Lockout/Tagout Level 2

Objectives

- Comply with OSHA 1910, which is part of our "Work Smart" set of standards.
- State the definition of a Lockout/Tagout.
- Recognize the locks & tags used at Fermilab.

Objectives

- Recognize LOTO activities.
- State the consequences of unauthorized removal of locks & tags.
- Recognize hazardous energy sources.
- Learn steps for energy isolation & control.

Objectives

- State the limitations of tagout devices.
- Understand the differences between type A and type B group locks.
- Recognize when a written LOTO procedure is required.

Objectives

- State the LOTO requirements during shift changes.
- Understand requirements for sub-contractors.

Why is it so important to follow LOTO procedures?

LOTO saves lives!

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Lockout/Tagout Level 2

Intro

Before coming to Fermilab, David Mertz of the ESH&Q section suffered an injury when LOTO procedures were not followed.

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Lockout/Tagout Level 2

Intro

Loading Media, Please Wait

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Lockout/Tagout Level 2

Intro

When does LOTO apply to my work at Fermilab?

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LOTO Program Applies To:

- The control of hazardous energy sources during service & maintenance of equipment.
- Activities near hazardous energy with the potential for injury if energy is released.
- Servicing or maintenance when guards and other protection is bypassed.

LOTO Does *Not* Apply To:

- Work on cord & plug connected equipment.
- Minor tool changes and adjustments during normal operations. These must be routine, repetitive and integral.
- Access to accelerator or beamline enclosures under controlled or supervised access conditions. No energy source work.

LOTO Does *Not* Apply To:

- Work on or near exposed energized equipment that involves inspection or testing covered under FESHM 9120 (distribution) and 9110 (utilization).
- Installations under the control of electric utilities.

LOTO Does *Not* Apply To:

- Hot tap operations involving utility company transmission and distribution systems (water & gas).
- If de-energizing introduces additional or increased hazards or is infeasible due to design.

Definitions

Lockout/Tagout

The placement of a lockout and/or tagout device on an energy isolating device in accordance with procedures which prevents operation of equipment until the lockout device is removed.

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Lockout/Tagout Level 2

Intro

Affected Employee

An employee whose job requires operation or use a machine or equipment on which servicing or maintenance is being performed under lockout or tagout.

OR

An employee whose job requires work in an area where such servicing or maintenance is being performed.

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Lockout/Tagout Level 2

Intro

Who might be an Affected Employee?

Everyone at the Laboratory!!!

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Lockout/Tagout Level 2

Intro

An **Authorized Employee** is someone who is:

- Authorized to lockout/tagout equipment in order to perform maintenance
- Authorized by line management
- Qualified by training and experience
- Must determine if a written procedure exists
  - Trained in written LOTO procedure

This definition is found in OSHA 1910

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Intro

A **Lead Authorized Employee** is:

- An authorized employee who performs or coordinates one or more LOTO activities for multiple personnel.
- Often the most senior or experienced person, but this is not a requirement.

This definition is found in OSHA 1910

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Intro

Knowledgeable Employee

An employee who assesses energy source(s) subject to LOTO and writes the procedure for the equipment.

This definition is specific to Fermilab.
A Knowledgeable Employee must first be an Authorized Employee.

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Lockout/Tagout Level 2

Intro

Exclusive Control

Exclusive control exists when the unplugged plug is within your sight and reach.

See the OSHA Interpretation in your booklet.

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Energy Sources you may encounter include:

- Electrical
- Mechanical
- Pressurized gases (includes cryogens & air)
- Pressurized fluids (hydraulics)
- Loaded Spring
- Gravity

Energy Isolating Device

1. A mechanical device that physically prevents the transmission or release of energy.
2. Pushbuttons, selector switches, or other control circuit type devices are not energy isolating devices.

Personal Lockout Device

A lockout device, the key for which is under the exclusive control of an individual.

Equipment Lockout Device

A lock and key used to hold an Energy Isolating Device in the safe position in a type B group lockout. Equipment locks may be a captured-key lock that is integral to the energy isolating device.

What are the requirements of Fermilab's Lockout/Tagout program?

