILDING CODES:
    • DCMB – DC
    • General Science – GS
    • NMR – NM
    • SHAW – SH
  
  ○ ### Number
    • 100 Series - Electrical Equipment
    • 200 Series - Mechanical Equipment
    • 300 Series - Cryogenic Equipment
    • 400 series - Scientific \ Other Equipment

• The procedure file name will be the procedure number for both the Word and PDF copies.

• After submittal and signature, the original, signed copy will be scanned and logged into the LTV Procedure Index by the Facilities Coordinator:
  
  ○ Z:\Lab-Wide Use\Safety\Equip Specific LTV Procedures\LTV PROCEDURE INDEX.xlsx
  
  ○ The Index is where any existing procedures can be found electronically. The signed hard copies of these procedures are located on the bookshelf in A131 (Facilities Coordinator Desk).

• After approval, the electronic Word copy will be locked for editing by the Facilities Coordinator. Any changes will be made to read only copies and using a Save-As function with the appropriate revision number. Old versions should be moved to the Old Versions folder in each section.

**Procedure Locations**

Equipment Specific LTV Procedures are electronically stored on the Z-Drive: Z:\Lab-Wide Use\Safety\Equip Specific LTV Procedures

• Approved procedures are scanned and stored in:
  
  ○ Z:\Lab-Wide Use\Safety\Equip Specific LTV Procedures\APPROVED LTV PROCEDURES PDF
  
  ○ These procedures are hyperlinked in the ESP Index spreadsheet.

• Editable procedures are written in MS word and stored in:
Z-Drive: Z:\Lab-Wide Use\Safety\Equip Specific LTV Procedures\LTV PROCEDURES WORD and in the appropriate sub folders based on area of the building and system.
WP-I LTV AIR GAPPPING

1.0 SCOPE:

Air gapping is the process whereby the sources of hazardous energy are physically removed from the work area to such an extent that LTV is not feasible and not necessary. It is a natural step during either the new construction or the demolition phases of a project. It is also applicable when machinery is temporarily relocated from its normal installation area to a separate work area for repair, servicing, or maintenance.

2.0 LTV WP-L LTV AIR GAPPPING:

Air gapping shall not be used as a substitute for lockout and tagout controls, where lockout controls are feasible. Because it is possible for an air gap to change over time, it is critical for the air gap to be obvious to all workers with the potential for exposure and reviewed on a daily basis.

Requirements for Air Gapping

• All energy sources must be physically and visibly separated from the work area.
• This separation must be visible without opening any panel doors, breaker doors or covers, etc.
• The minimum separation distance is three feet.
  o For electrical systems, this includes the conduit, cable tray, or other cable-supporting device.
  o Where a three-foot air gap is not achievable but lockout and tagout is not feasible, additional controls must be implemented to prevent an unplanned reconnection of the energy source. These controls must be approved by the NHMFL Safety Department on a case-by-case basis.
• Air gapping must be documented on the THA for the work done and approved by the employee’s Supervisor, a member of the Safety Department, or the Site Superintendent.

Except for temporary relocation of machinery, quick-disconnects or other temporary disconnections of wiring and piping are not considered suitable for air gapping.

Removal of wiring inside of a control panel is not suitable for air gapping.

New Construction

• During new construction, work will proceed through various stages. At some point, energy sources are connected and the LTV process comes into effect. Until that point, air gapping is sufficient.
• LTV is required to perform the initial connection or tie-in to the energy source. After this time, all work performed downstream of the energy source on equipment requires the application of lockout controls.
• The transition from work under an air gap to work under LTV must be managed under a documented energization and/or commissioning plan.

**Demolition**

• For demolition projects, LTV is required to perform the initial demolition of the energy tie-ins.
• After initial disconnection, the conduit, piping, equipment, or machine must be removed at least three feet from the tie-in point, and in a way that cannot be immediately reconnected. After this point in time, if the tie in point has been made safe, the lockout can be cleared, and lockout controls are no longer applicable in the work area.
• The transition from work under LTV to work under an air gap must be managed under a documented decommissioning plan.

