

Energy Control and Lockout Tagout

San Jose State University

Facilities Development and
Operations

Environmental Health and Safety

May 11, 2012

A man was killed after he was sucked into a wood chipper during a landscaping job.

SAN JOSE -- November 8, 2004

- Miguel Marquez, 19, was working just outside of Novellus Systems located at North First Street and Vista Montana around 11 a.m. Sunday when some debris got caught in the wood chipper's chute.
- Attempting to clear the chute by kicking the wood through, both his feet and legs were pulled into the shredder, Tepoorten said.
- His right leg had been completely severed, according to Tepoorten.
- Marquez had been a ground man at San Jose-based Arbor Science Inc. for approximately **two months before the accident.**

A father of three dies after being pinned by a milk-moving machine.

San Leandro – January 22, 2002

- Anthony Fraga, 41, an engineer, was doing routine maintenance on a container-loading machine when it somehow activated and pinned him inside.
- **Fraga started working at Safeway about three months ago.**

A 25-year-old male worker at a concrete pipe manufacturing facility died from injuries he received while cleaning a ribbon-type concrete mixer.

The victim's daily tasks included cleaning out the concrete mixer at the end of the shift.

The mixer operator had shut off the main breaker and then made a telephone call instead of following the normal procedure for checking the mixer before anyone entered it.

The victim did not know that the operator had de-energized the mixer at the breaker. Thinking he was turning the mixer off, he activated the breaker switch and energized the mixer.

The mixer operator returned from making his telephone call and pushed the toggle switch to check that the mixer was de-energized. The mixer started, and the operator heard the victim scream. He went immediately to the main breaker panel and shut off the mixer.

[NIOSH 1995].

Why do we need to be concerned about Electrical Safety and Lockout Tagout?

- OSHA reports that LOTO would prevent
 - 120 Fatalities each year.
 - 50,000 Injuries each year.
- United Auto Workers (UAW)
 - Study among their members between 1973 and 1995.
 - 20% of the fatalities (83 of 414) attributed to lockout/tagout.



NIOSH FACE Investigation Results

Fatality Assessment and Control Evaluation (FACE)

- 1. *Failure to completely de-energize***, isolate, block, and/or dissipate the hazardous energy source
- 2. *Failure to lockout and tagout energy control devices*** and isolation points after the hazardous energy source has been de-energized
- 3. *Failure to verify*** that the hazardous energy source was de-energized before beginning work

Federal OSHA Standards

The Control of Hazardous Energy (lockout/tagout).

- 29 CFR 1910.147



Federal OSHA Regulations

1910.146	Permit-Required Confined Spaces
1910.177	Servicing Multi-Piece and Single Piece Rim Wheels
1910.178	Powered Industrial Trucks
1910.179	Overhead and Gantry Cranes
1910.181	Derricks
1910.213	Woodworking Machinery
1910.217	Mechanical Power Presses
1910.218	Forging Machines
1910.261	Pulp, Paper, and Paperboard Mills
1910.262	Textiles
1910.263	Bakery Equipment
1910.265	Sawmills
1910.269	Electric Power Generation, Transmission, and Distribution
1910.272	Grain Handling
1910.305	Wiring Methods, Components, and Equipment for General Use
1910.306	Specific Purpose Equipment and Installations
1910.333	Selection and Use of Work Practices

California OSHA Regulations.

- California Code of Regulations, Title 8, “General Industry Safety Orders”
 - Section 3314 “Cleaning, Repairing, Servicing, and Adjusting Prime Movers, Machinery and Equipment.”
 - Revised January 6, 2005.
- California Code of Regulations, Title 8, “Electrical Safety Orders”
 - Section 2320.3 – 2320.6 within Article 3, “Work Procedures.”



Other Guidance

NIOSH Publication
No. 99-110:

- NIOSH Alert: Preventing Worker Deaths from Uncontrolled Release of Electrical, Mechanical, and Other Types of Hazardous Energy

American National
Standards Institute

ANSI/ASSE Z244.1-2003

- Control of Hazardous Energy Lockout / Tagout and Alternative Methods

San Jose State University

Electrical Safety
and
Energy Control Program

Environmental Health and Safety
in collaboration with
State Employees Trades Council Union

September 2, 2011



**SAN JOSÉ STATE
UNIVERSITY**

Electrical Safety and Energy Control Program

San Jose' State University

One Washington Square

San Jose, California

Facilities Development and Operations Department

Environmental Health and Safety

September 2, 2011

Standards, Regulations and References

1. National Fire Protection Association (NFPA) Standard 70E. Electrical Safety in the Workplace.
2. California Code of Regulations (CCR), Title 8, Subchapter 7. General Industry Safety Orders. Section 3203. Injury and Illness Prevention Program.
3. CCR, Title 8, Subchapter 7. General Industry Safety Orders. Section 3314. The Control of Hazardous Energy for the Cleaning, Repairing, Servicing, Setting Up, and Adjusting Operations of Prime Movers, Machinery and Equipment, Including Lockout/Tagout.
4. CCR, Title 8, Subchapter 5. Electrical Safety Orders.
5. Group 1. Low Voltage Electrical Safety Orders.
Section 2320.1. General
Section 2320.2. Energized Equipment or Systems
Section 2320.4. De-energized Equipment or Systems.
Section 2320.5. Energizing (or Re-energizing) Equipment or Systems.
Section 2320.6. Accident Prevention Tags.
6. Group 2. High Voltage Electrical Safety Orders
Section 2700. Definitions
Section 2706. Application
7. Group 2. High Voltage Electrical Safety Orders
Article 36. Work Procedures and Operating Procedures.
Section 2940. General Provisions.
Section 2940.6. Tools and Protective Equipment.
Section 2945. Access and Workspace Requirements Appendix C

The Electrical Safety and Energy Control Program includes the following key elements:

- a) Determination of employee exposure
- b) Implementation of various methods of exposure control, including:
 - i. Qualified Persons
 - ii. Lockout Procedures
 - iii. High Voltage Switching Orders
 - iv. Electric Arc Flash Personal Protective Equipment
- c) Communication of hazards to employees and training.
- d) Recordkeeping

Cal/OSHA Definitions

“High Voltage System” relates to associated electrical conductors and equipment operating at or intended to operate at a sustained voltage of more than **600 volts** between conductors.

“Low Voltage System” relates to associated electrical conductors and equipment operating at or intended to operate at a sustained voltage of **600 volts or less** between conductors.

Cal/OSHA Definitions

“Authorized employee” means a qualified person who locks out or tags out specific machines or equipment in order to perform cleaning, repairing, servicing, setting-up, and adjusting operations on that machine or equipment.

“Affected employee” means an employee whose job requires them to operate or use a machine or equipment on which cleaning, repairing, servicing, setting-up or adjusting operations are being performed under lockout, or whose job requires the employee to work in an area in which such activities are being performed under lockout.

An affected employee becomes an authorized employee when that employee's duties including performing cleaning, repairing, servicing, setting-up and adjusting operations.

Cal/OSHA Definitions

“Qualified Person” is a person, designated by the employer, who has received training in and has demonstrated skills and knowledge in the construction and operation of electric equipment and installations and the hazards involved.