General LOTO requirements

1. A violation of Fermilab's LOTO program may result in disciplinary action.

General LOTO requirements

2. Deviations from LOTO procedures are only permitted with the written approval of the D/S/C head.

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Lockout/Tagout Level 2
Intro

General LOTO requirements

3. Machines and equipment shall be physically isolated from sources of energy using an energy isolating device.

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Intro

General LOTO requirements

4. If there is no way of placing a lock on the energy isolating device, then you must turn OFF the energy isolating device, place a tag on it, and take one additional measure to prevent inadvertent restoration or power.

General LOTO requirements

5. Machines that were made or have undergone major changes after January 2, 1990 must be designed to accept lockout devices. Any machines receiving major modification *must* have LOTO padlocking provisions.

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Intro

General LOTO requirements

6. Management shall determine if a written LOTO procedure is required for a job and shall have one written if necessary.

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Intro

General LOTO requirements

7. The Authorized Employee is responsible for determining if a written procedure exists.
   - Annual training is required for written procedures.
   - You must follow the written procedure.

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General LOTO requirements

8. If a written LOTO procedure is not required, the Authorized Employee will follow the general LOTO procedure.

General LOTO requirements

9. If the Authorized Employee feels a written procedure is needed and one does not exist, he/she should notify the supervisor and should not proceed with the work.

General LOTO requirements

10. If there is a planned electrical outage and you have non-related work to do in the area you should apply LOTO at least 30 minutes before the outage. This will allow you to verify.

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Lockout/Tagout Level 2

Intro

What kind of Lockout/Tagout devices should I be using?

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Lockout/Tagout Level 2

Intro

Lockout and Tagout Devices

- LOTO locks are red.
- Do not use red-colored locks for any other purpose.
- You may use red tape or shrink wrap to make a plain padlock a LOTO padlock.

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Lockout/Tagout Level 2

Intro

Lockout and Tagout Devices

- There should only be one key per LOTO lock.
- If more than one key exists, destroy the extra keys immediately.
- Combination locks are ***not*** allowed for LOTO because they code can be cracked or shared.

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Lockout and Tagout Devices

- When multiple locks are required for a *single* LOTO activity, locks with a single common key may be used.
- The Fermilab locksmith can custom-key a set of locks.

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Intro

Lockout and Tagout Devices

All LOTO tags must :

- contain the words "DANGER, DO NOT OPERATE".
- be white, black and red.

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Intro

Lockout and Tagout Devices

All LOTO tags must:

- have a space for the Authorized Employee's name.

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Lockout and Tagout Devices

All LOTO tags:

- must have a reinforced eyelet capable of accepting a lock shackle of 0.25 inch diameter.
- are available at the Fermilab stockroom.

What do I need to know about applying a Lockout/Tagout Device?

Lockout/Tagout Device Application

- Each employee must apply his/her own locks.
- Lockout devices are applied to hold the isolating device in a “safe” or “off” position.
- The employee who places the lock must maintain exclusive control of the key.

Lockout/Tagout Device Application

- Only the Authorized Employee may remove his/her LOTO device.
- A supervisor may over lock for additional control.

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Intro

Lockout/Tagout Device Application

- A tag must always accompany a lock.
- The tag must be securely attached.
- The tag MUST clearly display "DANGER, DO NOT OPERATE" and the name of the Authorized Employee.

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Intro

Lockout/Tagout Device Application

The Authorized Employee's name is mandatory.

The tag may also display:

- a picture of the Authorized Employee.
- the date of application.
- other pertinent information, such as, a phone number or company name.

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Intro

Lockout/Tagout Device Application

Do not use string or tape to apply tag!

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Lockout/Tagout Level 2

Intro

Tagout Device Only Application

- A tagout device alone is only allowed when the energy isolating device is not capable of accepting a lockout device.
- The tag must be labeled “Danger – Do Not Operate" and clearly indicate the operation or movement that is prohibited.

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Intro

Tagout Device Only Application

- Use laboratory-furnished tags.
- Tags must be securely attached by non-reusable means to prevent intentional or inadvertent detachment. Locks can be re-used.