**Temporary Relocation**

• For work performed on equipment that has been physically removed from the normal installation area, LTV is not required.
• LTV is required to perform the initial disconnection.
• The lockout must remain in place to control the energy to the cables and pipes that are still in the area, unless these are made safe through enclosing, insulating, capping, blanking, or other methods suitable for the environment to prevent an inadvertent release of energy.
• Any employee performing work in the installation area must be personally locked out depending on their exposure.
• Prior to reinstalling the equipment, the lockout must be re-established.
WP-J LOCK REMOVAL

1.0 SCOPE:

The purpose of this procedure is to establish requirements and performance objectives that protect personnel where injury can occur as a result of the unexpected release of hazardous energy. Unexpected release of hazardous energy can include any unintended motion, energization start up, or release of stored energy, deliberate or otherwise, from the perspective of the employee(s) at risk.

This work process describes lock removal under conditions, such as lost keys or unavailable personnel. Any Authorized Employee may remove his or her own personal lock, in the event the key to a lock is lost or misplaced, the lock may be cut by the Authorized Employee after obtaining permission from their Supervisor, obtaining and filling out the Authorized Employee Lock Removal Form and having it signed by their Supervisor, NHMFL Safety Department, and the NHMFL Director/Assistant Director or Designee.

2.0 LOCK REMOVAL GUIDELINES:

Employee Lock Removal

- In the event that an Authorized Employee loses his key(s), is absent, or otherwise unavailable to remove his or her personal lock(s), the Supervisor may remove the lock(s) for the Authorized Employee. If the Authorized Employee’s Supervisor is not available, then the Absent Authorized Employee’s Department Manager may remove the lock.
- The following steps must be taken to remove an Absent Authorized Employee’s personal lock(s):
  - Obtain and fill out a printed copy of the Authorized Employee Lock Removal Form.
  - Verify that the Absent Authorized Employee who applied his or her personal lock(s) is not present.
  - Make all reasonable efforts to inform the Absent Authorized Employee that his/her lockout device(s) needs to be removed.
  - Make all reasonable efforts to inform the Absent Authorized Employee’s Supervisor that his/her employee’s lockout device needs to be removed.

Permission to remove an Absent Authorized Employee’s lock must be obtained from each of the following parties:

- The Absent Authorized Employee and the Absent Authorized Employee’s Supervisor/Department Manager.
- NHMFL Safety Department.
- NHMFL Director/Assistant Director or Designee.

Operated by Florida State University, University of Florida, and Los Alamos National Laboratory
Supported by the U.S. National Science Foundation and the State of Florida
After obtaining all required approvals, the Authorized Employee and/or the Authorized Employee’s supervisor can remove the lock(s). If present, the Absent Employee’s Supervisor along with the NHMFL Safety Department must physically witness the lock removal and must retain possession of the lock(s).

Before the Absent Employee returns to any work duty, the Absent Employee’s Supervisor must ensure that the employee is presented with the removed lock and is informed of the reasons for the removal.

The completed Absent Authorized Employee Lock Removal Form must be returned to the NHMFL Safety Department for record keeping.

**Primary Authorized Employee (PAE) Lock Removal/Transfer**

- In the event that a PAE is absent, or otherwise unavailable to remove their lock, a new PAE may remove the lock for them, subject to the following restrictions:
  - A new PAE must be assigned and the LTV must be transferred to the new PAE.
  - The new PAE must ensure that all aspects of the LTV are properly managed.
  - The LTV must be reapproved by an Issuing Authority.
  - Follow all the requirements for removing an Absent Employees’ lock.
APPENDIX 10.1 - SAFETY CLEARANCE USER DATABASE (SCUD) USERS GUIDE

1.0 PURPOSE:

The purpose of this user guide is to provide instruction in the use of the Safety Clearance User Database (SCUD) for the administration of the Lock Out/Tag Out procedure SP-1. This document outlines the creation of new safety clearances, adding personnel to the database and other administrative functions as they pertain to entering the information into the SCUD. For specific requirements on selecting isolation points and issuing safety clearances, see Safety Procedure SP-1.

