



Department of the Air Force  
HQ AEDC (AFMC)  
Arnold AFB, TN 37389

## Safety, Health, and Environmental Standard

---

**Title:** LOCKOUT/TAGOUT (LOTO)  
**Standard No.:** B2  
**Effective Date:** 06/25/2015  
**Releasability:** There are no releasability restrictions on this publication.

The provisions and requirements of this standard are mandatory for use by all personnel engaged in work tasks necessary to fulfill the AEDC mission. Please contact your safety, industrial health and/or environmental representative for clarification or questions regarding this standard.

Approved:

Contractor/ATA Director  
Safety, Health, and Environmental

Air Force Functional Chief

**SHE Standard B2 Lockout/Tagout**

**Record of Review/Revision**

(Current revisions are highlighted in yellow and marked with a vertical line in the right margin.)

Date/POC	Description
05/20/15 S. Nikodym	Scheduled review. Deleted Table of Contents at front of document. Revised Section 4.2 Inspections to correct inaccuracies. Deleted the general reference to National Institutes for Occupational Safety and Health (NIOSH). Added a reference to AFI 91-203 Air Force Consolidated Occupational Safety Instruction. Revised the tag graphics in Annex B for consistency with current GC forms. Revised “To,” “Organization,” and “Mail Stop” information in Annex C to reflect current information. Confirmed that there have been no changes to the NFAC Supplement.
08/11/13	Added NFAC supplement; no other change.
02/17/12 Roosa/Tate	Scheduled review. Minor administrative/ and reformatting changes only; relocated training to Section 5; renumbered subsequent paragraphs; added Section 6, Inspections/Audits.
09/27/09 R. Tate V. Peters	Annual review. Clarified retraining requirements and conditions for removal of LOTO devices, including addition of an annex to provide sample memorandum for LOTO device removal; converted flowcharts from Visio to MS Word.
09/11/08 R. Tate	Annual review. Administrative change only: Added Form GC 1182 as an optional supplement to the LOTO process (Paragraph 4.1.5.1).
09/07/07 D. Spry	Annual review. Administrative changes only: Added the following exception to bring standard in line with current practice: 4.1.4.1 and 4.4.7 <b>EXCEPTION:</b> <i>Due to Power Control’s continuous year-round 24 hour operation and lock identification consisting of the Power Systems Dispatcher’s phone number the use of a non-red lock for Electrical Hold Orders accompanied by a Danger Tag, GC-18, in lieu of a red lock is allowed.</i> Updated references to include AEDC Safety, Health, and Environmental Standard B4, High Voltage Electrical Work and OSHA 29 CFR 1910.269: Electric Power Generation, Transmission and Distribution
08/24/06 D. Spry	General revision, read entire standard. Changed Principal authorized employee to Lead authorized employee. Replaced work clearances with master work permit. Changed LOTO processes from table format to flowcharts in Annex.
07/09/05 A. Jennings	Throughout standard: replaced <i>operational locking</i> with <i>administrative control</i> , including new definition; incorporated requirement to use non-red (preferably blue) lock for administrative control. Added an annex to provide Sample JSA for Lockout/Tagout
12/21/04 M.B.Bragg	Clarifications to indicate that danger tag alone does not provide adequate LOTO: this includes changes to Section 1.0; Section 2.0, Item 5; Paragraph 4.1.1; Paragraph 4.1.5; Paragraph 4.1.10; and Paragraph 4.1.16. Revised paragraph 4.5.2 to include “Master Work Permit issuing official” in addition to area supervisor.
03/03/04 G. Neal	Reformatted to latest COI 91-5 requirements. Reformatted tables in annexes. Removed High Voltage Hold Order and Caution Order information since it is now included in SHE Std. B4. Removed reference to test/support contractor and modified references to reflect ATA organizations. Changed reference to the Work Clearance and Form GC-313 to Master Work Permit and Form GC-1732. Changed definition of High Voltage Electricity from “600V and above,” to “above 600 V,” to agree with SHE Standards B4 and B6.
03/01/02 Jim Watts	Revised to reflect latest OSHA requirements.



# Safety, Health, and Environmental Standard

## LOCKOUT/TAGOUT (LOTO)

### 1.0 INTRODUCTION/SCOPE/APPLICABILITY

1.1 Introduction – This standard establishes minimum requirements for lockout of energy isolating devices whenever maintenance or servicing is done on equipment, machines, and/or systems.

**NOTE:** At no time shall a danger tag alone be considered adequate lockout/tagout protection.

1.2 Scope – This standard addresses the control of hydraulic, pneumatic, steam, mechanical, electrical systems, powered machinery, hazardous gases, utility systems or other energy sources that could cause hazards to personnel or equipment due to unexpected startup or release. It shall be used to ensure that any equipment, machine, or system is stopped, isolated from all potentially hazardous energy sources, and locked out before employees perform any servicing or maintenance operation.

1.3 Applicability – This standard applies to all AEDC personnel and operations, including Air Force, Navy, Army Corps of Engineers and Contractors (including Subcontractors) at the Tennessee location and operations conducted by AEDC personnel outside the confines of Arnold AFB. Training requirements (to include use and inspection) for Subcontractor personnel training requirements are established and provided by their management.

### 3.0 DEFINITIONS

Administrative Control (formerly Operational Locking/Tagging) – Placement of locks and tags on energy-isolating devices to protect equipment/machines, or systems from the release of energy. Practice of protection reserved for those instances in which an energy source must be controlled to allow personnel to operate equipment in a specific operating mode or not inadvertently cycled. Administrative control is **never** used as a means of protection for those instances in which an energy source must be controlled to protect personnel and allow personnel to service, maintain, or modify equipment. Administrative control must use a blue Form GC-82 Safety Information Tag *and* a non-red lock, preferably blue.

Affected Employee – Employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under the lockout/tagout program, or whose job requires him/her to work in an area in which servicing or maintenance is performed.

Authorized Employee – One who locks and/or tags out machines, systems, or equipment so maintenance or service on that machine or equipment can be safely performed. Can include inspectors, observers, or others whose duties require them to perform LOTO to prevent harm from unexpected startup or energization of equipment or systems.

Area Supervisor – Person designated to implement the LOTO program in that area.

Base Operating Contractor – A long-term contractor directly accountable to the Air Force for the AEDC mission.

Complex Type I Lockout/Tagout – Process where a single lockbox is used to hang locks from individual authorized employees to ensure the safety of workers.

Complex Type II Lockout/Tagout – Process used where operations involve multiple companies/organizations and/or to be conducted over more than one shift. LOTO is placed on energy sources and the keys placed in one or more lockboxes by Authorized or Lead authorized employees and then secured by the Primary authorized employee. The energy isolation devices cannot be unlocked until after the Primary authorized employee, each Lead authorized employee and each authorized employee have removed their personal locks from the lockbox. Used where multiple crafts and/or companies are involved in sub-system lockout/tagout to ensure safety of entire system until last sub-system is safe.

Craft Supervisor – First-line supervisor responsible for the safety of work crews performing servicing or maintenance of equipment or systems.

Danger Tag (Form GC-18) – Safety tag used in conjunction with red locks associated with the lockout/tagout program.