NOTES:

1. Whether an employee is considered to be a "qualified person" will depend upon various circumstances in the workplace. For example, it is possible for an individual to be considered "qualified" with regard to certain equipment in the workplace, but "unqualified" as to other equipment.
2. An employee who is undergoing on-the-job training and who, in the course of such training, has demonstrated an ability to perform duties safely at his or her level of training and who is under the direct supervision of a qualified person is considered to be a qualified person for the performance of those duties.

Cal/OSHA Definitions

“Qualified Electrical Worker” is a qualified person who by reason of a minimum of two years of training and experience with high-voltage circuits and equipment and who has demonstrated by performance familiarity with the work to be performed and the hazards involved.

Cal/OSHA Definitions

Lockout device.

- A device that utilizes a positive means such as ***a lock***, either key or combination type, to hold an energy isolating device in the safe position and prevent the energizing of a machine or equipment.

Hazard Determination

#	Department Building Location	Job Title of Employees at Risk of Exposure	Nature of Exposure Risk
1	Facilities Development and Operations Department Central Plant	Qualified Electrical Workers Power distribution trades.	High voltage electrical work.
2	Facilities Development and Operations Department Campus Wide	Lockout Authorized Employees Electrical Trades HVAC Trades Energy Management Plumbing Trades SETC Project Supervisors	Low voltage electrical work. Service and repair of mechanical equipment and machinery. Service and repair of HVAC equipment. Service and repair of pumps.

Methods of Control

Only Qualified Workers shall work on energized low voltage electrical equipment or systems.

Work shall not be performed on exposed energized parts of equipment or systems until the following conditions are met ...

- *Nine conditions including a special work permit issued by the appropriate administrator.*

The SJSU Bottom Line is that no one will work on energized equipment or systems.

Work shall not be performed on exposed energized parts of equipment or systems until the following conditions are met:

1. Responsible supervision has determined that the work is to be performed while the equipment or systems are energized.
2. Involved personnel have received instructions on the work techniques and hazards.
3. Suitable personal protective equipment and safeguards (i.e., approved insulated gloves or insulated tools) are provided and used.

Exception: The use of approved insulating gloves or insulated tools or other protective measures are not required when working on exposed parts of equipment or systems energized at less than 50 volts.

4. Approved insulated gloves shall be worn for voltages in excess of 250 volts to ground.
5. Suitable barriers or approved insulating material shall be provided and used to prevent accidental contact with energized parts.
6. Suitable eye protection has been provided and is used.
7. Where required for personnel protection, suitable barricades, tags, or signs are in place.
8. Each employee who is exposed to the hazards of flames or electric arcs wears apparel that, when exposed to flames or electric arcs, does not increase the extent of injury that would be sustained by the employee.
9. Work Permit Required.

Methods of Control

Only “Qualified Electrical Workers” shall work on energized conductors or equipment connected to energized high-voltage systems.

The SJSU Bottom Line is that no one will work on energized equipment or systems.

Methods of Control

De-energized Equipment or Systems

Lockout – Tagout

Lockout Tagout (LOTO)

- A safe method to work on machines and equipment and systems.



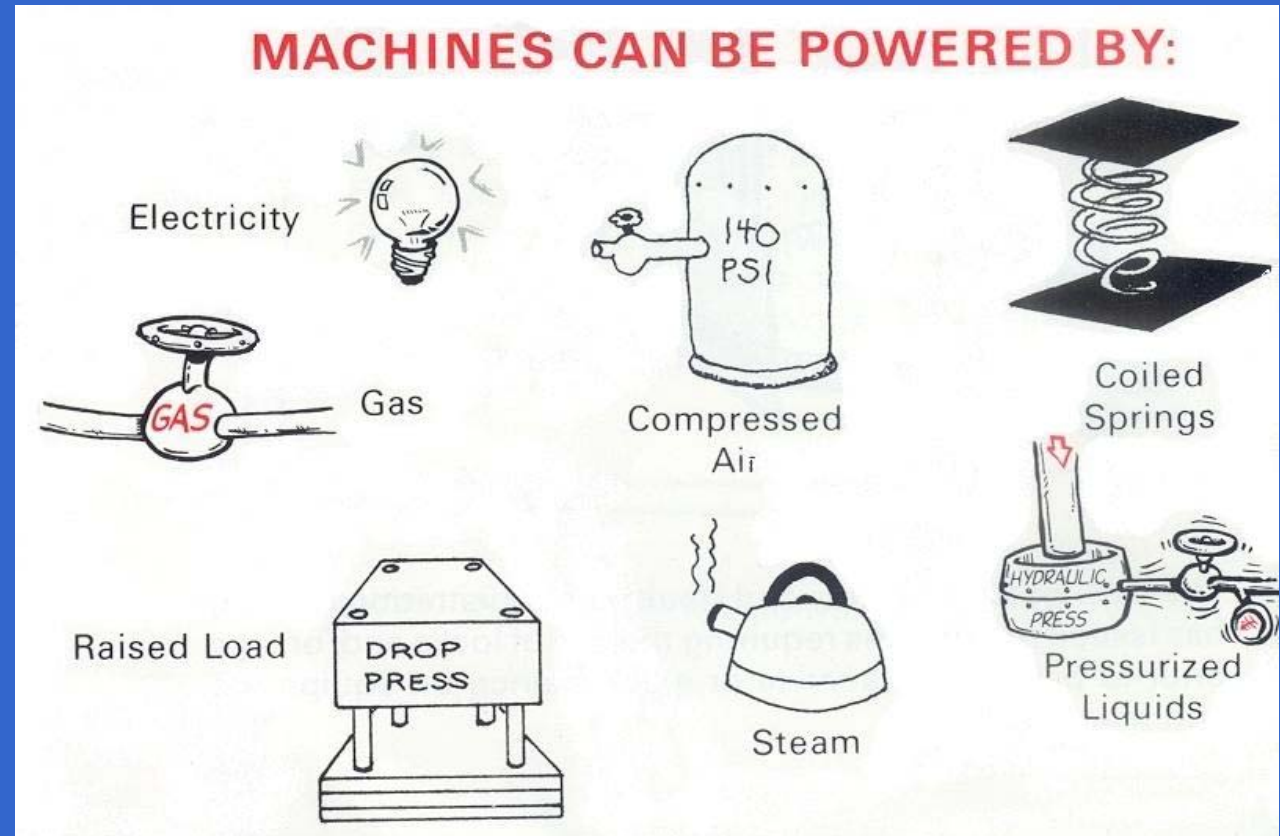
Lockout

- *The placement of a lockout device on an energy isolating device*
- *ensuring that the equipment being controlled*
- *cannot be operated until the lockout device is removed.*



Energy sources must be isolated and controlled!

- Kinetic / Moving
 - Spinning shafts
- Potential / Stored
 - Springs, gravity
- Electrical
- Mechanical
- Hydraulic
- Pneumatic
- Chemical
 - Acids, bases, asphyxiants
- Radiation
 - X-ray, ionizing, lasers, microwave, RF
- Pressure
 - Gases, liquids
- Thermal
 - Steam, cryogenics



What are the Key Elements of LOTO?