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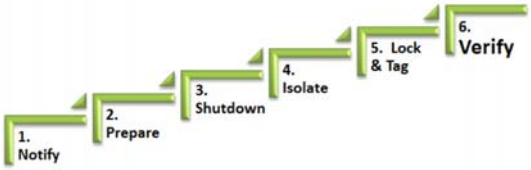
Tagout Device Only Application

When a tagout device alone is placed, at least one additional measure must be taken to prevent inadvertent restoration of power, such as:

- Removing a valve handle
- Removing fuses
- Blocking a control switch
- Locking room with isolating device inside
- Posting a person to guard tagged out device

What is Fermilab's LOTO procedure?

General LOTO Procedure



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Lockout/Tagout Level 2

Intro

General LOTO Procedure

- The General LOTO Procedure is used for simple situations, such as repairing a machine tool that uses only electric power.
- General LOTO will not work in certain situations. These situations require Written LOTO instead. We will cover Written LOTO and the circumstances in which it is required shortly.

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Intro

General LOTO Procedure

Successfully completing this training qualifies you to perform General LOTO only.

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Intro

How do I Establish an Electrically Safe Work Environment?

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Intro

Establishing an Electrically Safe Working Environment

- Notify affected employees.
- Determine all sources of electrical energy supply.
- Turn off machine or interrupt the load current.

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Intro

Establishing an Electrically Safe Working Environment

- Open disconnecting device(s) for each source and visually verify operation.
- Apply LOTO Device

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Intro

Establishing an Electrically Safe Working Environment

- Use a rated voltmeter (not a detector) for range of voltage tested during verification.
- If required by the permit, wear arc flash protection PPE.

These testing procedures are per FESHM 5042.

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Establishing an Electrically Safe Working Environment

- Validation - Before and after each test, determine that the voltage detector is operating satisfactorily (NFPA 70E).
- Ground the phase conductors or circuit parts before touching if the possibility of induced voltages or stored energy exists.

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Establishing an Electrically Safe Working Environment

Circuit conductors and circuit parts are considered energized until all energy is removed, disconnects are locked and tagged, and absence of electrical energy is verified.

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Intro

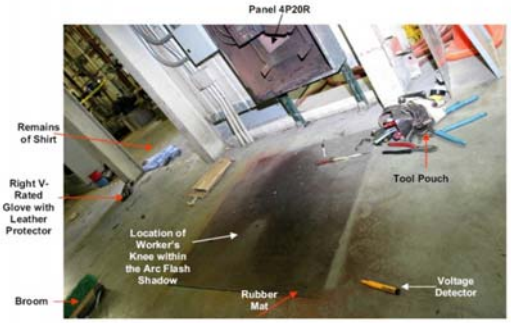

Figure 2-3. The insulating mat with the outline of BSE-1's knee in the arc flash shadow

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Figure 2-6. BSE-1's burned shirt and his flash-damaged PPE and tools

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Lockout/Tagout Level 2
Intro

Five Steps for Return to Service

1. Check equipment
2. Check work area
3. Verify that controls are in neutral, OFF or in a safe state
4. Remove Locks and Tags, and energize if appropriate
5. Notify affected employees

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Intro

Five Steps for Return to Service

What about step 6, restore power to the equipment?

- It is not part of OSHA or Fermilab procedures.
- There may be some situations in which it is not possible or desirable to restore power immediately after the work is complete.

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Lockout/Tagout Level 2

Intro

When are written LOTO procedures required?

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Intro

When are Written LOTO Procedures Required?

Under the OSHA safety standard procedures must be developed, documented and utilized; i.e., written, if any of the conditions listed on the next slide exist.

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Lockout/Tagout Level 2

Intro

When are Written LOTO Procedures Required?

1. There is potential for stored energy or residual energy.
2. There are multiple energy sources or paths.
3. There is a single energy source, but it cannot be readily identified and isolated.

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When are Written LOTO Procedures Required?

4. The isolation and locking out will not completely de-energize and deactivate the equipment.
5. Equipment cannot be isolated from the source and locked out during servicing or maintenance.
6. A single device will not achieve LOTO.
7. A lockout device is not under the exclusive control of the authorized employee.