2.0 SCOPE:

This document applies to all personnel working on equipment or systems that are under the control of the NHMFL. It is to be used as part of the overall NHMFL Safety Program.

This procedure is to be used by all personnel at the NHMFL, including employees, and contractors. This procedure identifies the specific requirements for the protection of personnel working on facility machinery, equipment, and systems from the hazards due to the unexpected or accidental release of stored or potential energy. This user guide also establishes responsibilities as applicable for the administration and implementation of the SCUD.

3.0 DEFINITIONS:

User Account – Each user has their own account that allows them to log in to the SCUD. This is separate from having a personnel record in the personnel section of the SCUD, but both the user account and personnel record are normally created together.

Access Level – A user’s access level controls what they are allowed to edit in the SCUD. Each user’s account will have either Primary Authorized Employee (PAE) access or Issuing Authority access.

Personnel Record – This record stores a user’s contact information and other pertinent data, and provides a source for the drop down menus when creating a Safety Clearance.

4.0 PROCEDURES:

User Accounts and Personnel Records

1. Logging into the SCUD

Users can log in from any screen within the SCUD by clicking the SWITCH USER button found in the upper right hand corner. By default, the “SCUD” user account is logged in when opening the SCUD program and this user is logged back in when you log out. The “SCUD” account allows anyone to view records but does not provide access to edit any records.
2. Changing Your Password

Users are permitted to change their own password at any time. The initial password is set to “9999” when creating or resetting an account. To change a password, click the SWITCH USER button and enter your user name and current password, then click the CHANGE PASSWORD button.

3. Resetting a Password

Navigate to the user’s personnel record using the LOOK UP button on the MAIN MENU under the Personnel section. Clicking the RESET PASSWORD button will reset that user’s password to “9999”. Only an Issuing Authority can reset someone’s password.

4. Creating Personnel Records and User Accounts

New personnel records can be created by clicking the CREATE NEW ACCOUNT button found at the bottom of the MAIN MENU or the LOOK UP personnel pages. There is also a link to create new accounts in the WORKER tab of a Safety Clearance. A user with a valid account must be logged in to create a new account for someone else.
Fill in the user’s info to create the personnel record. The data is saved automatically. After entering the user name you will be asked if you would like to create a user account for the worker you have just entered. When you click yes, an account will be created with the user name you have entered and an initial password of “9999”.

Note: Selecting the Issuing Authority check box during record entry does not grant the user Issuing Authority access level. It only sends a request to the administrator to enable this access level.

Safety Clearance Creation and Usage

1. Creating a New Safety Clearance

Click the NEW SAFETY CLEARANCE button found on the MAIN MENU or INDEX page to start a new Safety Clearance. You will be asked to log in if you haven’t already.

Enter who is going to be the PAE at the top of the form. Section I (including the description and isolation points) does not necessarily have to be filled out by the PAE. The PAE field at the top can be left blank while creating the Safety Clearance, or can be entered by someone else. However, all items in Section II and III must be entered by the user whose name is being entered. This is a digital signature and will be verified with the user’s account name and password.

Now enter the EQUIPMENT NAME by choosing an item from the drop down menu or typing your own. Items in the drop down will automatically populate the isolation points section with a pre-approved set of points for the given equipment. These points can be edited, removed or added to as needed without modifying the original set for future use.
For Sections II and III, the SCUD is programmed to prevent users from performing actions in violation of SP-1 such as not obtaining permission before hanging tags, issuing a Safety Clearance that you are the PAE on, etc. For specific requirements on writing, checking and issuing Safety Clearances, see SP-1. In general, all fields with names require the user whose name is being entered to provide their user name and password and the order in which users can sign the form is controlled as per SP-1.

Once the required fields have been signed the Safety Clearance will update showing it has been issued, which prevents editing of items in Section I.

2. Working with an Active Safety Clearance

To find an active safety clearance, click the INDEX PAGE button on the MAIN MENU or at the bottom of an individual safety clearance. The safety clearance number in the left column is a link to individual form for the safety clearance.