- Authorized Employees
- Affected Employees
- Locks
- Tags
- Energy Control Procedures
- Periodic Inspections
- Group Lockout Tagout
- Shift Change
- Outside Contractors
- Abandoned Locks



Cal/OSHA §3314

“Cleaning, Repairing, Servicing, and Adjusting Prime Movers, Machinery and Equipment.”

This Section applies to the

- cleaning,
- repairing,
- servicing,
- setting-up and
- adjusting

of machines and equipment in which the unexpected energization or start up of the machines or equipment, or release of stored energy could cause injury to employees.

Employees.

Authorized employee.

- A person who locks out or tags out machines or equipment in order to perform servicing or maintenance.

Affected employee.

- An employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed.

Lockout Devices



Lockout Devices

Only one key for each lock the worker controls.

Shall be removed by the employee who applied the device.

Shall not be used for other purposes.



Lockout Devices

- Durable.
- Standardized.
 - Color, or shape, or size
- Substantial.
- Identifiable.
 - Identity of the employee



Lock or Tag Methods

- If an energy isolating device is capable of being locked out, the employer shall utilize lockout.
- If an energy isolating device is not capable of being locked out, the employer shall utilize a tagout system and additional means.

Tag-out and Additional Means

- Additional means to be considered such as the...
 - removal of an isolating circuit element,
 - blocking of a controlling switch,
 - opening of an extra disconnecting device, or the
 - removal of a valve handle to reduce the likelihood of inadvertent energization.

Tagout Devices.

- Tagout devices, including their means of attachment, shall be substantial enough to prevent inadvertent or accidental removal.
- Tagout device attachment means shall be of a
 - non-reusable type,
 - attachable by hand,
 - self-locking, and
 - non-releasable
 - with a minimum unlocking strength of no less than 50 pounds and having the general design and basic characteristics of being at least equivalent to a one-piece, all environment-tolerant nylon cable tie.

Tags.

In all cases, accident prevention tags shall be placed on the controls of the equipment during cleaning/servicing and during repair. [3314 (d)]

- Date
- Reason
- Person

[§2320.6. Accident Prevention Tags. Electrical Safety Orders - Low Voltage]



Exceptions for locks and tags.

1. **Minor tool changes and adjustments**, and other minor servicing activities, which take place during normal production operations are not covered by the requirements if they are ...
 - routine,
 - repetitive, and
 - integral to the use of the equipment or machinery for production,
 - provided that the work is performed using alternative measures which provide effective protection.

Exceptions for locks and tags.

2. **Work on cord and plug-connected electric** equipment for which exposure to the hazards of unexpected energization or start up of the equipment is controlled by the
 - unplugging of the equipment from the energy source and by the
 - plug being under the exclusive control of the employee performing the work.

Exceptions for tags.

3. Where an employer has a uniform system with unique and ***personally identifiable locks*** designed for lockout, that are placed on the source of energy, ***accident prevention signs or tags are not required.***

[§3314. Amendment of section heading and section filed 12-7-2004; operative 1-6-2005]

Capable of being locked out.



- After January 2, 1990, whenever replacement or major repair, renovation or modification of a machine or equipment is performed, and whenever new machines or equipment are installed, energy isolating devices for such machine or equipment shall be designed to accept a lockout device.

“Cleaning, Servicing and Adjustments”

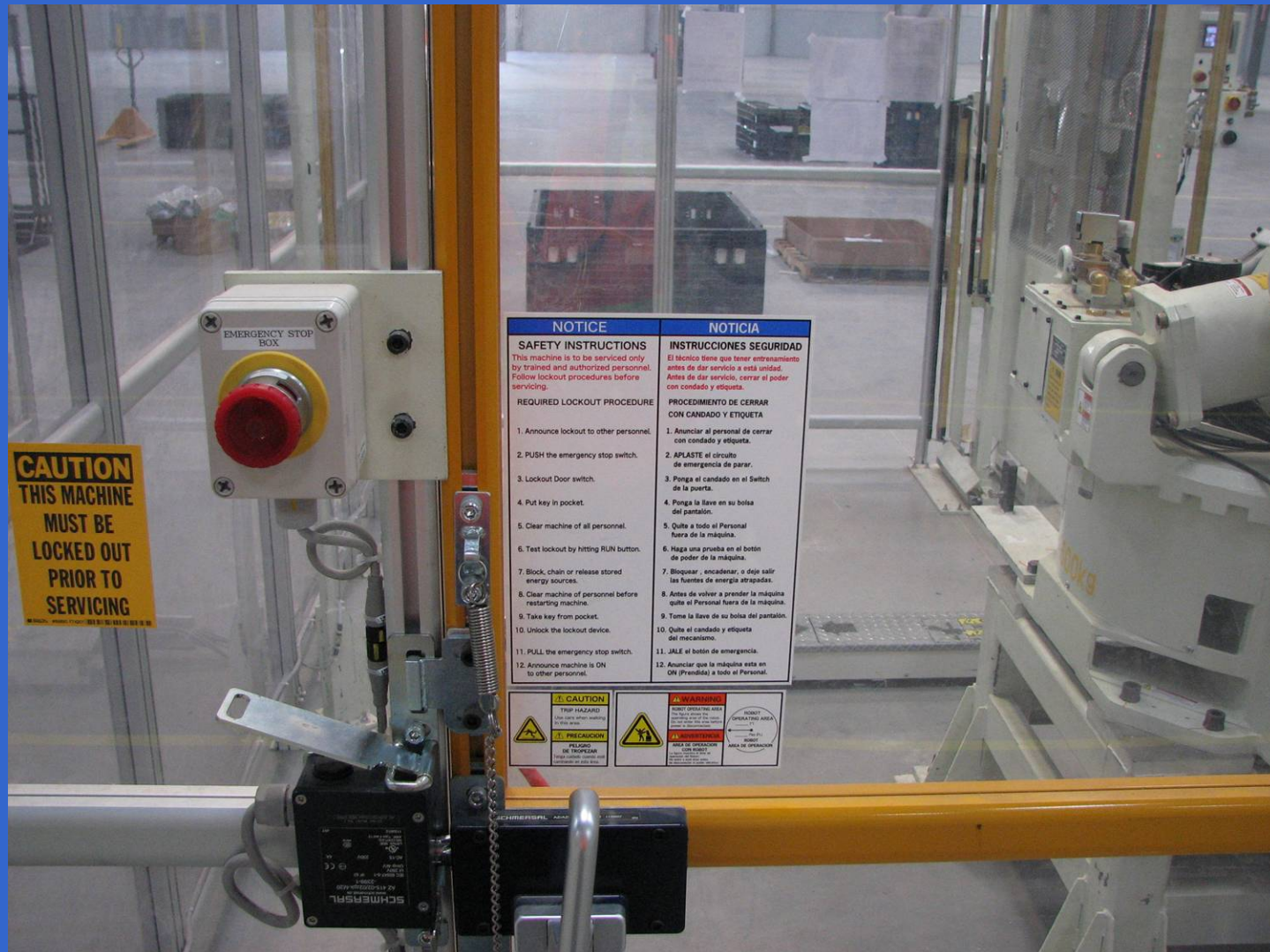
Equipment shall be stopped and the power source de-energized or disengaged,

and, ***if necessary***, the moveable parts shall be mechanically blocked or locked out to prevent inadvertent movement.