Department Locks – Standardized locks maintained by the Area Supervisor to be used on points of protection in a Complex lockout/tagout process. Must be red in color and be identified by department and name and number of the Primary authorized employee or identifying owner.

Double Block and Bleed – Closure of a line, duct or pipe by closing and locking or tagging two in-line valves and by opening and locking a drain or vent valve in the line between the two closed valves, i.e. two valves in series with a vent in between.

Energy Control Procedure – A procedure, written instruction, job safety analysis, master work permit, etc. that details specific guidance in controlling hazardous energy thus making the job safe for all workers.

Energy Isolation Device – Mechanical device that provides a positive means of control to prevent the transmission or release of energy, such as circuit breakers, disconnects, pins, blinds, valves, blocks, or double block and bleed. *Push buttons, selector switches, tag-only protection, and other such devices are not positive means of control.*

Kirk Key Interlock System – A permanent mechanical or electro-mechanical interlock that ensures a predetermined sequence of operation is followed.

Lead Authorized Employee – Employee who oversees or leads a group of servicing/maintenance workers during a Complex II lockout.

Lockbox – Box provided for the placement of keys to locks used to secure energy isolating devices in a complex lockout process.

Lockout/Tagout Process – Placement of locks and tags on energy-isolating devices to protect employees from the release of energy.

Lockout Device – Standardized red lock installed on an energy isolation device to ensure the device remains in a safe configuration, thereby protecting affected and authorized employees. Examples of lockout devices include valve lockout devices, lockout hasps, circuit breaker lockout devices, chains, etc.

LOTO – Lockout/tagout.

Master Work Permit – Document (Form GC-1732) that authorizes performance of work and specifies protection required to ensure safety. Issued to provide a method of communication/ coordination between the person responsible for the safety in the area or system and the personnel working in the area or system. (See AEDC Safety, Health, and Environmental Standard B1.)

Outside Contractor/Subcontractor – An organization employed by a contractor or the Air Force to do construction, maintenance, repair or other work at AEDC. There is no employment relationship, control or supervision of the subcontractor's employees by AEDC contractors. Also referred to as the construction contractor.

Personal Locks – Standardized red locks issued to authorized employees, used to secure energy isolating devices or lock boxes. Locks must display employee name and badge number. Employees shall never use a lock that belongs to another employee.

Point of Protection – Point or place where a lock and/or tag have been placed to protect workers from hazardous energy.

Primary Authorized Employee – Employee who exercises overall responsibility for adherence to the company LOTO procedure.

Simple LOTO – Process in which each authorized employee places three or less personal locks on energy isolating devices to protect the authorized employee(s). The keys for these locks are maintained by each authorized employee.

## 4.0 REQUIREMENTS/TRAINING/INSPECTION/PROCEDURES/RESPONSIBILITIES

### 4.1 Requirements

#### 10 Basic Steps of Lockout/Tagout

1. Identifying all energy sources and procedure development
2. Notify all affected employees
3. Shut down equipment
4. Lock out equipment
5. Apply Danger Tags
6. Release or block any stored energy or movable parts
7. Verify Lockout
8. Conduct the desired work on the system/equipment
9. Verify the system/equipment is safe for re-energizing
10. Remove lockout and tagout device(s).

- 4.1.1. **Step 1 - Identify all energy sources and develop procedure.** An initial survey shall be made to identify all the system/equipment's sources of power or energy (including stored energy sources such as electrical capacitors, springs, or elevated movable components) so that each energy source can be isolated. At this time a procedure shall be developed to serve as the basic plan for a safe control of energy during maintenance, repair and servicing.
- 4.1.1.1 Written Energy Control Procedures are required shall contain the following:
- 4.1.1.1.1 Specific steps for shutting down, isolating, blocking and securing equipment or systems to control hazardous energy.
- 4.1.1.1.2 Specific steps for the placement, removal and transfer of lockout and/or tagout devices and the responsibility for them.
- 4.1.1.1.3 Specific requirements for the testing of equipment or system to determine and verify the effectiveness of lockout devices, tagout devices, or other energy control measures.
- 4.1.1.2 Procedures may take the form of a Form GC-1707 Job Safety Analysis (JSA), see Annex A, or can be detailed on Form GC-1732 Master Work Permit or can take any other form so long as it meets the requirements stated above. Primary and/or Lead authorized employees shall be involved in the development of procedures for Complex lockouts, in order to ensure the protection of workers under their care.
- 4.1.2 **Step 2 - Notify all affected employees.** Everyone who would normally use the equipment being serviced shall be informed of the LOTO procedures being used and instructed not to attempt to start or energize the equipment.
- 4.1.3 **Step 3 - Shut down equipment.** Using appropriate equipment shutdown procedures, all controls shall be turned off.
- 4.1.4 **Step 4 - Lock out equipment.** Locks shall be applied to isolate each power source to prevent the operation of the equipment controls. One lock shall be applied to each point of protection.
- 4.1.4.1 Locks installed on energy isolation devices shall be color-coded red to allow easy recognition throughout AEDC and to eliminate confusion with administrative controls. The color-coding shall be adequate to allow anyone seeing the lock to identify it as a LOTO device.
- EXCEPTION:** Due to Power Control's continuous year-round 24-hour operation and lock identification consisting of the Power Systems Dispatcher's phone number the use of a non-red lock for Electrical Hold Orders accompanied by a Form GC-18 Danger Tag in lieu of a red lock is allowed.
- To satisfy the color code requirement, one of the following shall be accomplished: (See Annex B.)
- 4.1.4.1.1 The lock itself can be red.
- 4.1.4.1.2 Red tape can be applied to a different-colored lock.
- 4.1.4.1.3 A red protective cover can be applied to the lock body.
- 4.1.4.2 Personal locks shall contain as a minimum the employee's name and badge number.
- 4.1.4.3 Under no circumstance shall an employee use a personal lock that is identified as another employee's.
- 4.1.4.4 Department locks utilized to secure large equipment or systems with multiple energy sources shall be standardized and color-coded red.
- 4.1.4.5 Department locks shall be identified by one or more of the following:
- 4.1.4.5.1 Department ID
- 4.1.4.5.2 Key/isolating device number
- 4.1.4.5.3 Primary authorized employee's name and number
- 4.1.4.6 When department locks are used for Complex LOTO processes, keys to the locks shall be placed in a lockbox.