Workers can sign on to the safety clearance once it has been issued by adding their name in the worker tab in Section II. If a worker does not appear in the dropdown, a personnel record and user account can be created for them at this time. When signing on as a worker, the user should place their lock on the lock box or isolation point while they are working on the equipment. When finished, the worker removes their lock but SHOULD NOT remove their name in the worker tab.

3. Closing Out a Safety Clearance

Once work is complete and all locks have been removed, the PAE should sign for close out in Section III AND inform Operations/Facilities/Hybrid Ops as applicable. When Section III is completed, click the CLOSE OUT button.

4. Printing Labels

Labels can be printed for tags to be hung on isolation points as well as for workers to place on their personnel locks at the lock box. The Dymo printer next to the SCUD Mac in the Control Room is preferred. Spare labels for the Dymo can be found in the file cabinet below
the printer and instructions for replacement of labels are listed inside the printer under the cover.

The DYMO button at the bottom of the safety clearance form under the “Print Labels” section will print a label for each isolation point listed. Workers can print a label for their locks by clicking the “P” at the far right of their entry on the worker tab after they have signed on to the safety clearance.

If the DYMO printer is out of labels, the HP printer may be used by clicking the SHEET (HP) button. A window will appear with loading instructions for the label sheets.
APPENDIX 10.2 - MECHANICAL LOCKOUT GUIDELINES

Piping System Practices

Systems, portions of systems, and components that are at temperatures or pressures above or below ambient should be vented and, if necessary for the performance of work, drained and brought to ambient temperature. Whenever possible, an atmospheric drain and/or vent between the component to be worked and sources of pressure to the component should be tagged in the open position to depressurize the equipment and to accommodate thermal expansion or contraction.

Systems that operate at high pressures (e.g., greater than 500 psig), should be isolated from the work area by a double block and bleed system consisting of two closed valves in series and a vent and/or drain valve between the isolation valves should be opened.

If a vent and/or drain valve is not available, contact a Subject Matter Expert on how to best proceed. Whenever possible a vent/drain valve should be added before returning to service.

Verifying depressurization by breaking flanged connections, loosening valve bonnets, removing instrument tubing, or other similar actions should be avoided unless no other means for verifying depressurization exists. Strict supervisory control and advance planning are required if these methods are used.

Always consider that all valves have the potential to leak by. If you suspect a valve is leaking by, stop work and notify your Supervisor or the NHMFL Safety Department to evaluate before returning to work.

Always direct drains and vents in a safe direction.

Always verify that pressure has equalized with ambient pressure BEFORE breaking any pipe section. If you are not sure how verify pressure contact a Subject Matter Expert.

Check for signs of valve leakage before work begins each day.

Air gapping may be accomplished by removing piping from its pressure source by three feet and the three foot gap is easily observable by all potential workers without exposing themselves to additional hazards. Three foot requirement may be replaced by installing rated caps or blinds on pressure source.

Systems containing materials that have a potential to create an ODH environment should be isolated by a double block and bleed system and the isolated section should be purged.

When any of these conditions exists and two-valve isolation cannot be provided, specific management approval should be obtained before performing work. Exceptions to the two-valve
isolation should be documented in the lockout/tagout record and in the ISM process, and the workers should be informed.

**Valve Practices**

Pneumatically operated valves and solenoid-operated valves may be used as isolation points if the following conditions are met:

- A pneumatically or solenoid-operated valve that fails open or “as is” is NOT considered closed for lockout/tagout purposes, unless the valve is forcibly closed with a device designed to block off or obstruct operation of a valve. The valve must be locked and tagged.

- A pneumatically or solenoid-operated valve that fails closed is NOT considered closed for lockout/tagout purposes unless its power (air) supply is isolated and the valve is visually confirmed to be closed. The valve and its power (air) supply isolation points must be tagged.

- A process pressure operated valve, such as diaphragm or check valve, CANNOT be used as an isolation boundary valve unless it can be positively locked and tagged in a safe position.

- The local control point (e.g. handwheel, manual operator) for a motor or pneumatically operated valve must be locked/tagged when the valve is used as an isolation boundary point.