Locks - Cleaning, Servicing and Adjustments.



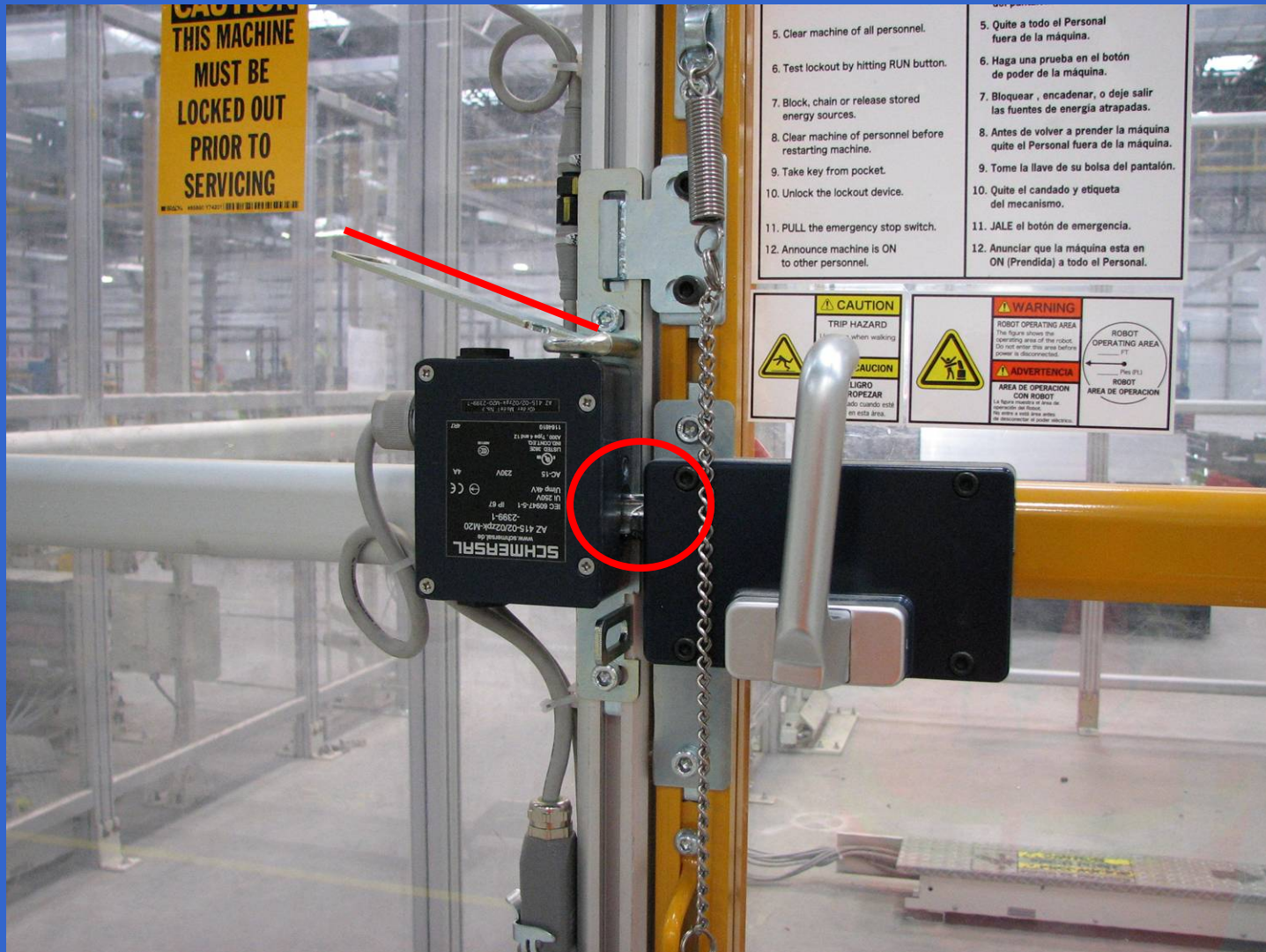
Locks - Cleaning, Servicing and Adjustments.



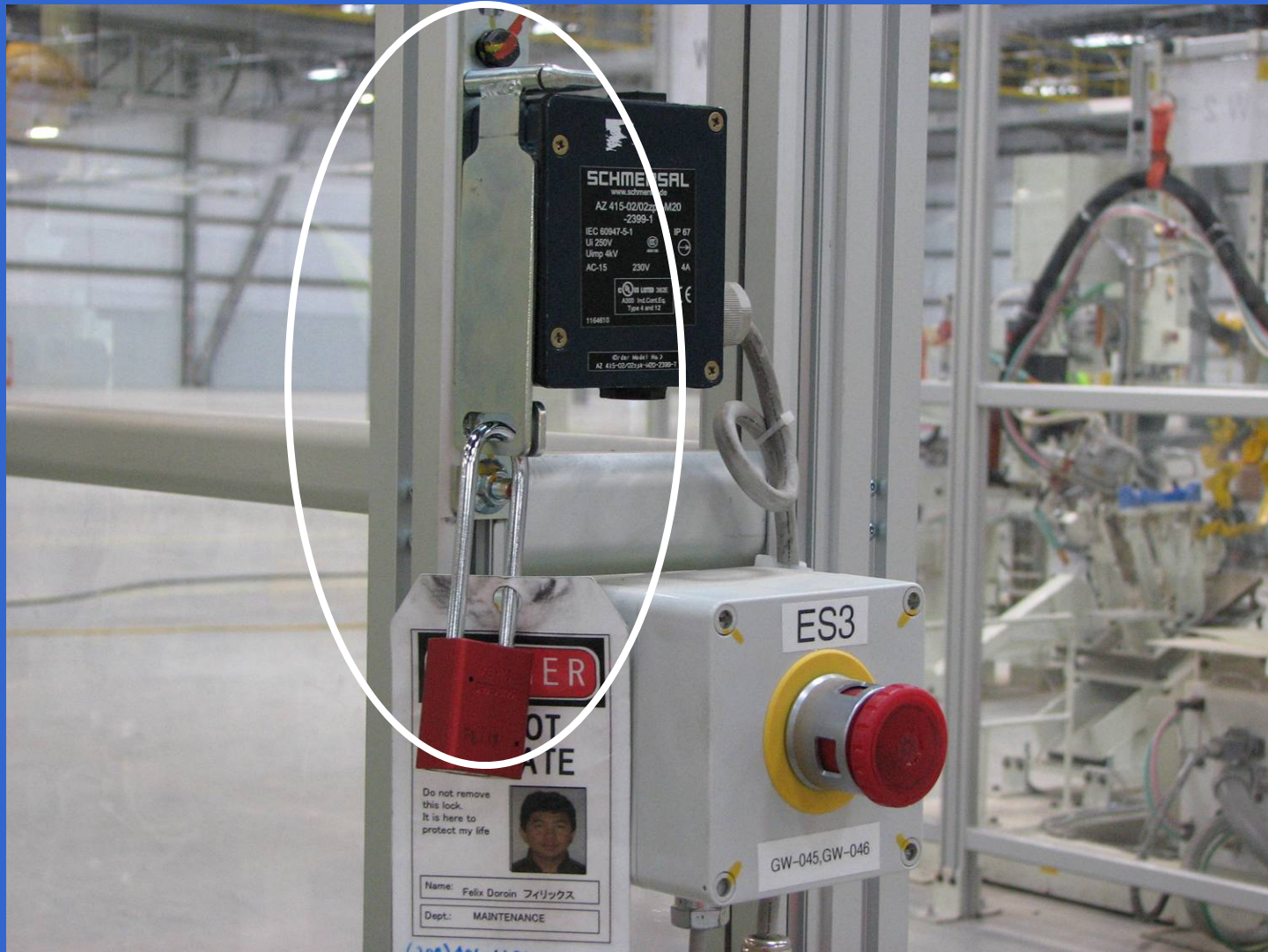
Locks - Cleaning, Servicing and Adjustments.