- 4.1.4.7 If isolating devices will not accept a lockout device, other means of equivalent positive lockout protection shall be utilized to protect affected employees. This may mean the removal of a control handle, the disconnection of control circuits, the posting of a sentry, etc. In addition, the equivalent protection shall always include the use of a Form GC-18 Danger Tag.
- 4.1.4.8 Lockboxes shall be
- 4.1.4.8.1 Tamper-proof and clearly labeled
- 4.1.4.8.2 Capable of being locked out by at least six locks
- 4.1.4.8.3 Incorporate a clear (see-through) area to verify contents
- 4.1.4.9 If possible lockboxes shall:
- 4.1.4.9.1 Contain individual hangers for each lock key used in the lockout process. Each key placed in the lockbox shall be identified with the number of the corresponding lock or isolation device.
- 4.1.4.9.2 Be located in close proximity to the Area Supervisor's office.
- 4.1.4.10 There shall be **NO** duplicate keys for any department or personal lock used in a lockout process.
- 4.1.4.11 For Kirk Key systems, which are not easily disabled, a single duplicate key is allowed and shall reside with a Senior Management Official or his/her designee. The duplicate key shall be under this official's complete control and shall only be used after the official personally ensures the safety of the personnel and equipment affected.
- 4.1.4.12 Authorized employees required to perform maintenance and service to equipment and systems shall normally be issued no more than three personal locks.
- 4.1.4.13 Removal of lock(s) and tag(s) of an absent employee require the following steps be performed:
- 4.1.4.13.1 Exhaust all attempts to locate and contact the absent employee at work or at home.
- 4.1.4.13.2 Obtain permission from the employee's supervisor to remove the safety lock(s) and/or tag(s).
- 4.1.4.13.3 Route an interoffice communication from the concerned supervisor to Safety describing the circumstances and events of why the personal safety lock(s) and/or tag(s) were removed. (See example in Annex C.)  
**NOTE:** Safety shall retain this document for a period of not less than five years.
- 4.1.4.13.4 Upon returning to work, the employee's supervisor or assigned representative shall promptly notify the individual of the lock(s) and/or tag(s) removal.
- 4.1.4.14 Removal of lock(s) because of a lost key requires the following steps be performed:
- 4.1.4.14.1 Obtain permission from the authorized employee.
- 4.1.4.14.2 Coordinate with the primary and/or lead authorized employee.
- 4.1.4.14.3 Route an interoffice communication from the concerned supervisor and to Safety describing the circumstances. (See example in Annex C.)  
**NOTE:** Safety shall retain this document for a period of not less than five years.
- 4.1.5 **Step 5 - Apply danger tags.** Both lockout AND tagout shall be required except where the equipment and its energy supply cannot accept a lock, in which case ALTERNATE MEANS OF PROTECTION THAT ARE EQUALLY AS EFFECTIVE AS A LOCK SHALL BE USED.
- 4.1.5.1 Form GC-18 Danger Tags shall be the only authorized tags used in the LOTO process just as red color-coded locks shall be the only authorized locks for LOTO.  
**NOTE:** Form GC-1182 Caution/Danger Tag Log may be used to supplement the LOTO process. Use of the GC-1182 is not a requirement of this standard nor does use of the GC-1182 replace or reduce any other requirements for LOTO or for the use of caution/danger tags.
- 4.1.5.2 Tags shall indicate the following:
- 4.1.5.2.1 Reason the lock is applied

- 4.1.5.2.2 Name and telephone number of the authorized employee placing the lock
- 4.1.5.2.3 Date that the lock is being placed
- 4.1.5.3 Tags shall have the following requirements:
  - 4.1.5.3.1 Be secured to the lock with a non-reusable, self-locking tie (Stock No. 5975-01-069-6592) or equivalent
  - 4.1.5.3.2 Be able to withstand at least a 50-pound force (equivalent to a one-piece, all-environment nylon cable tie)
  - 4.1.5.3.3 Be complete and maintained in a legible condition
  - 4.1.5.3.4 Be capable of withstanding the environmental conditions
  - 4.1.5.3.5 Have writing which is legible and capable of withstanding environmental conditions
- 4.1.6 **Step 6 - Release or block any stored energy or movable parts.** Any stored energy that may remain in the system shall be safely released. This may include draining charge out of a capacitor, blocking and bleeding down a steam line, or lowering elevated components that may fall. Equipment components that may move and injure someone shall be physically blocked in place.
  - 4.1.6.1 Equipment or systems with a potential for unexpected startup, release of stored energy, and/or hazardous gases that can injure employees shall be isolated with a red lock prior to the start of work. A mechanical protection device or other disconnection method that provides a positive means of energy isolation to prevent the transmission or release of energy, such as circuit breaker, disconnect, pins, blind, valve, or double block and bleed (two valves in series with a vent in between), must be installed if possible.
  - 4.1.6.2 The following steps shall be taken too isolate or block energy:
    - 4.1.6.2.1 Disconnect or shut down engines/motors that power mechanical systems.
    - 4.1.6.2.2 De-energize electrical circuits by disconnecting the power source from the circuit.
    - 4.1.6.2.3 Block fluid (gas, liquid, or vapor) flow in hydraulic, pneumatic, or steam systems by using control valves or capping or blanking the lines.
- 4.1.7 **Step 7 - Verify lockout.** Effective control of energy sources shall be verified the following measures:
  - 4.1.7.1 Checking that no one is exposed
  - 4.1.7.2 Attempting to operate the equipment using the normal controls
  - 4.1.7.3 Returning to neutral
- NOTE:** Verifying the lockout shall be a check or a test of isolation effort to prove that the energy has been controlled. Appropriate test equipment and/or visual inspection shall be used to verify that the stored energy sources have been effectively isolated. If there is a possibility that stored energy could re-accumulate to a hazardous level, verification of the lockout shall continue until work is completed or until the possibility of such re-accumulation no longer exists.
- 4.1.8 **Step 8 - Conduct the desired work on the system/equipment.**
- 4.1.9 **Step 9 - Verify the system/equipment is safe for re-energizing.** Equipment shall be visually inspected before energy is returned. This inspection shall include necessary measures to ensure that everyone is safely clear of the operating area and that covers and guards are in place, tools or debris are removed, and controls are off or in neutral.
- 4.1.10 **Step 10 - Remove lockout and tagout device(s).**

## 4.2 Inspections

- 4.2.1 Inspections shall be conducted at least annually to verify the effectiveness of the energy control procedures.
- 4.2.2 The inspections shall be performed by authorized employees other than the one(s) utilizing the energy control procedure being inspected.
- 4.2.3 Inspections shall include a demonstration of the procedures, which may be implemented through random audits and planned visual observations.

### 4.3 Procedures

#### 4.3.1 Written Instructions:

Written instructions shall be developed by each organization having workers who may be required to isolate systems/equipment associated with a potential to release hazardous energy. AEDC operations involving systems/equipment are extremely complex and require a variety of procedures, some simple and others complex. Accordingly, all AEDC LOTO procedures (Simple or Complex) shall comply with the following guidelines:

**4.3.2 Simple LOTO:** Each authorized employee shall place his/her personal locks and/or tag upon 3 or fewer energy-isolating devices and remove it upon departure from that assignment. Each authorized employee shall verify the de-energization of the equipment.

#### 4.3.3 Complex LOTO:

4.3.3.1 The individual organization owning or having functional interest in the facility or system shall develop procedures for Complex LOTO.

4.3.3.2 In some cross-functional areas, procedures shall be developed by one organization and coordinated with and approved by the other organization.

4.3.4 All Complex LOTO procedures shall provide the following basic organizational structure:

4.3.4.1 Designation of a *primary authorized employee*. The primary authorized employee shall be directly involved in the development and delivery of specific (Phase II) LOTO training and shall be responsible for gaining detailed knowledge of which energy sources need to be locked out.

4.3.4.2 A verification system shall be in place to ensure the continued isolation and de-energization of hazardous energy sources during maintenance and servicing operations.

