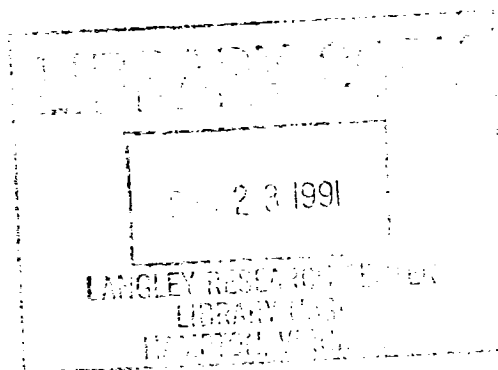


Controlling Hazardous Energy Sources (Lockout/Tagout)

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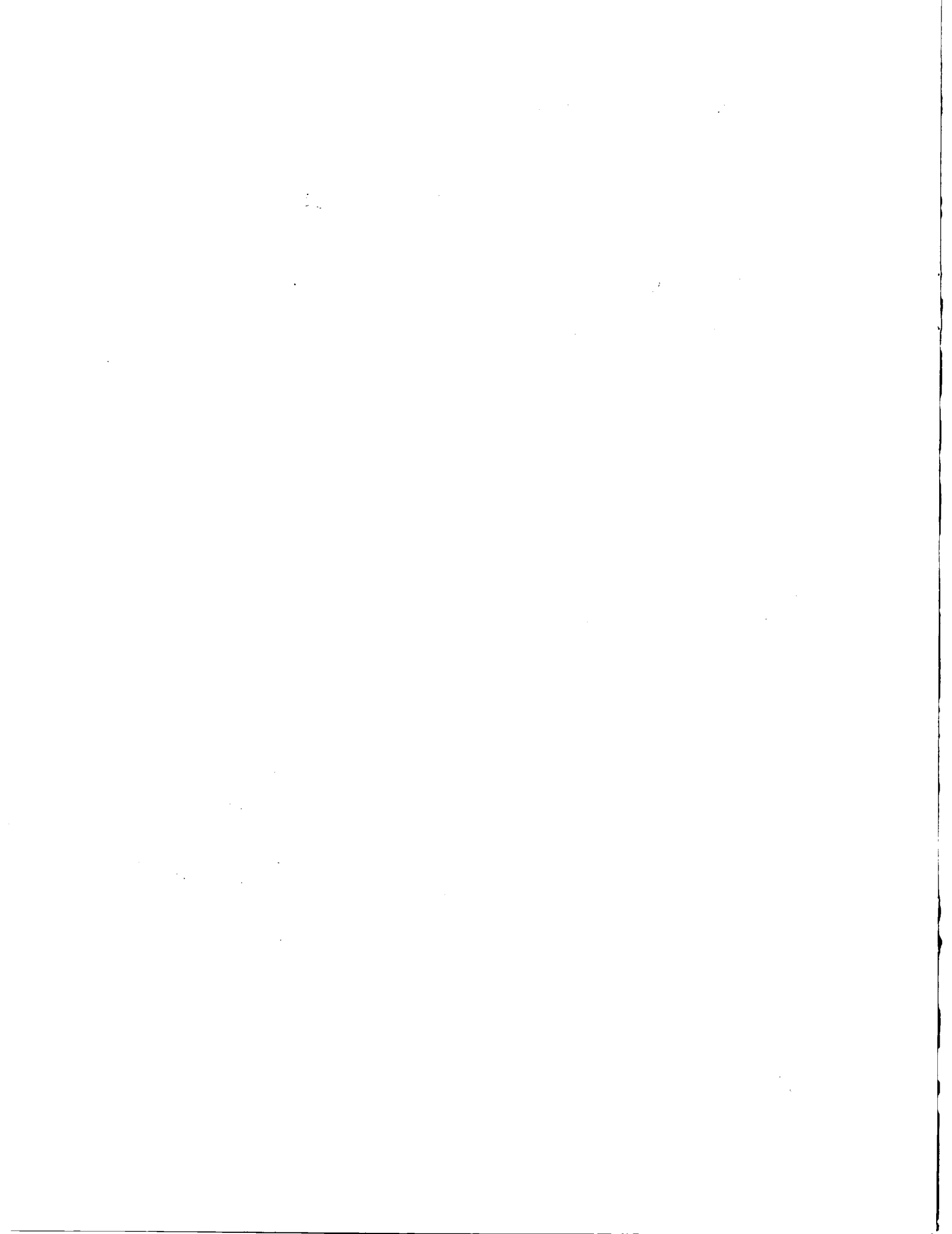
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October 1991

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1.0 PURPOSE:

This Safety Standard establishes the minimum requirements of the Occupational Safety and Health Administration (OSHA) 29 CFR 1910.147, Control of Hazardous Energy (Lockout/Tagout). It entails the development and application of mandatory procedures to prevent the unexpected operation of equipment or release of energy that could cause:

- Injury to personnel
- Damage to equipment
- Harm to the environment
- Loss or compromise of test data

2.0 SCOPE:

This Safety Standard sets forth minimum requirements, both for government and contractor personnel, for controlling exposures to potentially hazardous energy sources during work operations at the NASA Lewis Research Center and Plum Brook Station. It imposes basic rules to be followed to ensure protection against harmful exposures, and it presents baseline implementation requirements from which detailed lockout/tagout procedures can be developed for individual systems and equipment items. Exceptions to this Safety Standard must be authorized by the cognizant Safety Committee with review by the Safety Assurance Office.

This Safety Standard does not apply to operations known as "HOT TAPPING". These shall be dealt with on an individual basis by the above mentioned committee and office.

This Safety Standard applies, during all work activities, to the control of potentially hazardous energy sources at any energy level capable of causing the harmful outcomes listed under Section 1.0, PURPOSE. Energy sources and work activities include but are not limited to those indicated here:

EXAMPLE ENERGY SOURCES AND WORK ACTIVITIES COVERED BY THIS STANDARD

| <u>ENERGY SOURCES</u> | <u>ACTIVITIES</u> |
|---------------------------------|-------------------|
| Acoustical | Construction |
| Vacuum | Maintenance |
| Electrical | Installation |
| Pneumatic | Calibration |
| Hydraulic | Adjustment |
| Mechanical | Inspection |
| Compressed Gas | Cleaning |
| Spring Tension/Compression | Repair |
| Suspended or Moving Loads | Close Contact |
| Chemicals/Fuels | ...others... |
| Cryogens | |
| Ionizing/Non-ionizing Radiation | |
| Optical (e.g., Lasers) | |
| Thermal (i.e., Heat/Cold) | |
| ...others... | |

3.0 DEFINITIONS:

Authorized Employee - An employee responsible for placing his/her lock(s) and tag(s) on energy isolating devices. An employee shall meet the training requirements specified in Section 7.0 prior to being designated as an Authorized Employee.

Area Employee - An employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout or tagout, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed.

Area Supervisor - An employee designated by the Division Head to oversee worker safety in a given area, and who is responsible for implementing this Lockout/Tagout Procedure. An individual shall meet the training requirements specified in Section 7.0 prior to being designated as an Area Supervisor.

"Capable of Being Locked Out" - An energy isolating device is "capable of being locked out" if it is designed with a hasp or other attachment or integral part to which, or through which, a lock can be affixed, or if it has a locking mechanism built into it.

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

Energy Isolating Device - A mechanical device which physically prevents the transmission or release of potentially harmful energy - e.g., a disconnect switch, a blind flange, a physical block preventing motion of a mechanical device, a valve. (Control components such as push buttons and operating levers that are used in normal operation to direct energy flow/release do not qualify as energy isolating devices.)

Energy Source - A source of potentially harmful electrical, thermal, pneumatic, mechanical, hydraulic, chemical, or other energy. (See Section 2.0.)

General Lockout/Tagout - Method of securing ENERGY ISOLATING DEVICE(S) to provide positive means of protection against potentially harmful energy release in instances requiring no more than three points of energy isolation.

Group Lockout/Tagout - Method of securing ENERGY ISOLATING DEVICE(s) to provide positive means of protection against potentially harmful energy release in instances that (1) require more than three points of energy isolation or that (2) are used when multiple crafts or work crews may be exposed.

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

Lock Box - Container for keys to departmental locks used for GROUP LOCKOUT/TAGOUT. LOCK BOXES must accommodate multiple hasps. Locations of LOCK BOXES are to be established at well-recognized points of access by the organizational unit or units having control over them.

Lockout Device - A device that utilizes a positive means (such as a keyed lock) to hold an ENERGY ISOLATING DEVICE in the safe position and prevent the energizing of a machine or equipment.

Lockout - The placement of one (or more) LOCKOUT DEVICE(s) on the ENERGY ISOLATING DEVICE(s) in accordance with this procedure to ensure that the ENERGY ISOLATING DEVICE(s) and the equipment being controlled cannot be operated until the removal of the LOCKOUT DEVICE(s).

Multiple Lockout - A procedure used for LOCKOUT of more than one energy source.

Multiple Lockout Device - A mechanical device, such as a hasp, enabling application of more than one lock to an ENERGY ISOLATING DEVICE.

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

Positive Means of Protection - Prevention of potentially harmful release of energy by means that would require unusual and obvious measures to defeat.

Servicing and/or Maintenance - Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include any situation where the employee may be exposed to the unexpected energization or startup of the equipment or release of hazardous energy.

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

Tagout - Affixing a tag (NASA Form C-946, Rev. 6-87) on an ENERGY ISOLATING DEVICE, in accordance with an established procedure (as described in Section 5.0), to indicate that the ENERGY ISOLATING DEVICE and the equipment being controlled may not be operated until the tag is removed.

4.0 REQUIREMENTS AND RESPONSIBILITIES

These basic requirements underlie the formulation of this Safety Standard and guide its implementation:

1. All lockout/tagout procedures must be developed and executed according to the requirements of this Standard.
2. If equipment is capable of being locked out, potentially hazardous energy sources must be identified and: (a) protected against harmful accidental energy release by POSITIVE MEANS OF PROTECTION, (b) locked out, and (c) tagged out during periods of activity/operation when exposures to those sources could cause harm.
3. If equipment is not capable of being locked out, alternative protective measures must be employed. Those alternative measures must include tagging and must be directed by documented procedures, reviewed by the Safety Assurance Office, and approved by line management. These procedures must provide a level of safety equivalent to that obtained by using a lockout procedure.

4. Only AUTHORIZED EMPLOYEES may lockout/tagout energy isolating devices.
5. Only authorized locks and tags (NASA Form C-946, Rev. 6-87) may be used (per OSHA 29 CFR 1910.147 (c)(5)).
6. There may be no more than two (2) keys for any lock; one to be held by the AUTHORIZED EMPLOYEE, and one to be held under the control of the AREA SUPERVISOR for emergency removal only (See Section 5.4).
7. Each AUTHORIZED EMPLOYEE must affix his/her own lock/tag on the appropriate ENERGY ISOLATING DEVICE or, in the case of GROUP LOCKOUT, on the appropriate group LOCK BOX.
8. Locks/tags may be removed only by the AUTHORIZED EMPLOYEE who installed the lock/tag. (Emergency exceptions to this rule are covered under Emergency Removal Procedures - Section 5.4.)
9. No employee or work crew may work under the protection of a lock or locks belonging to another employee or work crew.
10. Locks intended for use under the requirements of this Safety Standard must not be used for any other purposes.
11. DANGER tags shall be issued only by the organizational unit having jurisdiction over the equipment/system involved.
12. A DANGER tag, NASA Form C-946 (Rev. 6-87), must be used in conjunction with each POSITIVE MEANS OF PROTECTION.
13. DANGER tags must be complete and legible. Information entered on the tag must include: the name of the organizational unit (and company, if placed by a contractor employee), the AREA SUPERVISOR, the AUTHORIZED EMPLOYEE, the date of application, and any other useful information regarding the operation.
14. Operating any device in violation of lock or a DANGER tag is prohibited.
15. All newly acquired equipment involving potentially hazardous energy sources must be outfitted to accommodate LOCKOUT DEVICES per OSHA 29 CFR 1910.147 (c)(2)(iii).
16. Existing equipment involving potentially hazardous energy sources must be retrofitted to accommodate LOCKOUT DEVICES upon replacement, major repair, renovation, or modification per OSHA 29 CFR 1910.147 (c)(2)(iii).
17. Supervisors of NASA and contractor personnel must ensure that employees under their supervision who are affected by or will use lockout/tagout procedures are trained to do so and are trained to recognize potentially hazardous energy sources per Section 7.0.
18. Violating any lockout/tagout rule or procedure may result in disciplinary action.

19. Supervisors of NASA and contractor personnel must ensure that employees under their supervision comply with the requirements of this Safety Standard and with the applicable lockout/tagout procedures.

5.0 DEVELOPING SPECIFIC PROCEDURES

Procedures for lockout/tagout are divided into two categories, General and Group. General procedures are typically used for work requiring few points of isolation and in-house work. Group lockout/tagout procedures are typically required when there are multiple isolating devices, locks, tags, crafts, or outside crews or contractors involved in a work project. Tagout procedures are used with each energy isolating device. Tagout procedures are identical to lockout procedures with the exception of placing a DANGER Tag on the energy isolating device. Tagout procedures require additional protection to ensure that a level of protection equivalent to that of lockout is obtained, e.g., checklists or sign-off sheets.

The Lockout/Tagout sequence provides distinct steps that must be followed during lockout/tagout procedures. These steps provide a logical sequence of events to provide maximum protection for personnel, equipment, product, and the environment.

5.1 GENERAL LOCKOUT/TAGOUT

Written procedures must be developed and documented by the Area Supervisor, approved by line management, reviewed by the Safety Assurance Office, and implemented to control all potentially hazardous energy sources. These procedures must include:

1. A specific statement of the intended use of the procedure, including identification of the particular equipment/system to which it applies and the activity it is to cover.
2. Specific procedural steps and responsibilities for each step. Procedural steps are to include but are not limited to:
 - a. NOTIFICATION - of area employees, supervisors/managers of systems to be shut down, and others who may be affected by the shutdown.
 - b. PREPARATION - for shutdown of equipment/system. Documented lockout/tagout procedures obtained and reviewed. Type and magnitude of energy and methods of control known by AUTHORIZED EMPLOYEE.
 - c. SHUTDOWN - of equipment/system. Equipment/system deenergized/powered down using standard procedures.
 - d. ISOLATION - of equipment/system. All energy isolating devices identified and operated to isolate equipment/system from energy sources.
 - e. LOCKOUT/
TAGOUT - Locks/tags applied to each isolating device. Each AUTHORIZED EMPLOYEE places a lock/tag on each isolating device.

- f. **RELEASE/DISCHARGE** - of all potentially harmful stored energy. All residual stored energy released/discharged by accepted safe means.
 - g. **VERIFICATION** - of isolation. Assurance obtained that the above steps of ISOLATION, LOCKOUT/TAGOUT, RELEASE/DISCHARGE have been carried out by physically operating the normal operating controls to ensure the equipment will not operate.
 - h. **CONDUCT** - work safely. Watch for unforeseen hazards.
 - i. **RESTORATION** - of equipment/system to normal operation. Insure all materials/tools are removed from equipment. Locks/tags removed by employee who applied them. Equipment/system returned to normal operating state. AREA EMPLOYEES, SUPERVISORS/MANAGERS, and others affected by the shutdown notified of lock/tag removal.
 - j. **CHANGES** - of personnel, shifts, or crew (see Section 5.3.).
3. If necessary, systems or equipment may be tested, calibrated, aligned, etc. while energized; however written procedures must be developed to govern such activities. Those procedures must include provisions for removing and replacing locks and tags, be reviewed by the Safety Assurance Office, and be approved by line management.
 4. Approved procedures will be retained, and any revisions must be reviewed by the Safety Assurance Office and approved by line management.

5.2 GROUP LOCKOUT/TAGOUT

When GROUP LOCKOUT procedures are used, they must afford a level of protection equivalent to that provided by GENERAL LOCKOUT procedures, and a master tag or checklist identifying points of isolation must be placed on or near the LOCK BOX. Written procedures must be developed and documented by the Area Supervisor, approved by line management, reviewed by the Safety Assurance Office, and implemented to control all potentially hazardous energy sources. These procedures must include:

1. A specific statement of the intended use of the procedure, including identification of the particular equipment/system to which it applies and the activity it is to cover.
2. Specific procedural steps and responsibilities for each step. Procedural steps are to include but are not limited to:
 - a. **NOTIFICATION** - of area employees, supervisors/managers of equipment/systems to be shutdown, and others that may be affected by the shutdown. Designate the Lead Supervisor/Manager who will oversee the lockout/tagout procedures if several crews, contractors, or departments are working on the same job.

- b. **PREPARATION** - for shutdown of equipment/systems. All documented lockout/tagout procedures obtained and reviewed. Type and magnitude of energy and methods of control known by **AUTHORIZED EMPLOYEE**.
 - c. **SHUTDOWN** - of equipment/systems. Equipment/systems deenergized/powered down using standard procedures.
 - d. **ISOLATION** - of equipment/systems. All energy isolating devices identified and operated to isolate equipment/systems from energy sources.
 - e. **LOCKOUT/TAGOUT** - Departmental/Area locks/tags are placed on isolating devices. Keys placed in Departmental/Area **LOCK BOX**. Master checklist at **LOCK BOX** checked off by all Authorized Employees working on the project verifying that the locks/tags are appropriately placed. All **AUTHORIZED EMPLOYEES** will place their lock on the hasp of the **LOCK BOX**. Reviewed by the Lead Supervisor/Manager as designated above in 2.a.
 - f. **RELEASE/DISCHARGE** - of all potentially harmful stored energy. All residual stored energy released/discharged from all equipment/systems by accepted safe means.
 - g. **VERIFICATION** - of isolation and checklist. Assurance obtained that above steps of **ISOLATION, LOCKOUT/TAGOUT, RELEASE/DISCHARGE** have been carried out by physically operating the normal operating controls to ensure the equipment will not operate.
 - h. **CONDUCT** - work safely. Watch for unforeseen hazards.
 - i. **RESTORATION** - of equipment/systems to normal operation. Insure all materials/tools are removed from equipment/systems. Locks/tags removed and checked off on the master checklist by the Authorized Employees. Equipment/systems returned to their normal operating states. **AREA EMPLOYEES, SUPERVISORS/MANAGERS**, and others affected by the shutdown notified of lock/tag removal.
 - j. **CHANGES** - of personnel, shifts, or crews (see Section 5.3.).
3. If necessary, systems or equipment may be tested, calibrated, aligned, etc. while energized; however written procedures must be developed to govern such activities. Those procedures must include provisions for removing and replacing locks and tags, be reviewed by the Safety Assurance Office and approved by line management.
 4. Approved procedures will be retained, and any revisions must be reviewed by the Safety Assurance Office and approved by line management.

5.3 SHIFT CHANGES

1. If a task involves more than one (1) shift, the Area Supervisor of the oncoming crew should be advised of any problems or safety concerns by the Area Supervisor of the off-going crew. As a minimum, the briefing should include: task description, a progress report, isolation actions taken, location of locks/tags, and any problems encountered.
2. The oncoming crew should use their own locks to replace the off-going crew's locks. If tags are used, a checklist, as stated in Section 5.0., shall be used and reviewed by the oncoming crew and the off-going crew.
3. The crew which completes the task will be responsible for restoring power, testing equipment, and removing locks/tags. The AREA SUPERVISOR is ultimately responsible for the restoration of power, testing of equipment, and the removal and accounting of locks/tags.

5.4 EMERGENCY REMOVAL

When the Authorized Employee is unavailable to remove their lock/tag device, that device may be removed using the following procedures:

1. The Area Supervisor and the Employee's Supervisor are notified.
2. The Employee's Supervisor notifies his/her Manager.
3. The Employee's Supervisor and Manager verify that employee is not available to remove their lock/tag device (every possible effort to locate the employee shall be made prior to lock/tag removal).
4. The Employee's Supervisor or Manager contacts the employee's home to inform him/her that his/her lock/tag device has been removed. If the employee can not be contacted, then the employee's supervisor shall ensure that the employee is notified that his/her lock/tag device has been removed before the employee begins work at the facility.
5. The Employee's Supervisor and the Area Supervisor shall remove the lock/tag device.
6. A report, which documents the above stated action, shall then be filed by the Employee's Supervisor to their line Manager with a copy sent to the Safety Assurance Office.

6.0 INSPECTIONS/AUDITS

Inspections/audits of conformance to this Safety Standard must be conducted not less frequently than annually by the Safety Assurance Office. The purposes of inspections/audits are to gauge the effectiveness of this Safety Standard and to guide its revision to ensure its continued effectiveness. Results of inspections/audits are to be documented per OSHA 29 CFR 1910.147 (c)(6)(ii), submitted to the responsible organization and kept on file in the Safety Assurance Office.

7.0 TRAINING

Training in the requirements of this Safety Standard must meet the requirements of OSHA 29 CFR 1910.147 (c)(7) and will be provided by line management to:

- AREA SUPERVISORS / MANAGERS
- AUTHORIZED EMPLOYEES
- AREA EMPLOYEES
- SAFETY COMMITTEE MEMBERS

The training must provide instruction in:

- Recognizing potentially hazardous energy sources;
- The purposes and functions of controlling potentially hazardous energy sources, as required by this Safety Standard;
- Attempting to restart or re-energize machines or equipment which have been locked/tagged out is prohibited;
- Knowledge and skills for applying energy isolating devices and lockout/tagout;
- In addition, because of the excessive use of tagging within the Center, employees must be trained in the limitations associated with tagout procedures per OSHA 29 CFR 1910.147 (c)(7)(ii).

Retraining/refresher training shall reaffirm employee proficiency and introduce new or revised control methods and procedures as necessary. Retraining will be provided a minimum of every two years and also when:

- Changes in job assignment bring about changes in the types of potentially hazardous energy sources to which the employee might be exposed;
- Changes in equipment or acquisition of new equipment bring about changes in the types of potentially hazardous energy sources to which the employee might be exposed;
- Changes occur in energy control procedures;
- Results of inspections/audits indicate training inadequacies;
- This Safety Standard is revised in any substantive way.

Results of training (i.e., attendees, topics covered, dates) are to be documented and submitted to the Technical and Administrative Training Branch.

APPENDIX A

EXAMPLE OF LOCKOUT/TAGOUT PROCEDURE

WHEN ELECTRICAL POWER OR CENTRAL AIR DISPATCHER ARE INVOLVED

ELECTRICAL SYSTEMS STANDARD

1. PROCEDURE WITH SYSTEM HAZARDS (Under direction of Electrical Power Dispatcher)

- a. Prior to starting work in an area, the authorized employee shall make a survey to locate and identify all energy isolating devices to be certain which switch(es) or other energy isolating devices apply to the equipment or process to be locked out and tagged.

NOTE:

Other energy sources besides electrical (e.g., mechanical, pneumatic, etc.) also may be involved.

- b. The authorized employee shall know the type and magnitude of energy that the machine or equipment utilizes and shall understand the hazards thereof.
- c. Prior to locking out and tagging the equipment or process, the authorized employee shall give notification to all personnel who work with this equipment or process of the reasons for and impending application of locks and tags.
- d. The authorized employee shall request the Electrical Power Dispatcher to isolate and lockout and tagout the proper system parts.
- e. After the Electrical Power Dispatcher has approved the authorized employee's request and has determined the extent of the isolation, he shall instruct the authorized employee who will be performing the job to sequentially execute the following:
 - (1) Shut down the equipment;
 - (2) Ensure that any stored energy (such as that in capacitors, etc.) is either dissipated or restrained by methods such as repositioning, blocking, etc.;

- (3) Lockout and tag the energy isolating devices.
- f. The Electrical Power Dispatcher will install a DANGER tag for each switch or other device which must not be operated while the isolation is to continue. For each tag issued, the Electrical Power Dispatcher shall complete the Electrical Power Dispatch "Tag-Out Record", NASA Form C-787 (Rev. 10-90).
- g. Under the direction of the Electrical Power Dispatcher, grounds shall be attached to locked out and tagged system parts as agreed upon by the authorized employee and the Electrical Power Dispatcher. The Electrical Power Dispatcher shall keep a record of any grounds that have been attached.

NOTE:

Overhead line work shall not be performed after lockout and tagout until grounds have been placed on all three phases on both sides of the point of work.

- h. The authorized employee shall assure that the isolation is accomplished by confirming that each isolating device is properly locked out and that tags are securely attached in a **conspicuous** location on each isolating device involved. The authorized employee shall not perform any work until isolation is complete, grounds are attached, and locks and tags are attached.
- i. After ensuring that no personnel are exposed, and as a check on having disconnected the energy source(s), the authorized employee shall operate the push button or other normal operating controls to make certain the equipment will not operate.

CAUTION:

Return operating control(s) to "neutral" or "off" position after the test.

- j. If more than one group is engaged in work in an area at the same time, **GROUP LOCKOUT/TAGOUT PROCEDURES WILL BE FOLLOWED.**
- k. **DO NOT ATTEMPT TO OPERATE ANY DEVICE WHICH HAS BEEN LOCKED OUT AND TAGGED.** No lock and tag may be removed until it has been released by the authorized employee at whose request it was issued, and then only after the Electrical Power Dispatcher has ordered its removal by the authorized employee.
- l. Should it become necessary to test the results of work done in a locked out and tagged area, then the locks, tags and grounds may be temporarily removed at the request of the authorized employee after permission has been granted by the Electrical Power Dispatcher. After the test, locks, tags and grounds shall be replaced at the request of the authorized employee after the Electrical Power Dispatcher has given permission.

NOTE:

All switching, placing, and removal of locks and tags shall be done by the authorized employees performing the work, under the direction of the Electrical Power Dispatcher.

- m. When the work in a locked out and tagged area has been completed, the authorized employee shall check the area around the equipment or process to ensure that all tools have been removed from the machine or equipment; all guards have been reinstalled; and all employees are in the clear. He/She must have absolute knowledge that everyone connected with the work on the system is accounted for before the locks and tags are removed.
- n. Prior to removing the locks and tags from the equipment or process, the authorized employee shall give notification to all personnel who work with this equipment or process of the impending removal of locks and tags.
- o. The authorized employee shall report to the Electrical Power Dispatcher that the work is finished and that the locks and tags may be removed.
- p. The Electrical Power Dispatcher shall give instructions to the authorized employee for the removal of locks, tags and grounds, and the restoration of energy to the equipment or process.

MECHANICAL SYSTEMS STANDARD

1. **PROCEDURE WITH SYSTEM HAZARDS** (Under direction of the Central Air Dispatcher)

- a. Prior to starting work in an area, the authorized employee shall make a survey to locate and identify all energy isolating devices to be certain which pipeline(s), compressor(s), valve(s) or other energy isolating devices apply to the equipment or process to be locked out and tagged.

NOTE:

Other energy sources besides mechanical (e.g., electrical, hydraulic, etc.) also may be involved.

- b. The authorized employee for the job shall know the type and magnitude of energy that the machine or equipment utilizes and shall understand the hazards thereof.
- c. Prior to locking out and tagging the equipment or process, the authorized employee shall give notification to all personnel who work with this equipment or process of the reasons for and impending application of locks and tags.
- d. The authorized employee shall request the Central Air Dispatcher to isolate and lockout and tagout the proper system parts.

- e. Whenever electrical equipment is involved in a mechanical system's lockout and tagout procedure, which is under the direction of the Central Air Dispatcher, the Central Air Dispatcher shall instruct the authorized employee to confer with the Electrical Power Dispatcher and arrange to have proper electrical equipment removed from service and locked out and tagged out in accordance with the Electrical Systems Standard of this Lockout and Tagout Standard. The Central Air Dispatcher also shall confer with the Electrical Power Dispatcher and assure himself that proper electrical lockout and tagout has been made before permitting work to be started.
- f. After the Central Air Dispatcher has approved the authorized employee's request and has determined the extent of the isolation, he shall instruct the qualified personnel who will be performing the job to sequentially execute the following:
 - (1) Shut down the equipment by operating valves and conducting other operations as may be required;
 - (2) Ensure that any stored energy (such as that in springs, elevated machine members, rotating flywheels, etc.) is either dissipated or restrained by methods such as repositioning, blocking, bleeding down, etc.;
 - (3) Lockout and tag the energy isolating devices.
- g. The Central Air Dispatcher shall forbid operation, and initiate the tag function on his CRT status tabular display. The latter action will indicate the locked out and tagged points on the appropriate operating schematic and prevent their operation from the Central Control Building during the isolation period. The Central Air Dispatcher shall record these actions on the Central Air Dispatch Tagout Record, Electrical/Mechanical, NASA Form C-771 (Rev. 6-90).
- h. The authorized employee shall assure that the isolation is accomplished by confirming that each isolating device is properly locked out and that locks and/or tags are securely attached in a conspicuous location on each isolating device involved. The authorized employee shall not permit any work to be done until isolation is complete and locks and tags are attached.
- i. After ensuring that no personnel are exposed, and as a check on having disconnected the energy source(s), the authorized employee shall operate the pushbutton or other normal operating controls to make certain the equipment will not operate.

CAUTION:

Return operating control(s) to "neutral" or "off" position after the test.

- j. If more than one group is engaged in work in an area at the same time, GROUP LOCKOUT/TAGOUT PROCEDURES WILL BE FOLLOWED.

- k. **DO NOT ATTEMPT TO OPERATE OR ALTER ANY SYSTEM OR EQUIPMENT WHICH HAS BEEN LOCKED OUT AND TAGGED.** No lock and tag may be removed until it has been released by the authorized employee at whose request it was issued or by his/her designated alternate, and then only after the Central Air Dispatcher has ordered its removal by the authorized employee.
- l. Should it become necessary to test the results of work done in a locked out and tagged area, then the locks, tags and grounds may be temporarily removed at the request of the authorized employee after permission has been granted by the Central Air Dispatcher. After the test, locks and tags shall be replaced at the request of the authorized employee after the Central Air Dispatcher has given permission.

NOTE:

All opening and closing of valves and other related operations as well as the placing and removal of locks and tags shall be done by the authorized employee performing the work, under the direction of the Central Air Dispatcher. The Central Air Dispatcher shall record the actions on NASA Form C-771.

- m. When the work in a locked out and tagged area has been completed, the authorized employee shall check the area around the equipment or process to ensure that all tools have been removed from the machine or equipment; all guards have been reinstalled; and all employees are in the clear. He/She must have absolute knowledge that everyone connected with the work on the system is accounted for before the locks and tags are removed.
- n. Prior to removing the locks and tags from the equipment or process, the authorized employee shall give notification to all personnel who work with this equipment or process of the impending removal of locks and tags.
- o. The authorized employee shall report to the Central Air Dispatcher that the work is finished and that the locks and tags may be removed.
- p. The Central Air Dispatcher shall give instructions to the authorized employee for the removal of locks and tags, and the restoration of energy to the equipment or process.

• *Staphylococcus aureus* (Staph aureus)
• *Staphylococcus epidermidis* (Staph epidermidis)
• *Staphylococcus saprophyticus* (Staph saprophyticus)
• *Staphylococcus carnosus* (Staph carnosus)
• *Staphylococcus sciuri* (Staph sciuri)

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| 13. ABSTRACT (Maximum 200 words) The minimum requirements as established by the Occupational Safety and Health Administration (OSHA) standard 29 CFR 1910.147 are discussed for preventing the unexpected operation of equipment or release of energy which could cause injury to personnel, damage to equipment, harm to the environment or loss or compromise of test data. Safety requirements both for government and contractor personnel are explained for potentially hazardous energy sources during work operations at the Lewis Research Center (Cleveland and Plum Brook Stations). Basic rules are presented to ensure protection against harmful exposures, and baseline implementation requirements are discussed from which detailed lockout/tagout procedures can be developed for individual equipment items. Examples of energy sources covered by this document include electrical, pneumatic, mechanical, chemical, cryogenic, thermal, spring tension/compression suspended or moving loads, and other potentially hazardous sources. Activities covered by this standard include but are not limited to construction, maintenance, installation, calibration, inspection, cleaning, or repair. | | | |
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