Locks - Cleaning, Servicing and Adjustments.



Locks - Cleaning, Servicing and Adjustments.



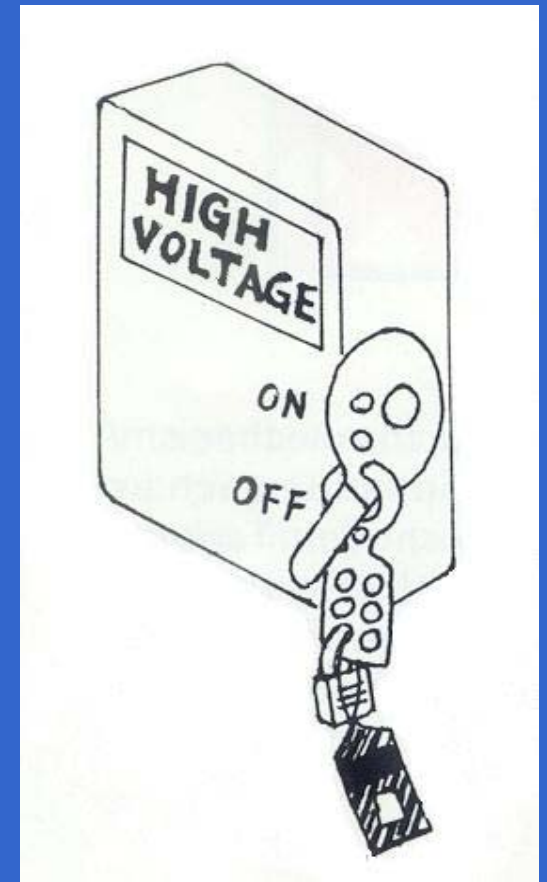
Locks - Cleaning, Servicing and Adjustments.



“Repair Work and Setting-Up Operations”

Equipment, or power-driven machines equipped with lockable controls or readily adaptable to lockable controls

shall be locked out in the “off” position during repair work and setting-up operations.



Locks - Repair Work and Setting-Up Operations.



Locks - Repair Work and Setting-Up Operations.



Locks - Repair Work and Setting-Up Operations.



Energy Control Procedures.

A hazardous energy control procedure shall be developed and utilized by the employer.

The procedure shall clearly and specifically outline the

- scope,
- purpose,
- authorization,
- rules, and
- techniques to be utilized for the control of hazardous energy, and the means to enforce compliance.

New as of January 6, 2005.

All machines and equipment are required to have a written procedure.

Cal/OSHA Requirements...

- *Each machine or piece of equipment is required to have a written procedure, regardless of the number of energy sources.*
- *Cord and Plug machines are exempt.*

Federal OSHA Exceptions...

The employer need not document the required procedure for a particular machine or equipment, when all of the following elements exist:

- (1) The machine or equipment has no potential for stored or residual energy or reaccumulation of stored energy after shut down which could endanger employees;
- (2) the machine or equipment has a single energy source which can be readily identified and isolated;
- (3) the isolation and locking out of that energy source will completely deenergize and deactivate the machine or equipment;
- (4) the machine or equipment is isolated from that energy source and locked out during servicing or maintenance;
- (5) a single lockout device will achieve a lock-out condition;
- (6) the lockout device is under the exclusive control of the authorized employee performing the servicing or maintenance;
- (7) the servicing or maintenance does not create hazards for other employees; and
- (8) the employer, in utilizing this exception, has had no accidents involving the unexpected activation or reenergization of the machine or equipment during servicing or maintenance.

Energy Control Procedures.

The employer's hazardous energy control procedures shall be documented in writing.

- (A) The employer's hazardous energy control procedure shall include separate procedural steps for the safe lockout/tagout of each machine or piece of equipment affected by the hazardous energy control procedure.

[§3314. Amendment of section heading and section filed 12-7-2004; operative 1-6-2005]

Section 3314(g) Requires Machine-Specific Energy Control Procedures

“The words in the regulation, when read together and in view of its purpose, sufficiently communicate a requirement that the energy control procedures must be identified with the specific machinery or equipment to which it applies.”

Bryant Rubber Corp., Cal/OSHA App. 01-1358, Decision after Reconsideration (Aug. 21, 2003)

As of January 6, 2005 Exception Allows for “Generic Procedures”.

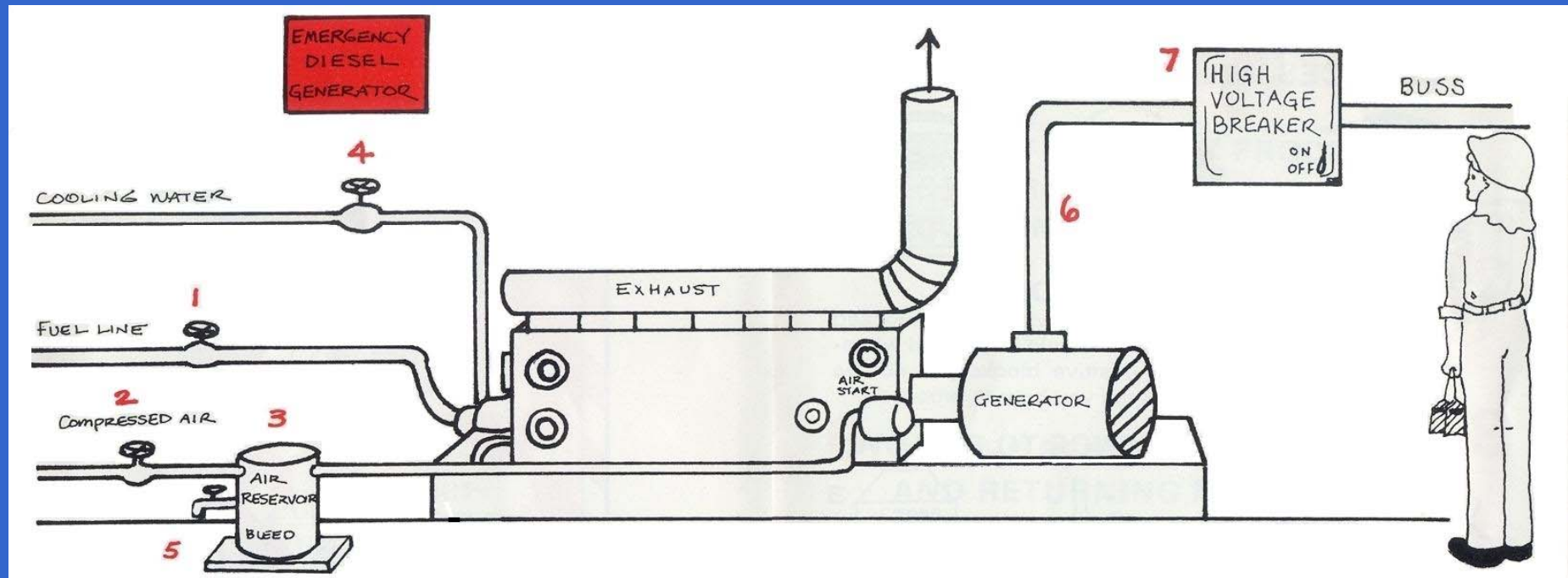
The procedural steps for the safe lockout/tagout of prime movers, machinery or equipment may be used for a group or type of machinery or equipment, when either of the following two conditions exist:

(1) Condition 1:

- (A) The operational controls named in the procedural steps are configured in a similar manner, and
- (B) The locations of disconnect points (energy isolating devices) are identified, and
- (C) The sequence of steps to safely lockout or tagout the machinery or equipment are similar.

(2) Condition 2: The machinery or equipment has a single energy supply that is readily identified and isolated and has no stored or residual hazardous energy.

Developing Energy Control Procedures.



- Locate and Identify Energy Isolating Devices
- Determine a Method to Verify Isolation

Identify Energy Isolating Devices.

- A mechanical device that physically prevents the transmission or release of energy.
 - A manually operated electrical circuit breaker;
 - a disconnect switch;
 - a line valve;
 - a block.
- ***Push buttons, selector switches and other control circuit type devices are not energy isolating devices.***

Determine Verification of Lockout

- Attempt to Start
- Volt – Ohm Meter
- Discharge capacitors by grounding.
- Dissipate inertial forces by allowing the system to come to a complete stop

- Blow down of air pressure
- Blow down of water or steam pressure.
- Release or block springs that are under tension or compression.

San Jose' State University
Environmental Health and Safety

Lockout Tagout Procedure Creation Form

Procedure ID: #	Department:	Creation Date:
Equipment ID: #	Building:	Procedure Preparer:
Equipment Name:	Location – Column – Room No:	
Equipment Type:	Special Instructions:	

Apply Order	Restore Order	Energy Source (Electrical Voltage, Gas, Water, Steam, Compressed Air)	Isolation Device (Circuit Breaker, Valve, Fuse, Block)	Isolation Device Location (Location on the equipment or control panel)	Verification Test Method (Attempt to Start, V-O-M, Visual Inspection, Relieve pressure)	Isolation Locking Method / Tool (Locking Device, Lock, Tag, Block, Remove Fuse)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

San Jose' State University
Environmental Health and Safety

Lockout Tagout Procedure Creation Form

Procedure ID:	#001	Department:	FD&O	Creation Date:	March 4, 2012
Equipment ID:	#AH 001	Building:	Clark Hall	Procedure Preparer:	John Hughes
Equipment Name:	Air Handler	Location – Column – Room No:	ROOF		
Equipment Type:	HVAC	Special Instructions:			

Apply Order	Restore Order	Energy Source (Electrical Voltage, Gas, Water, Steam, Compressed Air)	Isolation Device (Circuit Breaker, Knife Disconnect, Valve, Fuse, Block)	Isolation Device Location (Location on the equipment or control panel)	Verification Test Method (Attempt to Start, V-O-M, Visual Inspection, Relieve pressure)	Isolation Locking Method / Tool (Locking Device, Lock, Tag, Block, Remove Fuse)
1	1	240VAC	Disconnect Switch	Wall Panel	VOM	Lock
2	2	Compressed Air	Ball Valve	North Side	Relieve Pressure	Lock
3						
4						
5						
6						
7						
8						
9						
10						

Periodic Inspections.

The employer shall conduct a periodic inspection of the energy control procedure at least annually.



Periodic Inspections.

The periodic inspection shall include a review,
between the

- inspector and
- each authorized employee,

of that employee's responsibilities under the
energy control procedure being inspected.

San Jose' State University Demonstration of Lockout/Tagout

Employee Name	Building	Date:
Employee No.	Equipment Name	Manager's Name
Organization:	Equipment ID	Mgr's Telephone No.

✓- Yes X- No	A	Prior to the demonstration of Lockout/Tagout, is the Authorized Employee prepared with the necessary tools, equipment and skills as listed below?
	1	Has the employee attended a San Jose' State University Lockout/Tagout training class?
	2	Was the employee able to locate the written Lockout/Tagout Procedure for the equipment?
	3	Did the employee have the necessary Lockout/Tagout locks to perform the procedure?
	4	Did the employee have the necessary Lockout/Tagout tags to perform the procedure?
	5	Did the employee have the necessary Personal Protective Equipment?

✓- Yes X- No	B	Practical Demonstration of Lockout/Tagout Procedures
	1	Notification of Affected Employees?
	2	Preparation for Shutdown? – Grasp the situation, knowledge of the type and magnitude of energy, the hazards of the energy and the methods to control the energy.
	3	Orderly shutdown of the machine or equipment? Turn off the machine using the established written procedures.
	4	Energy isolation devices are physically located? Energy disconnects and devices are operated as to isolate the machine from the energy sources.
	5	Locks and/or tags are affixed to each energy-isolating device? Locks and lockout devices are affixed in a manner that will hold the energy isolating devices in a "safe" or "off" position. Tags are attached with each lock and at energy isolation devices which cannot be locked.
	6	Stored energy or residual energy is relieved, disconnected, restrained, and otherwise rendered safe?
	7	Verification of Isolation? Attempt to start the machine or equipment to verify that de-energization is accomplished.

✓- Yes X- No	C	Release from Lockout/Tagout
	1	Machines and Equipment are inspected to ensure that nonessential items are removed? Are the components operationally intact?
	2	Employees and work areas are checked to ensure that all employees are safely positioned or removed?
	3	The employee who applied the devices removes the lockout devices?
	4	Employee Notification? After the removal of lockout devices and before the machine or equipment is started, notify affected employees that the lockout devices are removed.

✓- Yes X- No	D	Employee Practical Demonstration
	Ω	The Authorized Employee whose name is listed below has successfully demonstrated his/her ability to perform Lockout/Tagout as documented above.

Employee's Signature	Date	Trainer's Signature	Date
Employee's Printed Name		Trainer's Printed Name	

Demonstration of LOTO.