4.3.4.3 Each authorized employee may verify individually that the hazardous energy has been isolated and/or de-energized.

4.3.4.4 Each lead authorized employee shall be responsible to the primary authorized employee for maintaining accountability of each worker in that specific group in conformance with the procedure. Lead authorized employees are required for Complex II LOTO.

4.3.5 Removal of LOTO devices from an energy-isolating device so that the equipment or component can be energized for testing or positioning requires the following sequence of actions and shall be documented in a procedure before testing can take place:

4.3.5.1 Notify the affected employees and authorized employees. If Complex LOTO, notify the primary and/or lead authorized employee(s) as well.

4.3.5.2 Clear the equipment of tools and materials.

4.3.5.3 Remove employees from the machine or equipment area and ensure that required tools or fixtures are safely and properly positioned.

4.3.5.4 Remove all repositioning and blocking devices and return all controls and valves to their normal operating positions.

4.3.5.5 Energize and proceed with testing or positioning.

4.3.5.6 De-energize all systems and reapply LOTO measures to continue the servicing, maintenance, or modification of the equipment.

4.3.6 Process flow diagram examples for Simple and Complex I and II LOTO are provided in Annexes D, E and F. It is emphasized that these flow diagrams are *suggested* methods offered for illustration only. In practice, the safety of each LOTO shall depend on the development of individual procedures specific to the current situation. Supervision shall appoint adequate responsible personnel to oversee Complex LOTO operation.

4.3.7 Administrative controls may be put in place for many reasons, including equipment security, programmatic purposes, or general safety; however, administrative controls shall **never** be used as the primary means of protection for personnel during a servicing or maintenance. Administrative control shall use the blue Safety Information Tag, Form GC-82, and a lock that is colored other than red (preferably blue).



**EXCEPTION:** Due to Power Control's continuous year-round 24-hour-per-day operation and lock identification consisting of the Power Systems Dispatcher's phone number, they are not required to use a Form GC-82 in conjunction with their administrative control locks.

4.3.8 Examples of Administrative Control are as follow:

4.3.8.1 Locked valves on fire protection systems

4.3.8.2 Locks on system valves to prevent accidental activation

4.3.8.3 A locked door to an area containing potentially hazardous equipment

4.3.9 When a new installation, replacement, major repair or modification of equipment, machines or systems takes place, energy-isolating devices shall be designed to accommodate locks.

#### **4.4 Base Operating Contractor Responsibilities**

##### **4.4.1 Management shall:**

4.4.1.1 Develop and maintain an effective LOTO program that complies with this standard.

4.4.1.2 Conduct and certify a periodic annual inspection of the program.

4.4.1.3 Appoint primary authorized employees and lead authorized employees, and ensure they are directly involved in the development and presentation of Phase II training/orientation on LOTO procedures.

##### **4.4.2 The Master Work Permit Issuing Official shall:**

4.4.2.1 Ensure written LOTO procedures and instructions are current and correct according to this standard, and maintain an adequate supply of locks/tags and various lockout devices (valve lockout devices, lockout hasps, circuit breaker lockout devices, chains, etc.)

4.4.2.2 Provide a knowledgeable employee to assist authorized employees in locating and placing locks and tags on isolating devices.

4.4.2.3 Act as primary or lead authorized employees when appointed.

4.4.2.4 Participate in developing procedures and providing specific training for authorized, primary authorized and lead authorized employees on the implementation of LOTO procedures and controls developed to protect employees from hazardous energy.

##### **4.4.3 Craft Supervisors shall:**

4.4.3.1 Ensure authorized and affected employees under their authority receive Phase I and II LOTO training.

4.4.3.2 Ensure all employees under their authority follow all LOTO requirements and instructions.

4.4.3.3 Participate in developing procedures and providing specific training for authorized, Primary authorized and Lead authorized employees on the implementation of LOTO procedures and controls developed to protect employees from hazardous energy.

4.4.3.4 Act as primary or lead authorized employee as required.

##### **4.4.4 Primary Authorized Employees shall:**

4.4.4.1 Serve as the key employee in the overall Complex LOTO processes.

4.4.4.2 Ensure safety of all employees under their responsibility

4.4.4.3 Coordinate with equipment operators or the Lead authorized employee before and after completion of servicing or maintenance operations requiring LOTO.

4.4.4.4 Ensure the provisions of this standard are carried out.

4.4.4.5 Participate in Phase II training/orientation for personnel involved in LOTO.

4.4.4.6 Provide direction and guidance to authorized and lead authorized employees with respect to control of hazardous energy and LOTO procedures.

**4.4.5 Lead Authorized Employees shall:**

- 4.4.5.1 Serve as the key employee for a specific group in a Complex II LOTO processes.
- 4.4.5.2 Ensure safety of all employees under their responsibility.
- 4.4.5.3 Ensure the provisions of this standard are carried out.
- 4.4.5.4 Provide direction and guidance to authorized employees with respect to control of hazardous energy and LOTO procedures.
- 4.4.5.5 Participate in Phase II training for personnel involved in LOTO.

**4.4.6 Authorized Employees shall:**

- 4.4.6.1 Obtain a department lock from the Area Supervisor when protection is required and the employee does not have a personal lock for personal protection. The employee shall place the lock and tag on the isolation device or hang the lock on the lockbox.
- 4.4.6.2 Receive guidance from Primary and Lead authorizing employees.
- 4.4.6.3 Not remove locks and tags without proper authorization.
- 4.4.6.4 Place their personal locks on the energy isolation devices and retain the key for Simple LOTO. When protection is no longer required, employees shall remove their personal locks and tags from point(s) of protection.
- 4.4.6.5 Place their personal locks on the lockbox, along with other authorized employees, when other crews are working simultaneously on the same equipment, machines, or systems for Complex LOTO.
- 4.4.6.6 When using a Complex LOTO process, the authorized employee identified on the Master Work Permit ensures the LOTO process is performed as stated on the written LOTO instruction. If more than one authorized employee is to be protected by the lockout, each of those authorized employees shall be responsible for verifying the contents of the lockbox prior to placing his/her personal lock on the lockbox.
- 4.4.6.7 Nothing in this standard shall prohibit an authorized employee from placing his or her personal lock directly on points of protection anytime they feel it necessary for individual protection.
- 4.4.6.8 Comply with all requirements found in this standard.
- 4.4.6.9 The contract monitor for outside contractors shall ensure that outside contractors comply with the provisions of this standard.

**4.4.7 Base Operating Contractor Safety, Health, and Environmental shall:**

- 4.4.7.1 Provide initial training and, upon request, refresher training to affected, authorized, Primary authorized and Lead authorized employees.
- 4.4.7.2 Assist in the development of systems and equipment LOTO strategies.
- 4.4.7.3 Develop and perform annual audits to determine compliance with this standard.
- 4.4.7.4 Provide audit information to Department Directors, Area Supervisors and the Air Force Safety Office.
- 4.4.7.5 Provide a review and update this standard when changes are required, not to exceed every year.