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Intro

When are Written LOTO Procedures Required?

8. Servicing or maintenance of equipment creates hazards for others.
9. There are documented incidents associated with this equipment where it activated or re-energized while under LOTO.
10. Any energy isolating devices are remotely operated.

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Intro

When are Written LOTO Procedures Required?

Written LOTO Procedures are drafted by Knowledgeable Employee(s) and must include:

- A statement of specific use
- Specific LOTO steps
- Specific steps for verification
- Specific steps for return to service
- Approval by Dept. head or higher

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Intro

When are Written LOTO Procedures Required?

- Written LOTO procedures replace General LOTO procedures.
- Written LOTO procedures may add to, modify or even skip General LOTO procedure steps.

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Intro

Written LOTO Procedures

This training alone does not qualify you to perform a Written LOTO. You must also be trained on each specific Written LOTO before you can perform it.

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Lockout/Tagout Level 2

Intro

Is Alternative Removal of Locks and Tags Allowed?

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Intro

Temporary Removal of Locks/Tags for Testing or Positioning

- Follow the *Five Steps for Return to Service*.
- When done, restore the lockout/tagout conditions following the written or general procedure.

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Lockout/Tagout Level 2

Intro

To remove a lock and/or tags when the ***employee is absent but verbally available***, supervisors should:

Solicit verbal permission from the absent employee to remove his/her LOTO devices.

↓

Discuss any special conditions known by absent employee.

↓

Solicit verbal permission from the Division Safety Officer.

↓

Have another Authorized Employee follow the *Five Steps for Return to Service.*

↓

Document the alternative removal and keep it on file.

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Lockout/Tagout Level 2

Intro

To remove a lock and/or tags when the ***employee is absent and not available***, supervisors should:

Make every reasonable effort to locate the Authorized Employee.

↓

Get written approval from the D/S/C Head.

↓

Have another Authorized Employee follow the *Five Steps for Return to Service.*

↓

Inform the original Authorized Employee before he/she resumes work activities.

↓

Keep a copy of the written approval on file.

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Lockout/Tagout Level 2

Intro

What is Group LOTO?

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Intro

Group LOTO

LOTO required for service or maintenance which involves two or more employees performing the work activity.

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Intro

Two Types of Group LOTO

Type A

(Simple)

Type B

(Complex)

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Intro

Type A Group LOTO

Lead Authorized Employee places lock & tag.

Everyone else locks behind the Lead.

Everyone verifies equipment is de-energized.

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Intro

Type A Group LOTO

Each worker removes his/her lock when his/her assigned tasks are complete. The Lead Authorized Employee must be the last to remove his/her locks.

If there is a written procedure, only the Lead Authorized Employee is required to be trained but others may be as well.

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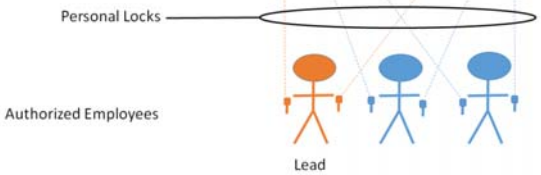
Intro

Type A Group Lockout

Energy Isolating Device(s)



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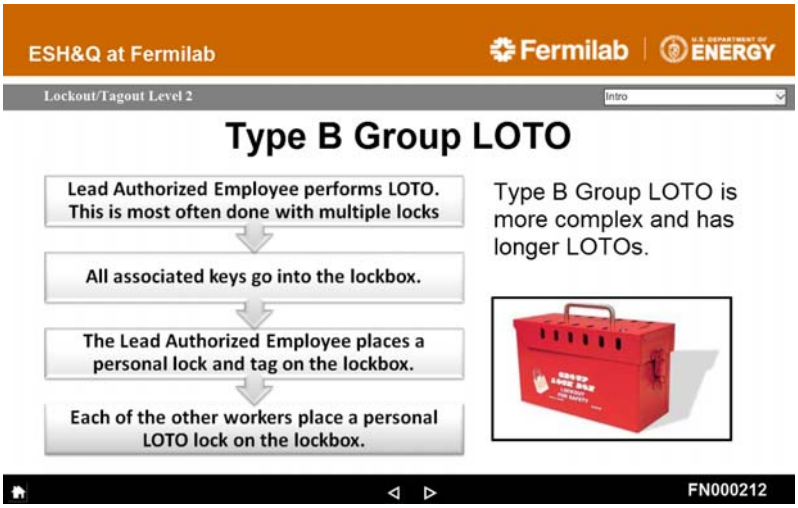
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Intro
Type B Group LOTO
Lead Authorized Employee performs LOTO. This is most often done with multiple locks
All associated keys go into the lockbox.
The Lead Authorized Employee places a personal lock and tag on the lockbox.
Each of the other workers place a personal LOTO lock on the lockbox.
Type B Group LOTO is more complex and has longer LOTOs.
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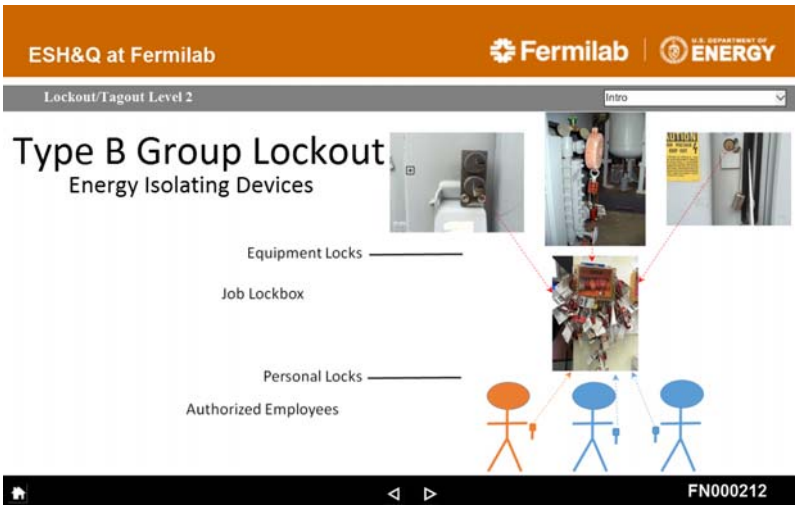
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Intro
Type B Group Lockout
Energy Isolating Devices
Equipment Locks
Job Lockbox
Personal Locks
Authorized Employees
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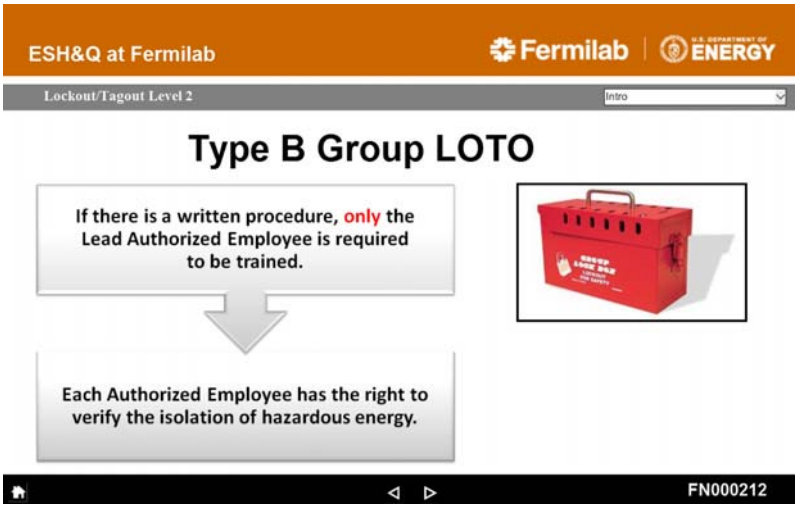
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Intro
Type B Group LOTO
If there is a written procedure, only the Lead Authorized Employee is required to be trained.
Each Authorized Employee has the right to verify the isolation of hazardous energy.
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Lockout/Tagout Level 2

Intro

What are the differences between Type A and B Group LOTO?

Type A

Each worker does LOTO and verifies.