Preliminary Preparations:

- Are you trained and authorized to perform LOTO?
- Are you able to locate the written LOTO Procedure for the equipment?
- Do you have the necessary LOTO locks and tags to perform the procedure?
- Do you have the necessary Personal Protective Equipment?

Demonstration of LOTO - Shutdown.

1. Notification of Affected Employees?
2. Preparation for Shutdown?
 - Grasp the situation.
3. Orderly shutdown of the machine or equipment?
4. Energy isolation devices are physically located?

5. Locks and tags are affixed to each energy-isolating device?
6. Stored energy or residual energy is relieved, disconnected, restrained, and otherwise rendered safe?
7. Verification of Isolation?

Determine Verification of Lockout

- Attempt to Start
- Volt – Ohm Meter
- Discharge capacitors by grounding.
- Dissipate inertial forces by allowing the system to come to a complete stop

- Blow down of air pressure
- Blow down of water or steam pressure.
- Release or block springs that are under tension or compression.

Demonstration - Release from LOTO.

- | | |
|---|--|
| <ol style="list-style-type: none">1. Remove nonessential items?2. Check to ensure that all employees are safely positioned or removed? | <ol style="list-style-type: none">3. The employee who applied the devices removes the lockout devices?4. Employee Notification? |
|---|--|

San Jose' State University Demonstration of Lockout/Tagout

Employee Name	Building	Date:
Employee No.	Equipment Name	Manager's Name
Organization:	Equipment ID	Mgr's Telephone No.

✓- Yes X- No	A	Prior to the demonstration of Lockout/Tagout, is the Authorized Employee prepared with the necessary tools, equipment and skills as listed below?
	1	Has the employee attended a San Jose' State University Lockout/Tagout training class?
	2	Was the employee able to locate the written Lockout/Tagout Procedure for the equipment?
	3	Did the employee have the necessary Lockout/Tagout locks to perform the procedure?
	4	Did the employee have the necessary Lockout/Tagout tags to perform the procedure?
	5	Did the employee have the necessary Personal Protective Equipment?

✓- Yes X- No	B	Practical Demonstration of Lockout/Tagout Procedures
	1	Notification of Affected Employees?
	2	Preparation for Shutdown? – Grasp the situation, knowledge of the type and magnitude of energy, the hazards of the energy and the methods to control the energy.
	3	Orderly shutdown of the machine or equipment? Turn off the machine using the established written procedures.
	4	Energy isolation devices are physically located? Energy disconnects and devices are operated as to isolate the machine from the energy sources.
	5	Locks and/or tags are affixed to each energy-isolating device? Locks and lockout devices are affixed in a manner that will hold the energy isolating devices in a "safe" or "off" position. Tags are attached with each lock and at energy isolation devices which cannot be locked.
	6	Stored energy or residual energy is relieved, disconnected, restrained, and otherwise rendered safe?
	7	Verification of Isolation? Attempt to start the machine or equipment to verify that de-energization is accomplished.

✓- Yes X- No	C	Release from Lockout/Tagout
	1	Machines and Equipment are inspected to ensure that nonessential items are removed? Are the components operationally intact?
	2	Employees and work areas are checked to ensure that all employees are safely positioned or removed?
	3	The employee who applied the devices removes the lockout devices?
	4	Employee Notification? After the removal of lockout devices and before the machine or equipment is started, notify affected employees that the lockout devices are removed.

✓- Yes X- No	D	Employee Practical Demonstration
	Ω	The Authorized Employee whose name is listed below has successfully demonstrated his/her ability to perform Lockout/Tagout as documented above.

Employee's Signature	Date	Trainer's Signature	Date
Employee's Printed Name		Trainer's Printed Name	

Group Lockout Tagout.

Primary responsibility is vested in an authorized employee for a set number of employees working under the protection of a group lockout or tagout device.



Group Lockout

Each authorized employee shall affix a personal lockout device to the group lockbox when he or she begins work,

and

shall remove those devices when he or she stops working on the machine or equipment being serviced or maintained.

Group Lockout



End of Shift at SJSU

The authorized employee will remove his or her personal safety lock and

- Replace it with a lock or a plastic tie-wrap and safety tag, clearly marked with the date, time and reason for the lockout.
- The shift supervisor shall be notified of the machine or equipment status.

Crew Change

The relief person will place a lock and tag on the equipment or machine before the first employee removes his or her lock and tag.

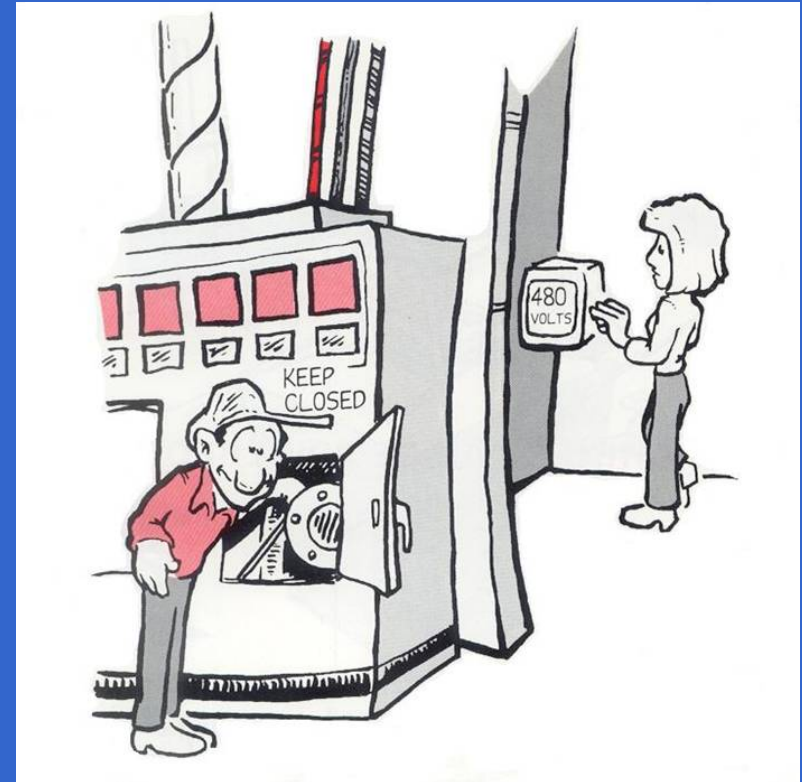
Outside Contractors.

Cal/OSHA

- The on-site employer's lockout tagout procedures shall be followed. [3314(i)]

Fed/OSHA

- the on-site employer and the outside employer shall inform each other of their respective lockout or tagout procedures.



Abandoned Locks.

Each lockout tagout device shall be removed by the employee who applied the device.

– May be removed under the direction of management.

1. Verification by the management that the authorized employee is not at the facility:
2. Making all reasonable efforts to contact the employee to inform him/her that his/her lockout or tagout device has been removed; and
3. Ensuring that the authorized employee has this knowledge before he/she resumes work at that facility.

Confined Space Entry Hazards

A confined space that contains any other recognized serious safety or health hazard.