**4.4.8 The Inspector shall:**

- 4.4.8.1 Observe the procedure being implemented by a representative number of authorized employees and shall talk with other authorized employees, even though they may not be implementing the energy control procedure.
- 4.4.8.2 Ensure that the energy control procedures are being properly implemented and provide an essential check on the continued utilization of the procedures.
- 4.4.8.3 Review the responsibilities of each authorized employee implementing the procedure with that employee.
- 4.4.8.4 Conduct this review with each affected and authorized employee when tagout only is used.

4.4.8.5 Ensure that energy control procedures used less frequently than once a year are reviewed when used.

## **5.0 TRAINING FOR AEDC BASE OPERATING CONTRACTOR PERSONNEL**

5.1 LOTO training for Base Operating Contractor Personnel shall be provided in two phases:

5.1.1 Phase I shall be generalized training on the concepts and principles of control of hazardous energy and the elements of the OSHA Lockout/Tagout Program, and is conducted by Base Operating Contractor Safety, Health, and Environmental (SHE).

5.1.2 Phase II shall be more specific training/orientation on individual workplace procedures. Phase II shall be practice for actual operations, which is much more detailed and is conducted by operations personnel. If Primary or Lead authorized employees are assigned to a lockout operation, they shall be directly involved in developing and delivering Phase II training/orientation.

5.2 Training of primary authorized, lead authorized and authorized employees shall be required when:

5.2.1 There is a change in employee job assignments that would require new responsibilities affecting the control of hazardous energy.

5.2.2 A new hazard is introduced due to a change in machines, equipment, or process.

5.2.3 There is a change in the energy control procedures.

5.2.4 A periodic inspection reveals inadequacies in the company procedures or in employee knowledge.

5.3 The auditor will immediately contact supervision upon observing an inadequacy. Whenever an inspection, audit, or SHE determines there are deviations from or inadequacies in the employee's knowledge or use of the LOTO procedures, SHE will conduct appropriate retraining based on the evidence of the noncompliance. This training may range from on-the-spot review for minor discrepancies to full classroom retraining, depending on the extent of the inadequacies.

## **6.0 INSPECTIONS/AUDITS**

In addition to the periodic inspections by employees involved in the LOTO process, safety and quality audits or inspections may be conducted to verify compliance with this standard.

## **7.0 REFERENCES**

**Air Force Instruction 91-203, Air Force Consolidated Occupational Safety Instruction**

AEDC Safety, Health, and Environmental Standards:

- B1, Master Work Permit
- B4, High Voltage Electrical Work
- B6, Low Voltage Electrical Safety Related Work Practices

OSHA 29 CFR 1910.147: The control of hazardous energy (LOTO)

OSHA 29 CFR 1910.269: Electric Power Generation, Transmission and Distribution

## **8.0 ANNEXES**

- A. Sample JSA for LOTO
- B. Sample Administrative Control and LOTO Locks and Tags
- C. Sample LOTO Device Removal Memorandum
- D. Simple LOTO Process
- E. Complex Type I LOTO Process
- F. Complex Type II LOTO Process

## **9.0 SUPPLEMENT**

NFAC A321-0801-XSP B2 Lockout Tagout

**Annex A – Sample Form GC-1707 Job Safety Analysis for LOTO**

**JOB SAFETY ANALYSIS**

JOB OR PROJECT NUMBER/NAME	LOCATION	WORK ORDER NO.
----------------------------	----------	----------------

1. WRITE JOB/TASK IN THE SPACE PROVIDED AND DIVIDE THE TASK INTO INDIVIDUAL STEPS, AS APPROPRIATE.
2. IN THE HAZARD COLUMN, LIST ALL POSSIBLE HAZARDS ANTICIPATED IN THE INDIVIDUAL STEP OF THE TASK OR JOB
3. IN THE SAFE PLAN COLUMN, PROVIDE THE CORRECTIVE ACTIONS THAT WILL BE TAKEN TO PREVENT THE HAZARDS.
4. IN THE RESOURCES COLUMN, LIST THE EQUIPMENT AND RESOURCES THAT ARE NEEDED TO ACHIEVE THE "SAFE PLAN."
5. EACH TEAM MEMBER WHO WORKS UNDER THIS JSA MUST REVIEW AND VERIFY BY PRINTING HIS OR HER NAME AND INITIALING BELOW; WHEN THE CONTINUATION SHEET IS USED, THAT SHEET MUST ALSO BE VERIFIED. WHEN WORK IS INTERRUPTED DUE TO SHIFT CHANGE, HOLIDAY, ETC., ALL EMPLOYEES MUST INITIAL THAT THE JSA/SAFE PLAN IS STILL IN PLACE BEFORE RESUMING WORK.

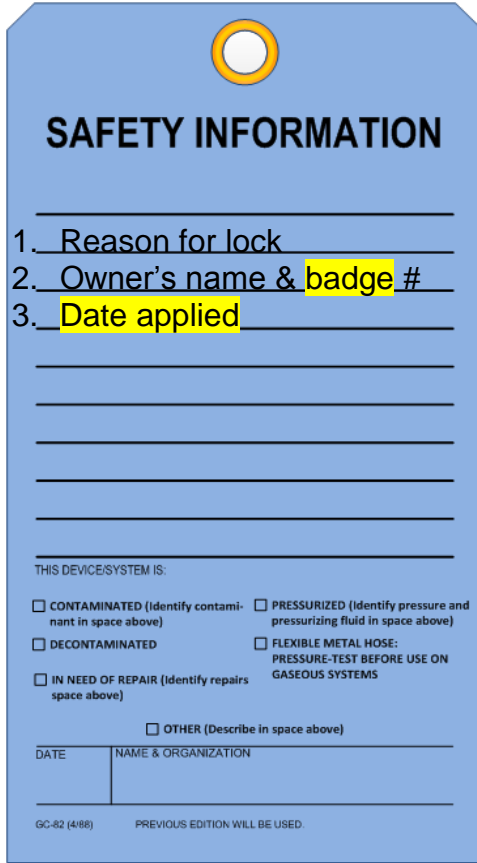
DESCRIBE JOB OR TASK,	DATE (MM/DD/YYYY)
-----------------------	-------------------

STEP	DESCRIBE INDIVIDUAL TASK STEPS	HAZARD	SAFE PLAN	EQUIPMENT & RESOURCES
1.	Identify Energy Sources - ID all sources of system/equipment power or energy (including stored sources like capacitors, stored hydraulic energy, etc.)			
2.	Notify all Affected Employees - everyone who would normally use equipment or might otherwise be affected by lockout.	<p>This annex provides an example of individual task steps that may be used in devising a JSA for LOTO activities. Verify use of current Form GC-1707 JSA on each job.</p>		
3.	Shut Down Equipment - Use appropriate shutdown procedure. Turn off all controls			
4.	Lockout Equipment - Lockout power source. Prevent controls operation.			
5.	Apply Danger Tags			
6.	Release or Block Stored Energy or Moving Parts – safely release energy (drain capacitor charge, bleed pressure from line, lower component that may fall, etc.)			
7.	Verify Lockout – make sure no one is exposed, and then attempt to operate equipment. If re-accumulation of energy is possible, verification must continue periodically to verify danger is not building.			
8.	Conduct Work on System or Equipment			
9.	Verify Equipment or System Safe for Re-energizing – make sure personnel clear, equipment components in place (covers, guards, etc.), and controls in neutral or safe position.			
10.	Remove Lockout & Tagout Devices			

Annex B

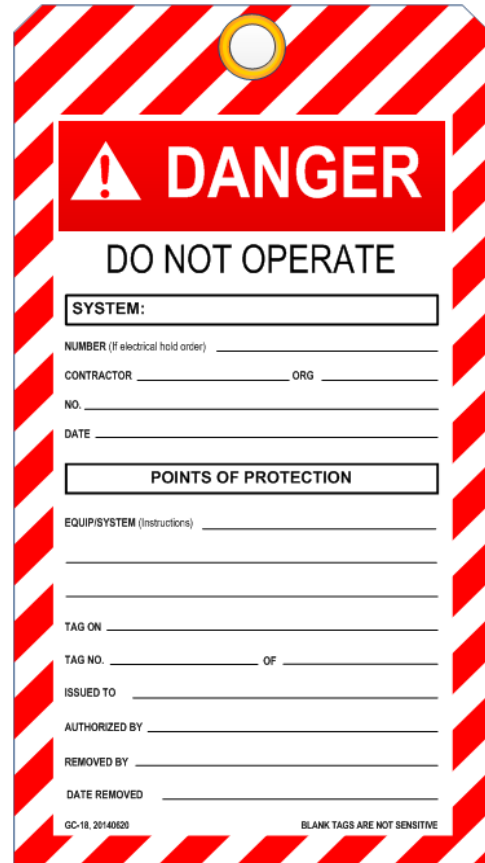
Sample Locks and Tags

Administrative Control Locks and Tags



A blue rectangular tag with a yellow ring at the top. The text reads: **SAFETY INFORMATION**  
1. Reason for lock \_\_\_\_\_  
2. Owner's name & badge # \_\_\_\_\_  
3. Date applied \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
THIS DEVICE/SYSTEM IS:  
 CONTAMINATED (Identify contaminant in space above)     PRESSURIZED (Identify pressure and pressurizing fluid in space above)  
 DECONTAMINATED     FLEXIBLE METAL HOSE: PRESSURE-TEST BEFORE USE ON GASEOUS SYSTEMS  
 IN NEED OF REPAIR (Identify repairs space above)     OTHER (Describe in space above)  
DATE \_\_\_\_\_ NAME & ORGANIZATION \_\_\_\_\_  
GC-82 (4/88)    PREVIOUS EDITION WILL BE USED.

LOTO Locks and Tags



A red and white striped rectangular tag with a yellow ring at the top. The text reads: **! DANGER**  
**DO NOT OPERATE**  
SYSTEM: \_\_\_\_\_  
NUMBER (if electrical hold order) \_\_\_\_\_  
CONTRACTOR \_\_\_\_\_ ORG \_\_\_\_\_  
NO. \_\_\_\_\_  
DATE \_\_\_\_\_  
POINTS OF PROTECTION  
EQUIP/SYSTEM (Instructions) \_\_\_\_\_  
TAG ON \_\_\_\_\_  
TAG NO. \_\_\_\_\_ OF \_\_\_\_\_  
ISSUED TO \_\_\_\_\_  
AUTHORIZED BY \_\_\_\_\_  
REMOVED BY \_\_\_\_\_  
DATE REMOVED \_\_\_\_\_  
GC-18, 2014-0820    BLANK TAGS ARE NOT SENSITIVE



Departmental Locks

(at least one):

1. Dept. ID
2. Key or Isolating device number
3. Primary or Lead's name & number



Personal Locks:

1. Owner's name
2. Owner's badge

**Annex C**  
**Sample Memorandum**

---

<b>Date:</b> MMM/DD/YYYY	<b>Organization</b>	<b>Mail Stop</b>
<b>To:</b> Safety, Health, and Environmental	XXXX	XXXX
<b>From:</b> Employee's Supervisor	XXXX	XXXX
<b>Subject:</b> LOTO Device Removal		

---

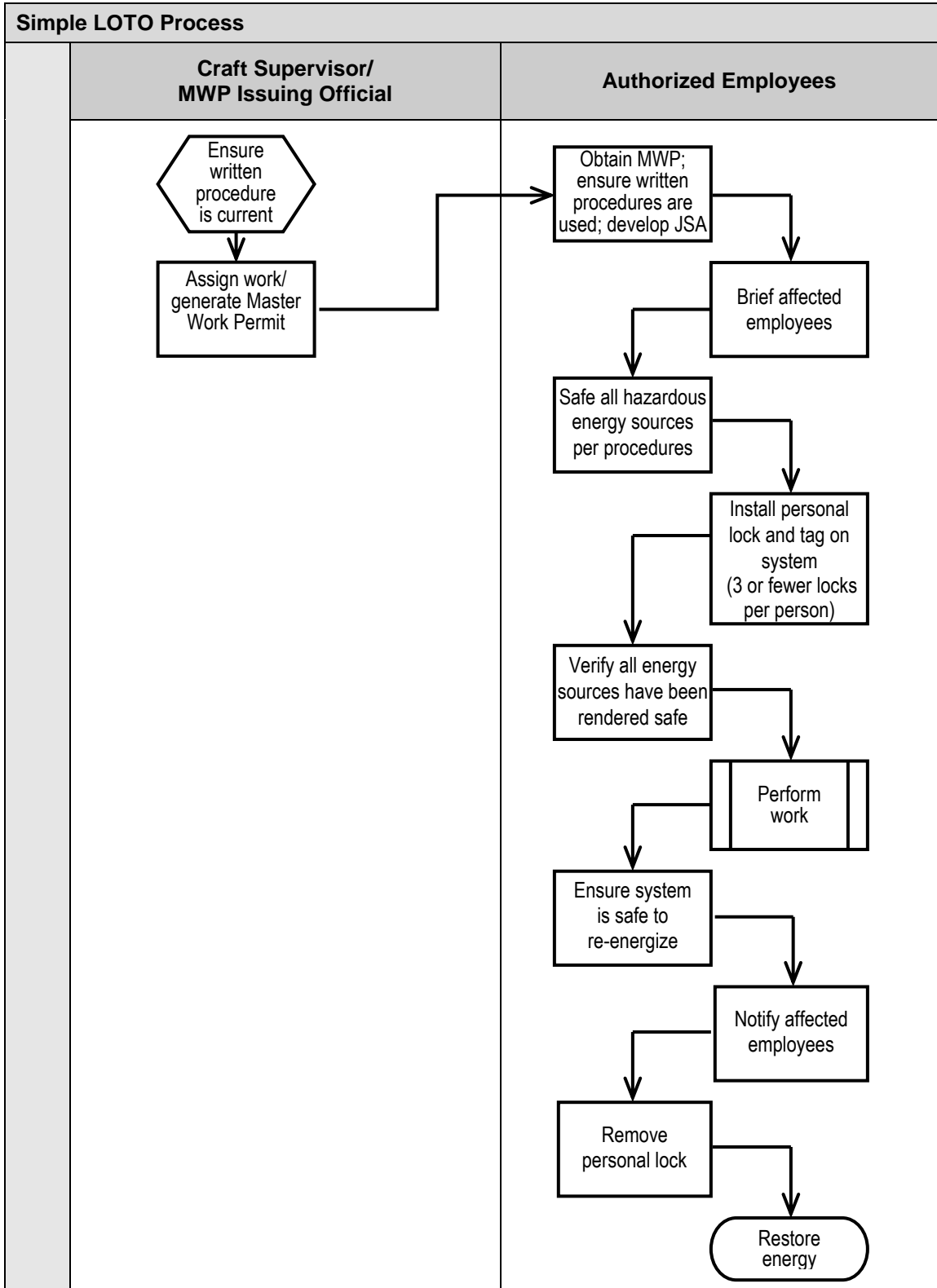
On Xxxxxday, Month XX, XXXX, the LOTO device used by (employee's name and badge number) had to be removed due to (employee absent, lost key, called away unexpectedly, etc.) State the reason why it was important the device be removed and the location (Building Number), system (RC1 Cooler), lockbox number or equipment ID.

Prior to requesting permission to remove the lock, the following steps were taken:

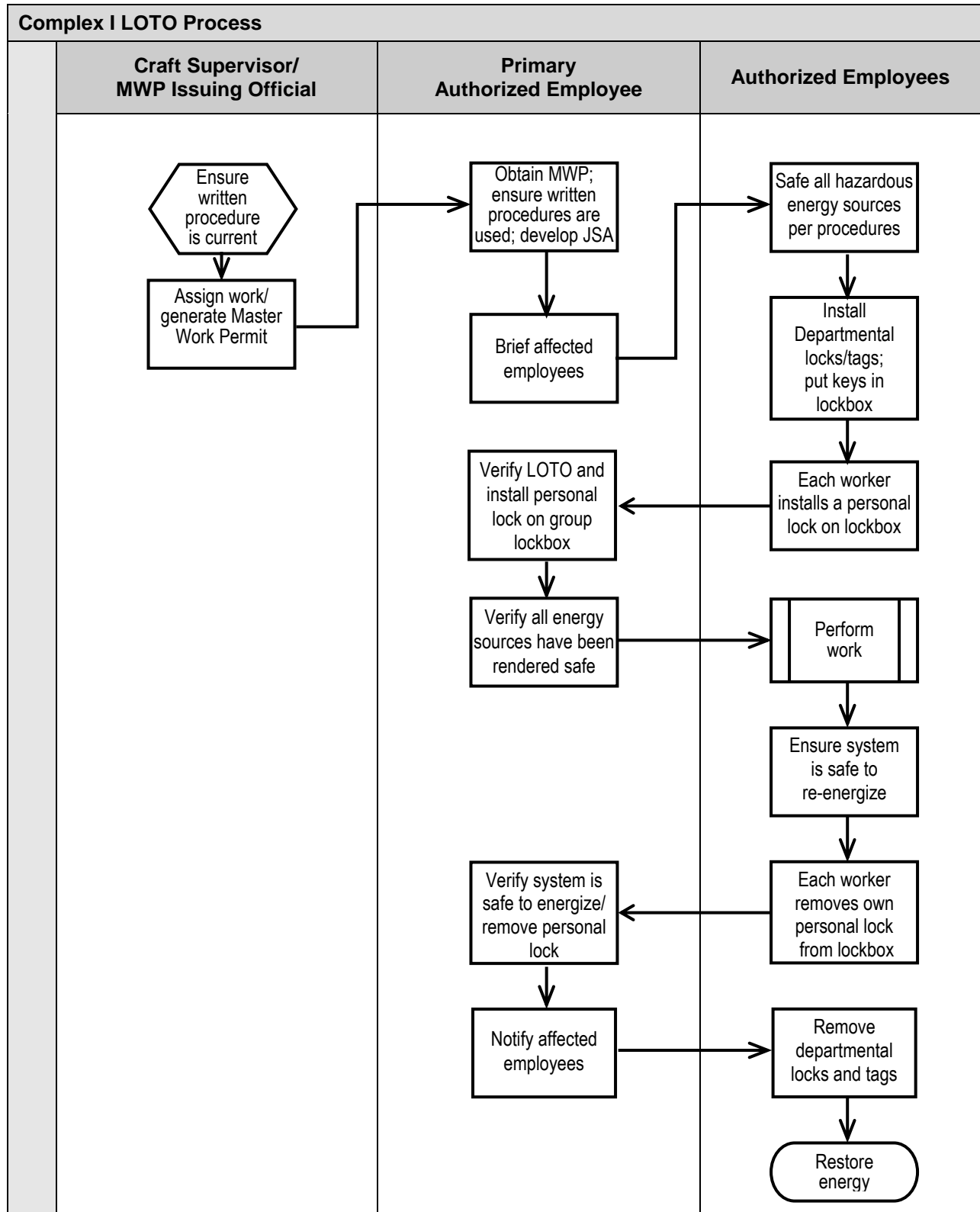
- 1) Ensured the employee is not in the affected location.
- 2) Exhausted all attempts to locate and contact the employee at work or at home.
- 3) Gained approval to remove lock from the employee's supervisor and the affected area supervisor.
- 4) State what other attempts were taken to contact the employee and if the attempts were successful or not.

cc: Department Director

Annex D  
Simple LOTO



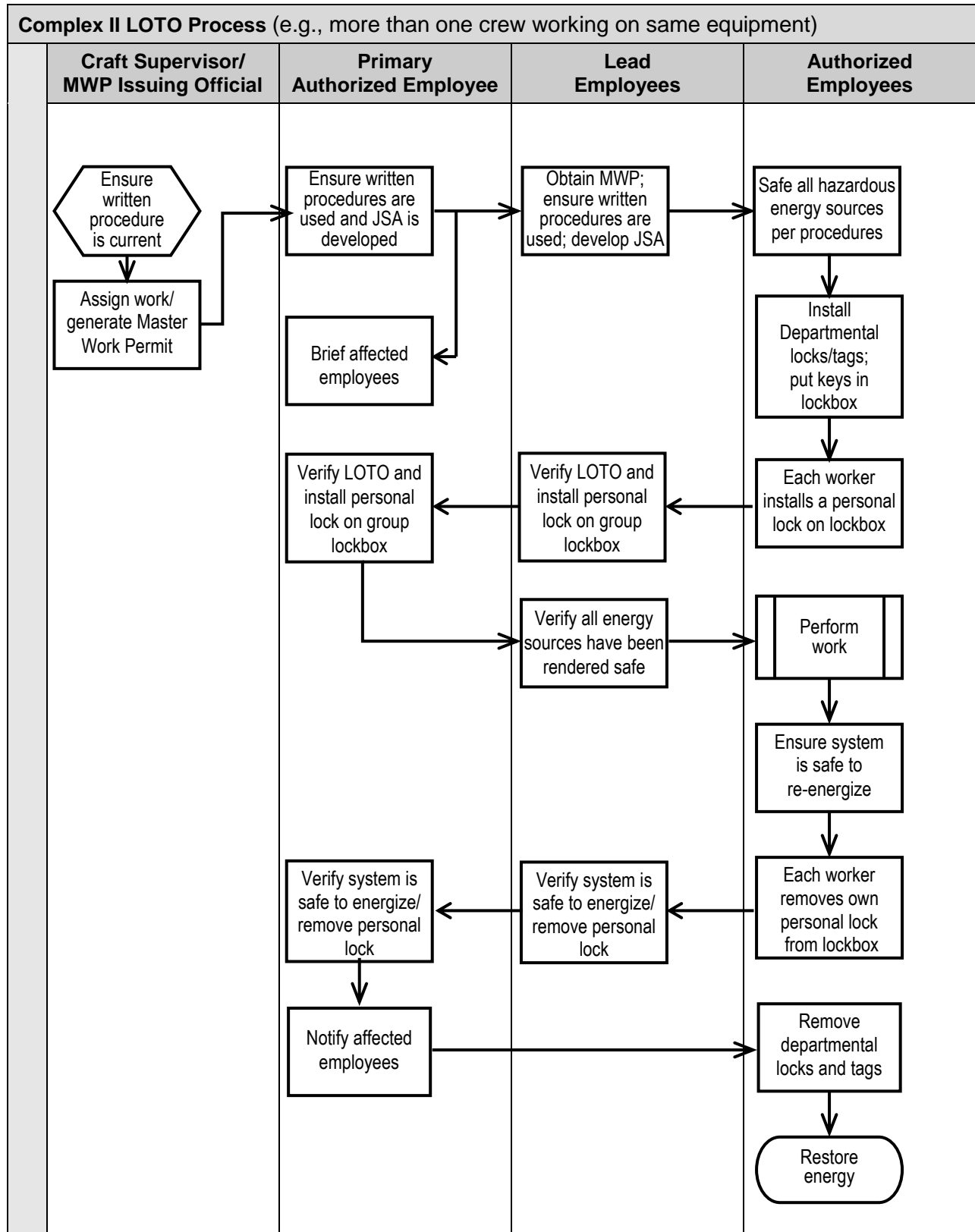
Annex E  
Complex I LOTO





Annex F

Complex II LOTO



# A321-0801-XSP B2 Lockout Tagout Supplement

This supplement has been approved for the NFAC Site.

**Review:** This supplement will be reviewed and updated using the same cycle as the AEDC Safety Standard B2 Lockout/Tagout (LOTO).

**References:** AEDC Safety Standard B2 – Lockout/Tagout (LOTO)

## **Scope:**

This supplement establishes minimum requirements for lockout of energy isolating devices whenever maintenance or servicing is done on equipment, machines, and/or systems.

This supplement applies to the control of hydraulic, pneumatic, steam, mechanical, electrical systems, powered machinery, hazardous gases, utility systems or other energy sources that could cause hazards to personnel or equipment due to unexpected startup or release. It shall be used to ensure that any equipment, machine, or system is stopped, isolated from all potentially hazardous energy sources, and locked out before employees perform any servicing or maintenance operation.

This supplement applies to all personnel conducting operations, maintenance, testing and support at NFAC, NASA Ames.

## **NFAC Worksite Application:**

NFAC will comply with OSHA Regulation 29 CFR 1910.147 The Control of Hazardous Energy (lockout/tagout).

Requirements for Lockout/Tagout:

1. Identify all energy sources and develop LOTO procedures
2. Notify all affected employees
3. Shut down equipment
4. Lock out equipment
5. Apply Danger Tags
6. Release or block any stored energy or movable parts
7. Verify Lockout
8. Conduct the desired work on the system/equipment
9. Verify the system/equipment is safe for re-energizing
10. Remove lockout and tagout device(s).

If isolating devices will not accept a lockout device, other means of equivalent positive lockout protection shall be utilized to protect affected employees. If unable to provide a positive lockout protection at the source line of any hazardous energy must be locked out and tagged out in two locations.

Locks used for lockout/tagout for personnel and equipment must be red in color only and have only one key (no duplicate keys allowed)(AMERICAN LOCK A1106RED). For single systems requiring multiple equipment locks they must be red and can be keyed alike (AMERICAN LOCK A1106KARED). The single system can only have one key, any duplicate keys must be destroyed. Employees shall only use company issued locks .

Supervisor locks are to be gold in color and may have any number of key(s) as required (AMERICAN LOCK A1106YLLW).

For multiple sources of hazardous energy a Group Lock Box will be utilized to store all labeled keys of each equipment lock required. Personnel will then apply their personnel locks to the box, restricting access to all the required equipment locks. This process requires a "Energy Control Log Sheet" A321—0801-XSF-16 be filled out listing all the equipment locks applied, location, reason for lockout, and Master Tag Number Supervisor Lock is applied to the Group Lock Box so the supervisor can ensure the system is correct before being put back into service. This process is also utilized during jobs involving multiple shifts even if it only requires one equipment lock.

Red and Gold colored locks are not allowed to be used for any other function than LOTO.

# A321-0801-XSP B2 Lockout Tagout Supplement

Kirk Key system is not allowed as a means of LOTO due to the fact that duplicate keys are kept on site.

Other locks required at NFAC administrative and/or security can be any color except red or gold.

Each individual NFAC employee, customer, and vendor shall use his company provided LOTO device when required. The only exception is for performing tours: the tour guide will only need to hang his company-provided lock in the designated area and ensure that the tour group stays with the guide at all times.

- I. NFAC Site Management shall
  1. Ensure supplement is followed.
  2. Ensure that LOTO procedures are developed as required.
- II. NFAC Supervisors and Test Director shall
  1. Ensure this supplement is followed by staff, customers and vendors.
  2. Ensure LOTO procedures are developed as required.
  3. Ensure LOTO of all sources of energy to protect personnel.
  4. Ensure staff LOTO training is current (initial training and refresher every two years).
  5. When an employee's LOTO device has to be removed, ensure the "Lockout Device and Tag Removal Request" A321-0801-XSF-17 has been completed.
  6. Ensure systems that are not active have their LOTO inspected every six months (locks and tags intact and legible).
- III. NFAC Safety Engineer shall
  1. Assist in LOTO procedures.
  2. Give LOTO training to staff.
  3. Ensure vendors follow LOTO procedures.
  4. Generate and issue personal LOTO tags and locks to staff and customers.
  5. Approve purchasing of LOTO safety devices.
  6. Provide customers with LOTO orientation.
- IV. NFAC Staff shall
  1. Follow this supplement and procedures:
    - a. Identifying all energy sources and procedure development.
    - b. Notify all affected employees.
    - c. Shutdown equipment.
    - d. Lockout equipment.
    - e. Apply Danger Tags.
    - f. Release or block any stored energy or movable parts.
    - g. Verify lockout.
    - h. Conduct the desired work on the system/equipment.
    - i. Verify the system/equipment is safe for re-energizing.
    - j. Remove LOTO device(s).
  2. For multiple locks, multiple shifts and/or required use "Energy Control Log Sheet" A321-0801-XSF-16.
  3. Maintain their LOTO training (initial and every two years).
  4. Follow procedure for LOTO removal:
    - a. LOTO device removal is only allowed if the owner is not available. Contact NFAC Supervisor, or Test Director for removal of another employee's lock/device.
    - b. Personnel are not allowed to continue any work duties until the "Lockout Device and Tag Removal Request" A321-0801-XSF-17 has been signed.