Type B

Lead Authorized Employee locks and VERIFIES. Each Authorized Employee may observe and VERIFY at his/her discretion.

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Intro

How do shift or personnel changes affect LOTO procedures?

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Intro

Shift or Personnel Change

If *no one* else will be working on system:	If *someone* else will be working on system:
• Leave LOTO as is	• Off-going employee unlocks or pulls his/her tags • On-coming employee locks or adds his/her own tags • On-coming employee VERIFIES • Exchanging keys is not permitted

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Intro

Shift or Personnel Change - Group LOTO

The Lead Authorized Employee places her or his own lock to lock box.

The job lockbox and captured keys remain under the control of the Lead Authorized Employee.

If absent, the Lead Authorized Employee may designate someone else the lead while retaining control of job lockbox.

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Intro

Shift or Personnel Change - Group LOTO

Special circumstances may warrant the complete transfer of the Lead Authorized Employee responsibility.

The off-going and on-coming Lead Authorized Employees should simultaneously remove and apply their locks.

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Lockout/Tagout Level 2

Intro

What is Supervised LOTO?

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Supervised LOTO

The placement of lockout and tagout devices on an energy isolating device by an employee or non-employee who has not completed the Fermilab course for LOTO Level 2 when under the direct supervision of a Fermilab authorized employee.

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Lockout/Tagout Level 2
Intro

The Following Conditions apply to Supervised LOTO:

- The system must accept LOTO locks and tags.
- The supervised individual should be briefed on general LOTO key control and lock removal.
- If there is a written procedure, the authorized employee follows procedure and applies LOTO and verifies isolation.
- The supervised individual applies LOTO lock(s) and verifies isolation.
- D/S/Cs may require Division Safety Officer notification.
- If the supervised individual is a Fermilab employee, he or she should take LOTO Level 2 as soon as possilbe.

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Lockout/Tagout Level 2
Intro

LOTO Training

General LOTO training is required every 2 years.

- Your first time taking General LOTO must be in the classroom.
- All subsequent sessions may be taken online or in the classroom.
- If you fail the online test twice, you will be required to take the class in the classroom.
- Written LOTO training must be renewed annually.

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LOTO Inspections

- Divisions, Sections, and Centers must perform and document annual inspections of each written procedure, starting with a review by a Knowledgeable Employee.
- Annual written procedure reviews must be conducted by an authorized employee who is not authorized on the specific LOTO procedure. (This person is the inspector.)

The Knowledgeable Employee:

Reviews the written LOTO procedure for any mistakes, deviations from program requirements or inadequacies..

Inspects the equipment that the procedure isolates.

Requests assistance from other employees if the LOTO procedure involves equipment from DSCs other than hers or his, or if additional expertise is needed to fully review the procedure.

LOTO Procedure Inspection

1. The inspector reviews the procedure with all employees authorized to perform the LOTO procedure.
    - May need more than one session.
    - These sessions may be counted as the annual written procedure training.
2. The inspector then observes a sample group of authorized employees correctly executing the procedure.

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Lockout/Tagout Level 2

Intro

What is Fermilab's LOTO procedure for Sub-Contractors?

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Lockout/Tagout Level 2

Intro

Sub-Contractors

Sub-Contractors are required to have their own LOTO program if they perform activities which may cause injury from energy release.

- Subcontractors learn about our LOTO program through subcontractor training.
- Subcontractors submit their program to their Fermilab project manager for approval by ESH&Q.
- Fermilab informs affected employees about and how to comply with the subcontractor's LOTO program.

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Sub-Contractors

Two types of sub-contractors must follow Fermilab's LOTO program.

Heating and Ventilation Time & Material sub-contractors

Electrical Time & Material sub-contractors

We provide both types of sub-contractors with LOTO II training at no cost to them.

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Sub-Contractors

All sub-contractors must be able to prove that all their personnel performing LOTO have been trained.

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Sub-Contractors

Fermilab LOTO locks and tags may be loaned to a subcontractor without requiring a tool loan form (FESHM 7010-5.17).

Fermilab employees may over-lock a sub-contractor LOTO.

- Sub-contractor locks first, then Fermilab employees over-lock.

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Lockout/Tagout Level 2

Intro

Configuration Control

The Configuration Control program is used when we need to exercise some sort of configuration or administrative control. It provides management control.

This often occurs when a piece of equipment must remain unattended for a long period of time such as in storage.

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Configuration Control

- Removal of locks/tags may result in injury, damage, disruption of normal processes, or degradation of the system.
- Employees that remove configuration control without authorization may be disciplined.

Reasons we might use Configuration Control include:

- Locking out an overhead crane electrical disconnect.
- Locking equipment while awaiting repair or parts.
- Locking a valve to control the flow of fluids.
- Locking radioactive waste container.

Configuration Control

Configuration Control procedures are less strict than LOTO.

- Can use lock *without* a tag if the use is obvious.
- Combination locks are allowed.
- Keyed locks may have more than one key.

Configuration Control - Removal

- The removal of the lock should be done by the person or group who applied it.
- Lock removal by another authorized or qualified person is allowed if there is assurance that removal will not create an unsafe condition.

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Configuration Control Locks

- Can use any shape or color of lock **EXCEPT RED.**
- Yellow, manilla or red tags are allowed. However, they must not contain the words "*DANGER: DO NOT OPERATE*"
- RED locks and "*DANGER: DO NOT OPERATE" tags* are used exclusively for LOTO.

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Configuration Controls & Sub-Contractor LOTO

- As noted before, most subcontractors are eligible to use their LOTO system in place of Fermilab's.
- Sub-contractor LOTO may use other lock and tag colors and wording that are different from Fermilab's.
- If you have any doubt, treat it as lockout!

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Intro

Summary

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Intro

Summary

- You will become an Authorized Employee for two years upon successful completion of this training.
- Red locks and danger tags mean LOTO in place. LOTO is ***not*** to be violated. You will not be faulted for investigating any locks and tags before removing them.

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Lockout/Tagout Level 2

Intro

Summary

Remember the six steps to lock out.

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Lockout/Tagout Level 2

Intro

Summary

Apply best practices by visually verifying disconnects and voltmeter readings.

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Lockout/Tagout Level 2

Intro

Summary

Remember the *Five Steps to Return to Service*.

1. Check equipment
2. Check work area
3. Verify that controls are in neutral, OFF or in a safe state
4. Remove Locks and Tags, and energize if appropriate
5. Notify affected employees

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Lockout/Tagout Level 2

Intro

Summary

- Written LOTO procedures are required under special circumstances. They must be written by Knowledgeable Employees and must receive Dept. Head approval (or higher).
- The temporary removal of LOTO locks and/or tags is allowed if you follow the *Five Steps for Return to Service* and restore the lockout/tagout conditions following the procedure.

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Lockout/Tagout Level 2

Intro

Summary

There are two types of Group LOTO.

Type A - each worker does LOTO and verifies.

Type B - the Lead Authorized Employee locks and VERIFIES. Each Authorized Employee may observe and VERIFY at his/her discretion.

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Lockout/Tagout Level 2

Intro

Summary

- Be sure to follow proper procedures during shift changes that involve LOTO or Group LOTO.
- Training is required in order to perform General LOTO. Additional training is required to be able to peform each Written LOTO.
- Inspections and audits of written LOTO procedures are required.

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Intro

Summary

Supervised LOTO is allowed when an employee or visiting/guest scientist needs to perform LOTO and training is unavailable. An Authorized Employee must supervise the application of the LOTO.

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Intro

Summary

- Sub-Contractors are required to have their own LOTO program if they perform activities which may cause injury from energy release.
- Electrical Time & Material sub-contractors and Heating and Ventilation Time & Material sub-contractors are an exception. They ***must*** follow Fermilab's LOTO procedures.

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Lockout/Tagout Level 2

Intro

Summary

The Configuration Control program is used when we need to exercise some sort of configuration or administrative control. It is less strict than LOTO.

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Lockout/Tagout Level 2

Intro

This concludes LOTO 2 training. Upon passing the test you will be qualified to perform General LOTO for 2 years.

Don't forget what you learned today. It might save your life!

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