- Machine guarding,
- Mixing blades,
- Slip and fall,
- Heat,
- Cold
- Electrical shock,
- Chemicals, paints, adhesives,
- Hot work, welding, cutting.



Training

- **Each authorized employee** shall receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for energy isolation and control.
- **Each affected employee** shall be instructed in the purpose and use of the energy control procedure.
- **All other employees** whose work operations are or may be in an area where energy control procedures may be utilized, shall be instructed about the procedure, and about the prohibition relating to attempts to restart or reenergize machines.

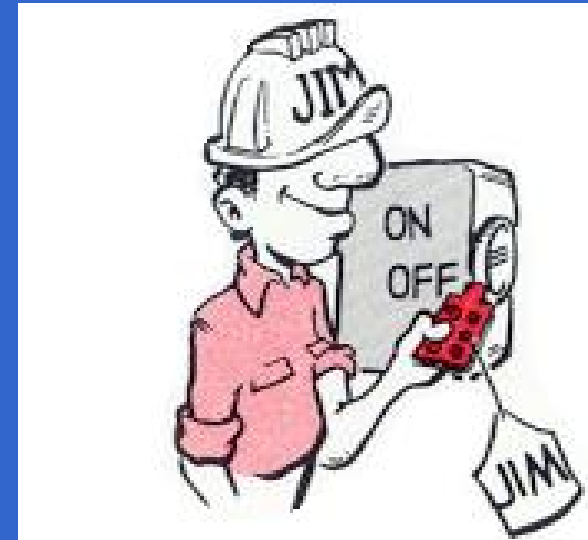
Retraining

- **Change** in job assignments, a change in machines, equipment or processes that present a new hazard, or when there is a change in the energy control procedures.
- **Inadequacies** in the employee's knowledge or use of the energy control procedures.

The retraining shall reestablish employee proficiency and introduce new or revised control methods and procedures, as necessary.

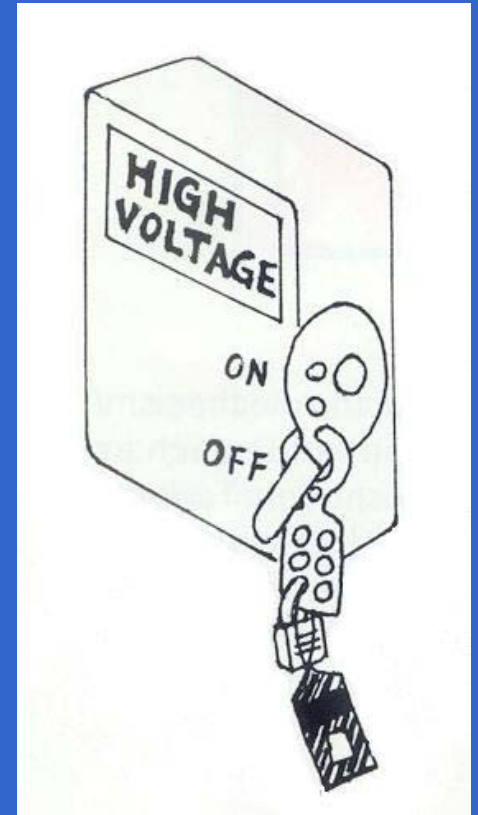
Are you up to date?

- Perform lockout training.
- Develop written procedures for each piece of machinery and equipment.
- Perform the annual review and update procedures.
- Perform annual verification of lockout of every authorized employee.



The End.

- For additional information, visit Cal/OSHA web site at www.dir.ca.gov
- California Code of Regulations, Title 8, “General Industry Safety Orders”
 - Section 3314 “Cleaning, Repairing, Servicing, and Adjusting Prime Movers, Machinery and Equipment.”
 - ***Revised January 6, 2005.***
- California Code of Regulations, Title 8, “Electrical Safety Orders”
 - Section 2320.3 – 2320.6 within Article 3, “Work Procedures.”



Lockout Quiz

1. T – F A qualified worker can perform maintenance or servicing of equipment under certain conditions without locking out.
2. T – F Lockout can be performed for you by a co-worker if you are not available to put your lock on the equipment.
3. T – F Employees are permitted to remove locks for co-workers when they are unavailable.
4. T – F You may use your lock for other purposes until it is needed for locking out equipment.

Lockout Quiz

5. T – F Except in cases of emergency, a lock should only be removed by the person who placed the lock on the equipment.
6. T – F A tag can be used as another means of locking out provided that it is in conjunction with another positive means of disconnecting the energy source.
7. T – F When changing shifts you must ensure that the locks and tags of your replacement are substituted for your own before leaving the job.
8. T – F A push button or selector switch is appropriate energy isolating devices.

Lockout Quiz

9. An employee who is permitted to apply a lock or tag to control hazardous energy is an:

1. Affected employee
2. Authorized employee
3. Contract employee
4. Experienced employee

10. If your lock cannot be placed directly on the energy control source, then:

1. You must complete the work energized
2. You must not complete the work
3. You must use tagout alone
4. You must use tagout in conjunction with another positive means of disconnecting the energy source

Lockout Quiz

11. Who must be notified prior to beginning work on a tool involving hazardous energy control?

1. The EH&S Department
2. All affected workers
3. The supervisor of the work area
4. Plant engineering

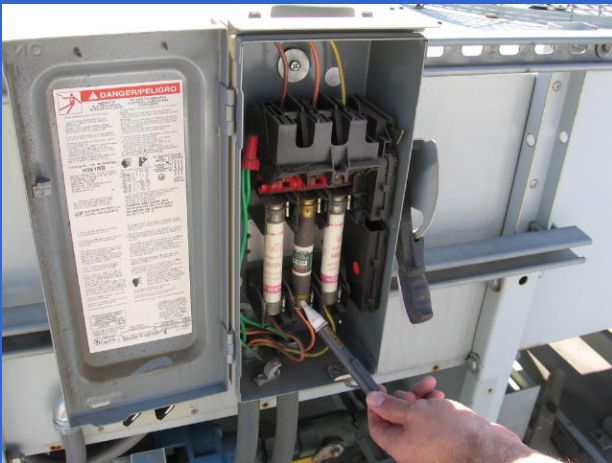
12. T – F After applying lockout/tagout and prior to beginning actual work, a person should attempt to restart the equipment to ensure all energy is controlled.

END

King Library Roof – Fan Coil Unit



King Library Roof – Fan Coil Unit



Prepare a Lockout Procedure.

- Identify Energy Isolation Devices.
 - Apply Locking Devices
 - Verify Energy Isolation
-
- Pump Motor Energy Control

King Library Roof – Fan Coil Unit



- Coolant Fluid Isolation



King Library Roof – Air Handler Unit



King Library Roof – Air Handler Unit



Prepare a Lockout Procedure.

- Identify Energy Isolation Devices.
- Apply Locking Devices
- Verify Energy Isolation

AHU – 003 Energy Isolation

1. Variable Frequency Drive
2. Hand – Off – Auto
3. Circuit Breaker

King Library Roof – Air Handler Unit



- Verify Energy Isolation at Motor Conductors

End