Always follow the order prescribed in the LTV procedures.
APPENDIX 10.3 - ELECTRICAL LOCKOUT GUIDELINES

It is the policy of the NHMFL that all live parts operating at 50 volts or above to which an employee may be exposed shall be placed in an electrically safe work condition and locked out before work is done on or near them.

All electrical work shall follow SP-70 Electrical Work Procedure.

Electrical Hot Work requires the approved completion of a NHMFL Energized Work Permit. Simply wearing Arc Flash or insulated PPE is not a substitute for a properly established LTV or completion of an Energized Work Permit. The exception to this is troubleshooting and testing.

All exposed electrical parts are to be treated as live until verified using a 3 point test method with a portable digital volt meter.

Grounds shall be installed and locked or tagged on as part of a lockout for work on any circuits > 1000V.

For 4160V and 12.4KV lockouts, the breakers must be racked out in the cubicle when counted on for an Energy Isolation Device. Open contacts inside of a vacuum bottles shall not be considered positive isolation.
<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>John Kynoch</td>
<td>Head of Facilities, NHMFL</td>
</tr>
<tr>
<td>Bryon Dalton</td>
<td>Head of Magnet Operations, DC Magnet Building</td>
</tr>
<tr>
<td>Larry Gordon</td>
<td>Control Room Operator, DC Magnet Building</td>
</tr>
<tr>
<td>Joel Piotrowski</td>
<td>Control Room Operator, DC Magnet Building</td>
</tr>
<tr>
<td>Michael Hicks</td>
<td>Control Room Operator, DC Magnet Building</td>
</tr>
<tr>
<td>Chris Oxendine</td>
<td>Assistant Electrical Supervisor, General Science Building</td>
</tr>
<tr>
<td>Kevin Gamble</td>
<td>Mechanical Supervisor, General Science Building</td>
</tr>
<tr>
<td>Marshall Wood</td>
<td>Electrical Supervisor, NHMFL</td>
</tr>
<tr>
<td>TASK</td>
<td>LTV PROCESS</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>Working on equipment with more than one isolation boundary.</td>
<td>Centrally Controlled Complex LTV</td>
</tr>
<tr>
<td>Working on equipment with one isolation boundary, part of a larger system.</td>
<td>Centrally Controlled Simple LTV</td>
</tr>
<tr>
<td>Working on a 120V power supply with a cord</td>
<td>Cord and Plug Exception, no LTV</td>
</tr>
<tr>
<td>Hooking up the output of a portable 240VAC input PS with a cord.</td>
<td>Individually Controlled LTV w lock on a cord cap</td>
</tr>
<tr>
<td>Changing oil on a 240V AC vacuum pump hardwired to wall. Piping disconnected</td>
<td>Individually controlled LTV</td>
</tr>
<tr>
<td>Draining a magnet of Magnet Cooling Water through a ≤ 1” drain</td>
<td>Operations Exception, no LTV</td>
</tr>
<tr>
<td>Venting a compressed air system through a ≤ 1/2 compression fitting as part of a lockout process</td>
<td>Operations Exception, no LTV</td>
</tr>
<tr>
<td>Working on a magnet with the Anaconda cables &gt; 3’ air gap to cell stabs</td>
<td>Air Gap, no LTV required.</td>
</tr>
<tr>
<td>Working on power supply with bus links removed</td>
<td>Centrally controlled complex LTV</td>
</tr>
<tr>
<td>Installing a pipe on a helium/nitrogen system, but not connected to the tie in point.</td>
<td>Air Gap, no LTV required if &gt;3’ or blanked</td>
</tr>
<tr>
<td>Changing a belt on an air handler, local, labeled disconnect</td>
<td>Individually Controlled LTV</td>
</tr>
<tr>
<td>Changing a belt on an air handler, motor isolation point in electrical panel.</td>
<td>Centrally Controlled LTV</td>
</tr>
<tr>
<td>Changing a belt on a hood</td>
<td>Individually Controlled LTV</td>
</tr>
<tr>
<td>TASK</td>
<td>LTV PROCESS</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>--------------------------------------</td>
</tr>
<tr>
<td>exhaust fan, local disconnect</td>
<td>Controlled LTV</td>
</tr>
<tr>
<td>Changing a 480V motor on a roof exhaust fan, local disconnect</td>
<td>Centrally Controlled Simple LTV</td>
</tr>
<tr>
<td>Changing a 480V motor on an air handler unit, local disconnect</td>
<td>Centrally Controlled Simple LTV</td>
</tr>
<tr>
<td>Meggering a pump motor in the utility plant</td>
<td>Centrally Controlled Simple LTV</td>
</tr>
<tr>
<td>Removing a pump motor in the utility plant</td>
<td>Centrally Controlled, Complex LTV</td>
</tr>
<tr>
<td>Putting a transfer line into a helium dewar</td>
<td>Operations Exception, no LTV</td>
</tr>
<tr>
<td>Thumping a helium dewar</td>
<td>Operations Exception, no LTV</td>
</tr>
<tr>
<td>Changing out a bit on a drill press, mill or lathe</td>
<td>Operations Exception, no LTV</td>
</tr>
<tr>
<td>Changing a blade on a stationary band saw</td>
<td>Individually Controlled LTV</td>
</tr>
<tr>
<td>Changing blade on portable band saw</td>
<td>Cord and Plug Exception, no LTV</td>
</tr>
<tr>
<td>Installing stock, cleaning chips or taking measurements on a mill or lathe</td>
<td>Operations Exception, no LTV</td>
</tr>
<tr>
<td>Changing a belt on Res Mag deburring machine</td>
<td>Individually Controlled LTV</td>
</tr>
<tr>
<td>Changing filters in chilled water, equipment cooling system</td>
<td>Operations Exception, no LTV</td>
</tr>
<tr>
<td>Working in an electrical cabinet where the wires which would supply the power are disconnected</td>
<td>Centrally Controlled, Simple LTV</td>
</tr>
<tr>
<td>TASK</td>
<td>LTV PROCESS</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>and capped inside the cabinet. Cabinet fed from a single breaker in a distribution panel.</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX 10.6 LOST KEY/ABSENT PERSON LOCK REMOVAL FORM

**NATIONAL HIGH MAGNETIC FIELD LABORATORY**

<table>
<thead>
<tr>
<th>LOST KEY/ABSENT PERSON LOCK REMOVAL FORM</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**1. GENERAL INFORMATION**

<table>
<thead>
<tr>
<th>Requestor’s Name:</th>
<th>Safety Clearance Number:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lock Owner’s Name:</th>
<th>Lock Owner’s Phone Number:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**2. EQUIPMENT INFORMATION**

<table>
<thead>
<tr>
<th>Equipment Name:</th>
<th>Equipment Location:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Reason lock cannot be removed by Authorized Employee:

**3. ATTEMPT TO CONTACT THE ABSENT PERSON (BY SUPERVISOR)**

<table>
<thead>
<tr>
<th>Date/Time:</th>
<th>Phone Number Called:</th>
<th>Made Contact:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date/Time:</th>
<th>Phone Number Called:</th>
<th>Made Contact:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date/Time:</th>
<th>Phone Number Called:</th>
<th>Made Contact:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Expected Return Date:

**4. AUTHORIZATION TO REMOVE THE ABSENT PERSON’S LOCK**

Signature/Date/Time of Absent Person’s Supervisor Accepting Notification Responsibility:

Signature/Date/Time of NHMFL Safety Department Authorizing Lock Removal:

Signature/Date/Time of NHMFL Director/Assistant Director/Designee Authorizing Lock Removal:

**5. LOCK OWNERS SUPERVISOR REMOVES THE LOCK**

**6. SAFETY DEPARTMENT TO HOLD LOCK AND FORM UNTIL EMPLOYEE RETURN**

**7. ACKNOWLEDGEMENT OF LOCK REMOVAL UPON EMPLOYEE RETURN**

Signature/Date/Time of Lock Owner:

Signature/Date/Time of Lock Owner’s Supervisor:

Signature/Date/Time of NHMFL Safety Department: