LOTO

Control of Hazardous Energy

MIIA
Nonprofit
Locally based
Member driven
Serving Massachusetts communities since 1982

INSTRUCTOR: KIM LINDGREN, MS, CHST

Welcome

Facility

Emergencies

Schedule

Participation

Materials

Introductions

Name

Years of experience

Safety knowledge (1 – 10)

LOTO knowledge (1 – 10)


WHY ARE
YOU HERE?

Safety and Health Program

ARECC

Do you do this is your daily lives?

Examples?

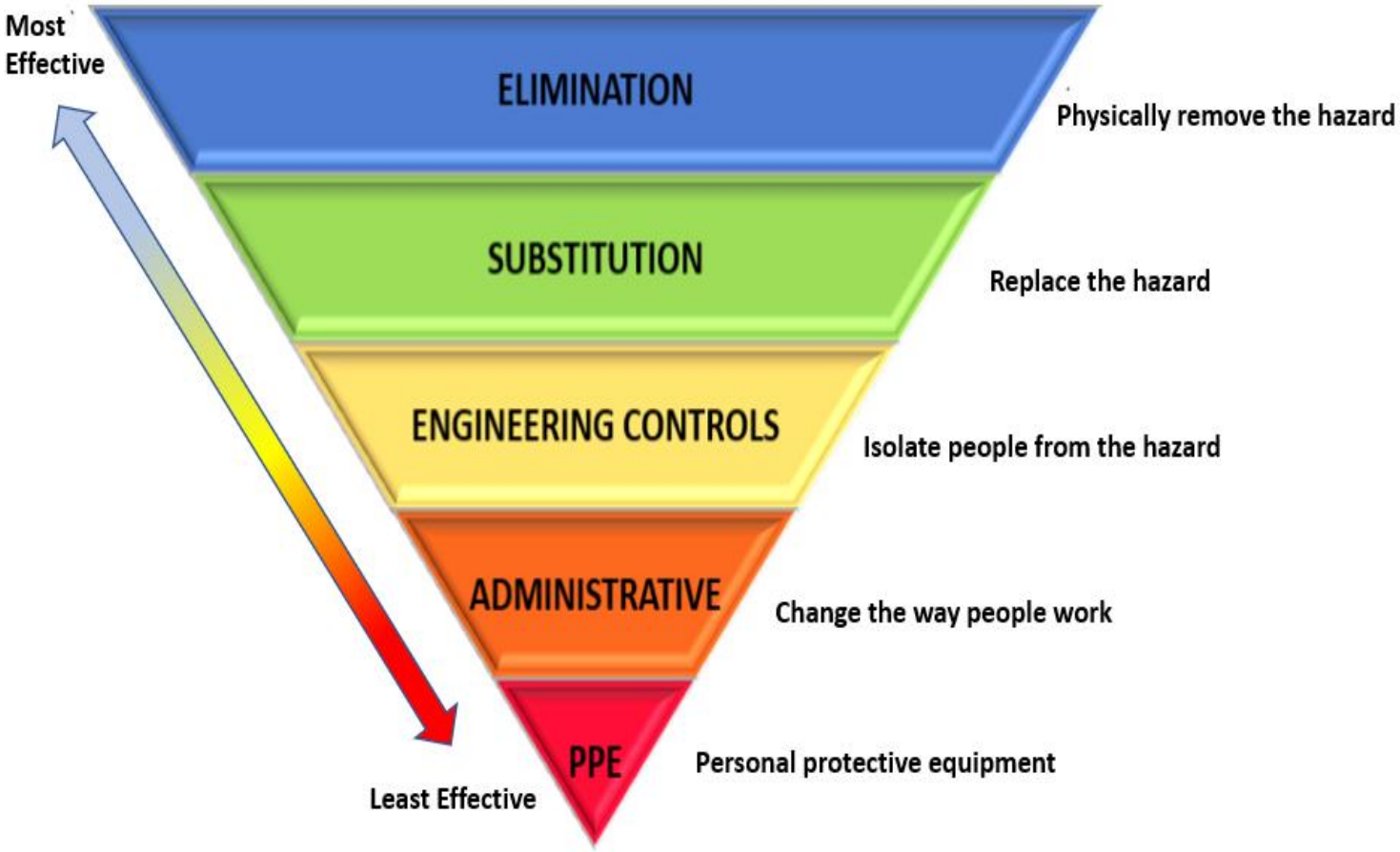
ARECC

ARECC


ANTICIPATE
RECOGNIZE
EVALUATE
CONTROL
CONFIRM


See It!
Mechanical
Electrical
Pressure
Temperature
Chemical
Biological
Radiation
Sound
Gravity
Motion

Hierarchy of Controls



The Six P's

Processes

Policies

Programs

Plans

Procedures

Practices

proc·ess
/ˈprä ˌses/

a series of actions or steps taken in order to achieve a particular end.

The Six P's

Processes

Policies

Programs

Plans

Procedures

Practices

pol·i·cy[1]

/ˈpäləsē/

a course or principle of action adopted or proposed by a government, party, business, or individual.

The Six P's

Processes

Policies

Programs

Plans

Procedures

Practices

pro·gram

/ˈprōˌgram/

a set of related measures or activities with a particular long-term aim.

The Six P's

Processes

Policies

Programs

Plans

Procedures

Practices

plan

/plan/

an intention or decision about what one is going to do.

The Six P's

Processes

Policies

Programs

Plans

<u>Procedures</u>

Practices

pro·ce·dure

/prəˈsējər/

an established or official way of doing something.

The Six P's

Processes

Policies

Programs

Plans

Procedures

Practices

prac·tice

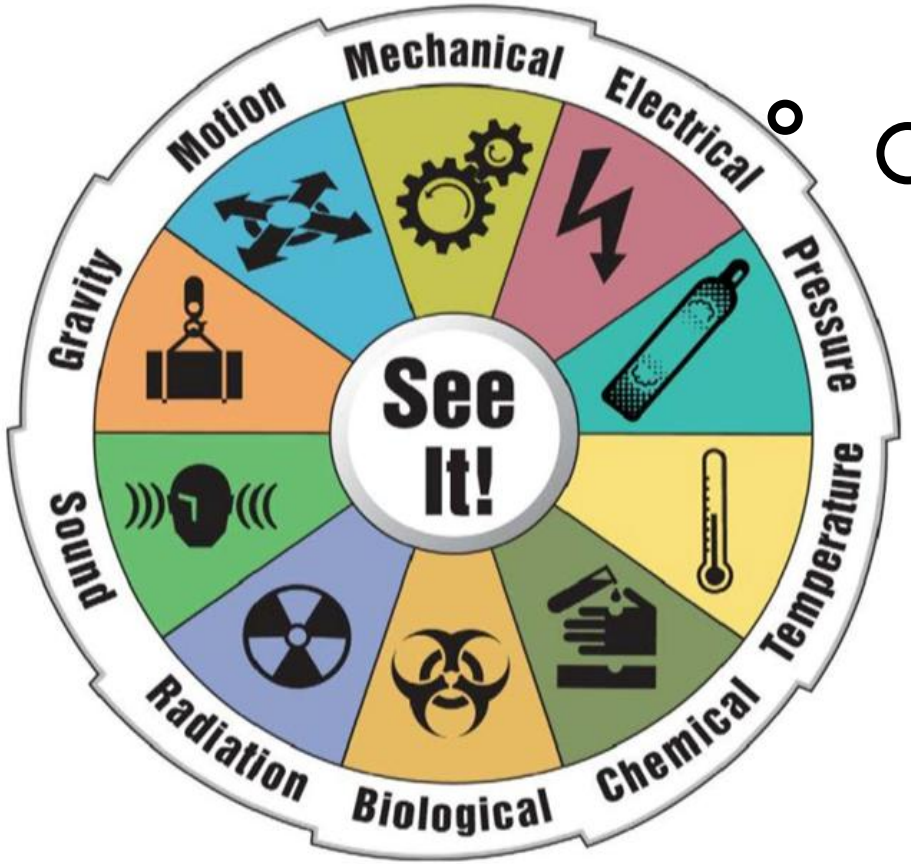
/ˈpraktəs/

the actual application or use of an idea, belief, or method, as opposed to theories relating to it.

What is Lockout/Tagout?

…a set of procedures that protect workers from hazardous energy when servicing or maintaining machinery and equipment

Lockout – Tagout…*aka*…Hazardous Energy Control



Bring to a Zero State

Do You Have a Lockout/Tagout Program?

Written Lockout/Tagout Procedures?

Written Lockout/Tagout Procedures?

Written Lockout/Tagout Procedures?

Written Lockout/Tagout Procedures?

1 BRADY Lockout/Tagout Posted Procedure

ID#: 5879 2
Created: 7/6/2018
Revised: 7/6/2018

Facility: Brady Good Hope - Production 3
Location: Boiler Room
Description: Boiler #1

4 Lockout Points

Note: 5 This machine is capable of generating extremely high temperatures. Allow it to return to room temperature before proceeding.Confined Space. Authorized personnel only. Permits are required before entering. Follow all Confined Space procedures.Piping systems can store energy hydraulically. Ensure pressures are isolated and/or have been relieved before proceeding.

MCC 3 Column 3 Bucket A | EAST VIEW | NORTH VIEW

6

Lockout Steps

Step #	Action	Info	Verification
1 Electrical E-1 480V 7	The E-1 Disconnect is located on the East side of the machine on the MCC panel Column 3 bucket A. . Turn Disconnect to the off position and lock out.	Use a Lock and hasp device.	Attempt to restart at control panel.
2 Gas G-1 Natural Gas	The G-1 Ball Valve is located on the East side of the machine. Turn Valve to the off position and lock out. 8	Use a Ball valve lockout device.	Verify pressure has bled off.
3 Water W-1 Hot Water Supply	The W-1 Butterfly Valve Lockout is located on the East side of the machine. Turn the valve to the closed position and lock out.	Use a Lock and hasp device.	Verify pressure has bled off.
4 Water W-2 Hot Water Return	The W-2 Butterfly Valve Lockout is located on the East side of the machine. Turn the valve to the closed position and lock out.	Use a Lock and hasp device.	Verify pressure has bled off. 9

BRADY SAFETY SOFTWARE & SERVICES 1-800-443-0495 BradySafety.com

Lockout Tagout Procedure

Purpose: 10 To protect authorized employees against unexpected or unplanned activation of equipment or energy while servicing equipment.

Scope: Utilize this procedure for all scheduled PM shutdowns, any maintenance task that requires you to place your body in harms way of the equipment, or if you have to leave the area while the equipment is in service.

Enforcement: Failure to properly follow lockout tagout procedure will result in corrective action.

SHUTDOWN, LOCK, TAG & TEST SEQUENCE 11

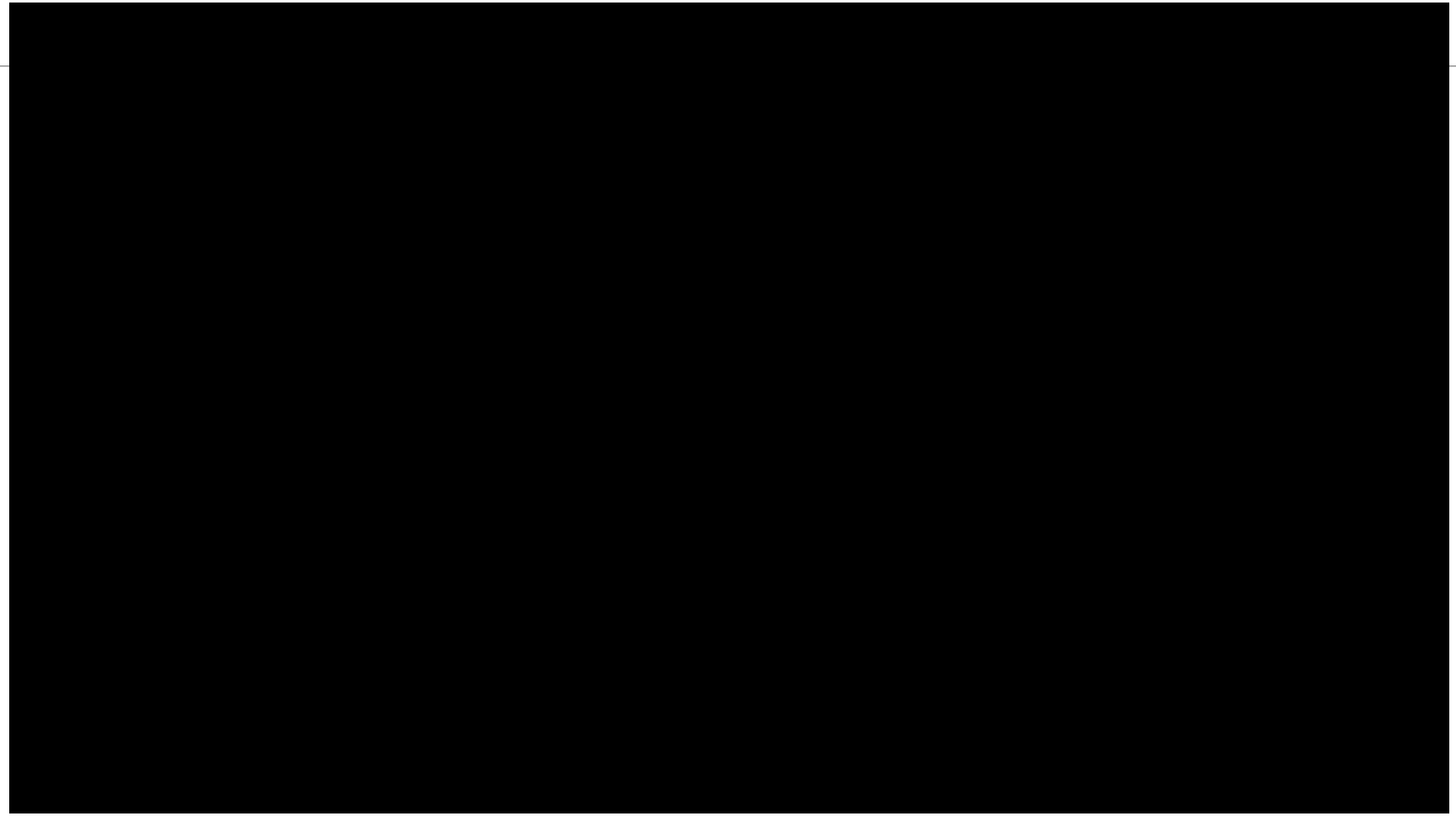
#	STEP	DESCRIPTION
1	Notify Employees	Notify all affected employees that servicing or maintenance is required on a machine or equipment, and that the machine or equipment must be shut down and locked out to perform the servicing or maintenance.
2	Review Lockout Procedure	The authorized employee shall refer to the company procedure to identify the type and magnitude of the energy that the machine or equipment utilizes, shall understand the hazards of the energy, and shall know the methods to control the energy.
3	Perform Machine Stop	If the machine or equipment is operating, shut it down by the normal stopping procedure (depress the stop button, open switch, close valve, etc.). Reference machine operating procedure for normal shutdown.
4	Isolate Energy	Follow graphical lockout-tagout procedure from top to bottom to de-activate the energy isolating device(s) so that the machine or equipment is isolated from the energy source(s). NOTE: It may be necessary to dissipate the non-lockable energy sources before isolating the lockable energy sources. (i.e. lower the machine to lowest position before locking out.)
5	Lockout Energy	Lockout and tagout the energy isolating device(s) with assigned lock(s) and tag(s).
6	Dissipate Energy	Stored or residual energy (such as that in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems,as well as air, gas, steam, or water pressure, etc.) must be dissipated or restrained by methods such as grounding, repositioning, blocking, bleeding down, etc.
7	Attempt Restart	Ensure that the equipment is disconnected from the energy sources by first checking that no personnel are exposed, then verify the isolation of the equipment by operating the push button or other normal operating controls or by testing to make certain the equipment will not operate. Caution: Return operating controls to neutral or "off" position after verifying the isolation of the equipment.

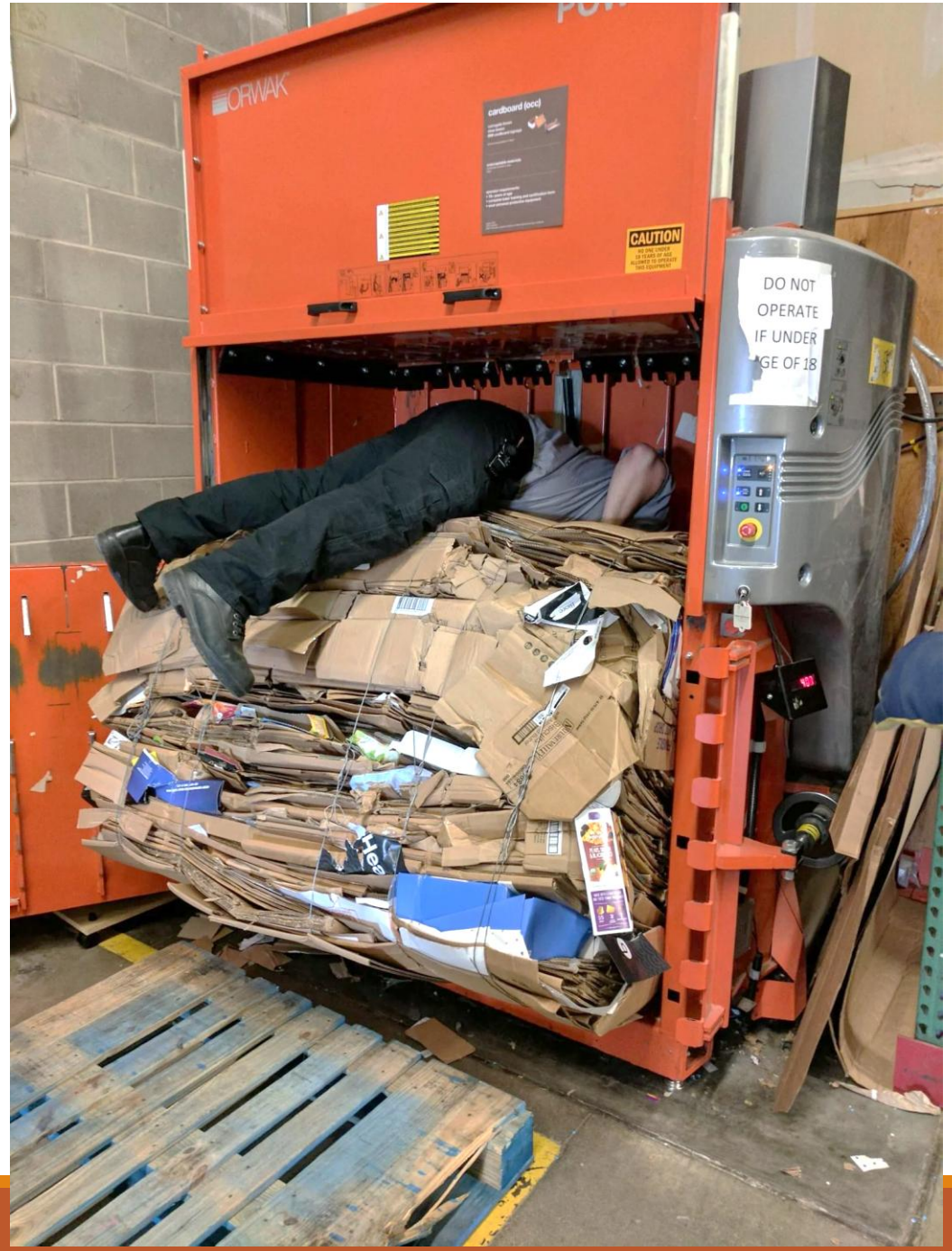
RESTORE TO SERVICE SEQUENCE 12

#	STEP	DESCRIPTION
1	Check Machine	Check the machine or equipment and the immediate area around the machine to ensure that nonessential items have been removed and that the machine or equipment components are operationally intact.
2	Check Area	Check the work area to ensure that all employees have been safely positioned or removed from the area.
3	Verify Machine	Verify that the controls are in neutral.
4	Remove Lockout	Remove the locks, tags and lockout devices and re-energize the machine or equipment. In reverse order, follow all of the steps from the visual lockout-tagout procedure found on the previous page. Note: The removal of some forms of blocking may require re-energization of the machine before safe removal.
5	Notify Employees	Notify affected employees that the servicing or maintenance is completed and the machine or equipment is ready for use.

Why Do We Need It?

1st Day on the Job




ORWAK
cardboard (occ)
CAUTION
DO NOT
OPERATE
IF UNDER

The Need for LOTO – NIOSH Report

1,281 fatalities

152 involved installation, maintenance, service, or repair tasks – on or near machines, equipment, processes, or systems

The Need for LOTO

Contributing Factors – Failure to…

Completely de-energize, isolate, block, and/or dissipate energy source (124 of 152 incidents)

Lockout and tag-out energy control devices and isolation points after de-energization (17 of 152)

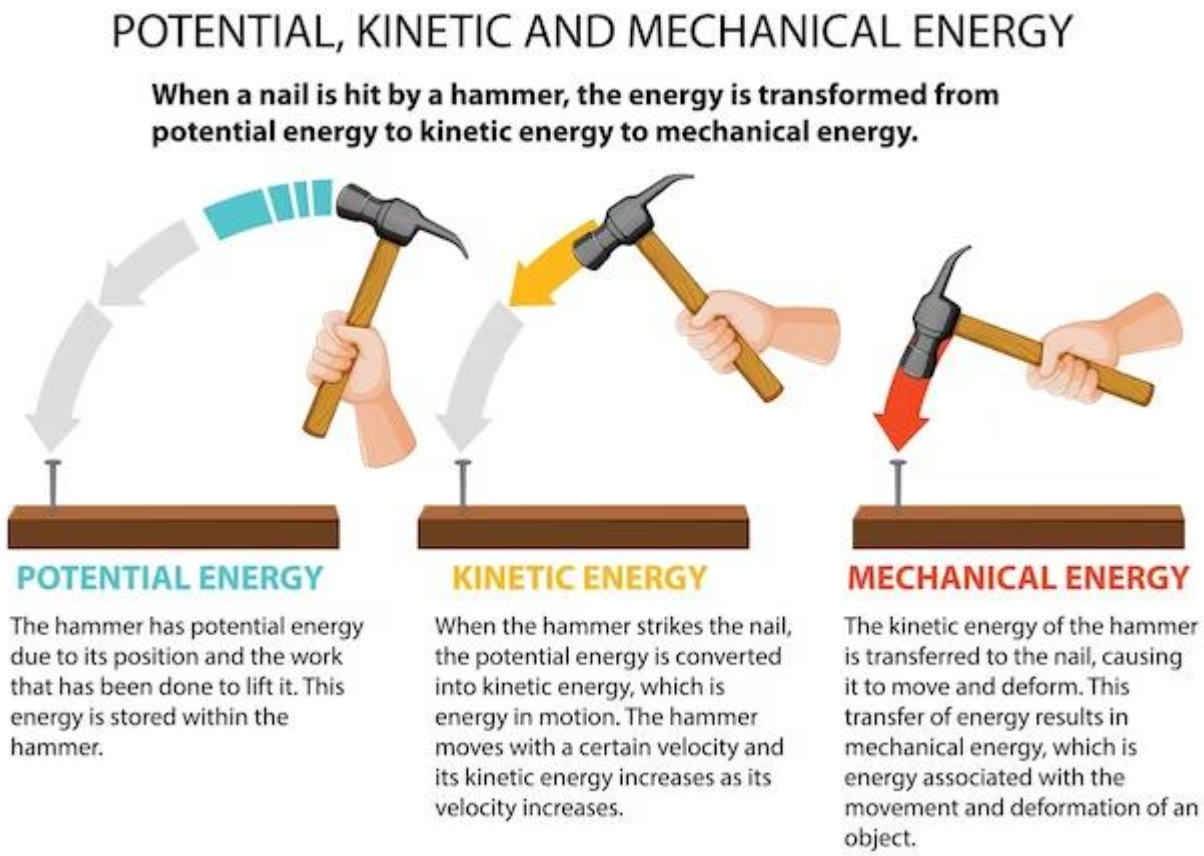
Verify energy source was de-energized before beginning work (11 of 152)

The Need for LOTO

UAW study: 83 of 414 fatalities among members due to lockout/tag-out procedures

Energy sources involved

- Kinetic
- Potential
- Electrical
- Thermal



General Duty Clause ➡ 29 CFR 1926 Construction

OSH Act of 1970

Table of Contents | General Duty Clause | Complete OSH Act Version ("All-in-One")

SEC. 5. Duties

(a) Each employer --

(1) shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees;

(2) shall comply with occupational safety and health standards promulgated under this Act.

(b) Each employee shall comply with occupational safety and health standards and all rules, regulations, and orders issued pursuant to this Act which are applicable to his own actions and conduct.

Course Goal

Apply requirements of OSHA regulations 29 CFR1910 and 29 CFR1926 to your specific program needs

OSHA

An official website of the United States government. Here's how you know

U.S. DEPARTMENT OF LABOR

Occupational Safety and Health Administration

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OSHA | STANDARDS | ENFORCEMENT | TOPICS | HELP AND RESOURCES | NEWS

Safety and Health Topics › Control of Hazardous Energy (Lockout/Tagout)

Control of Hazardous Energy (Lockout/Tagout)

1910.147 Control of Hazardous Energy (LOTO)

a) Scope, application and purpose
b) Definitions
c) General
d) Application of control
e) Release from lock out or tag out
f) Additional requirements

Appendix A – Typical minimal lockout procedures

OSHA Occupational Safety and Health Administration

REGULATIONS

Top 10 OSHA Violations – FY 2024

Violation	Regulation	# Violations
Fall Protection	1926.501	6,307
Hazard Communication	1910.1200	2,888
Ladders	1926.1053	2,573
Respiratory Protection	1910.134	2,470
Lockout/Tagout	1910.147	2,443
Powered Industrial Trucks	1910.178	2,481
Fall Protection - Training	1926.503	2,050
Scaffolding	1926.451	1,873
Personal Protective Equipment	1926.102	1,814
Machine Guarding	1910.212	1,541

29 CFR 1926 Construction

Subpart C – General Safety and Health Provisions

1926.20(b)(3) The use of any machinery, tool, material, or equipment which is not in compliance with any applicable requirement of this part is prohibited. Such machine, tool, material, or equipment shall either be identified as unsafe by tagging or locking the controls to render them inoperable or shall be physically removed from its place of operation.

29 CFR 1926 Construction

Subpart O – Motor Vehicles, Mechanized Equipment, Marine Operations

1926.600(a)(3)(i)

Heavy machinery, equipment, or parts thereof, which are suspended or held aloft by use of slings, hoists, or jacks shall be substantially blocked or cribbed to prevent falling or shifting before employees are permitted to work under or between them. Bulldozer and scraper blades, end-loader buckets, dump bodies, and similar equipment, shall be either fully lowered or blocked when being repaired or when not in use. All controls shall be in a neutral position, with the motors stopped and brakes set, unless work being performed requires otherwise.

29 CFR 1926 Construction – Subpart Q Concrete and Masonry

1926.702(j) Lockout/Tagout Procedures.

1926.702(j)(1)

No employee shall be permitted to perform maintenance or repair activity on equipment (such as compressors, mixers, screens or pumps used for concrete and masonry construction activities) where the inadvertent operation of the equipment could occur and cause injury, unless all potentially hazardous energy sources have been locked out and tagged.

1926.702(j)(2)

Tags shall read Do Not Start or similar language to indicate that the equipment is not to be operated.

- **Part Number:** 1926
- **Part Number Title:** Safety and Health Regulations for Construction
- **Subpart:** 1926 Subpart AA
- **Subpart Title:** Confined Spaces in Construction
- **Standard Number:** 1926 Subpart AA
- **Title:** Confined Spaces in Construction
- **GPO Source:** e-CFR

ANSI Standards – Best Practices

Safeguarding Equipment; Lockout/Tagout

ANSI B11.0-2023 Safety of Machinery

ANSI B11.19-2019 (R2024) Performance for Risk Reduction Measures: Safeguarding and Other Means of Reducing Risk

ANSI/ASSP Z244.1- 2024 Control of Hazardous Energy: Lockout/Tagout

QUESTIONS?

Learning Objectives

Discuss – scope, application, purpose and key definitions

Describe – activities covered by LOTO requirements

Describe – activities NOT covered by LOTO requirements

Identify and discuss – control measures for various case studies

Learning Objectives

Discuss – elements of an energy control program

Explain – process for a workplace energy source inventory

Develop – written procedure for a designated piece of equipment

Discuss – training/communication of authorized; affected; and “other” personnel

Identify – requirements for periodic inspections

Sessions to Meet Objectives

1. Scope, Application, Purpose, and Definitions
2. Lockout/Tagout Program
3. Lockout/Tagout Equipment
4. Lockout/Tagout Procedures
5. Periodic Inspections
6. Training and Communication

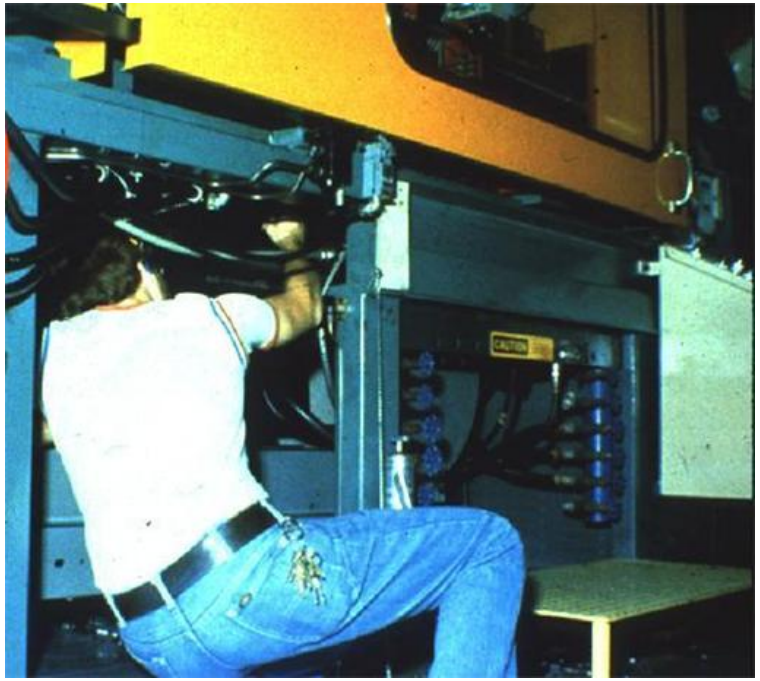
Session 1

Scope, Application, Purpose, and Definitions

Control of Hazardous Energy

Practices and procedures necessary to disable machinery and equipment

Protect workers performing service and maintenance activities



Scope

LOTO covers servicing and maintenance of machines and equipment to prevent worker injury from…

- **unexpected** energization or **start-up** of machines or equipment, or
- release of stored energy

Servicing? Maintenance? Or..Bad Idea?

LOTO Application

Service and maintenance takes place **during normal production**

And employee must…

- remove or bypass a guard or safety device; or
- any body part is placed into a danger zone

LOTO Does Not Apply

Cord and plug equipment

- Hazard controlled by worker
- Unplugging isolates equipment
- Worker maintains exclusive control of plug

Exception to LOTO

Minor servicing activity

Routine: a regular course of procedure in accordance with established practices

Repetitive: repeated as part of production process or cycle

Integral: inherent to production process

Must use alternative measures to provide **effective** protection

Alternative Effective Protection

Interlocked gates or barriers

Mechanical blocks, pins, bars or locking devices

Remote devices to remove worker from danger zone

- Lubricator
- Valve or gate
- Other?

Example – Exception

Takes place during production, appears to be ***routine, repetitive,*** and ***integral*** to use of equipment

Alternative protection

- interlock gate

Alternative Effective Protection?

Employee reaches into die area of hydraulic press

Cleans die surface about once/hour

Light curtain installed for protection

Assume “minor servicing work”

Is this effective protection?

What is the Purpose of LOTO?

Employers must establish a program

Develop and implement procedures for affixing appropriate lockout/tagout devices to energy isolating devices

Disable machines or equipment to prevent unexpected energization, start up, or release of stored energy

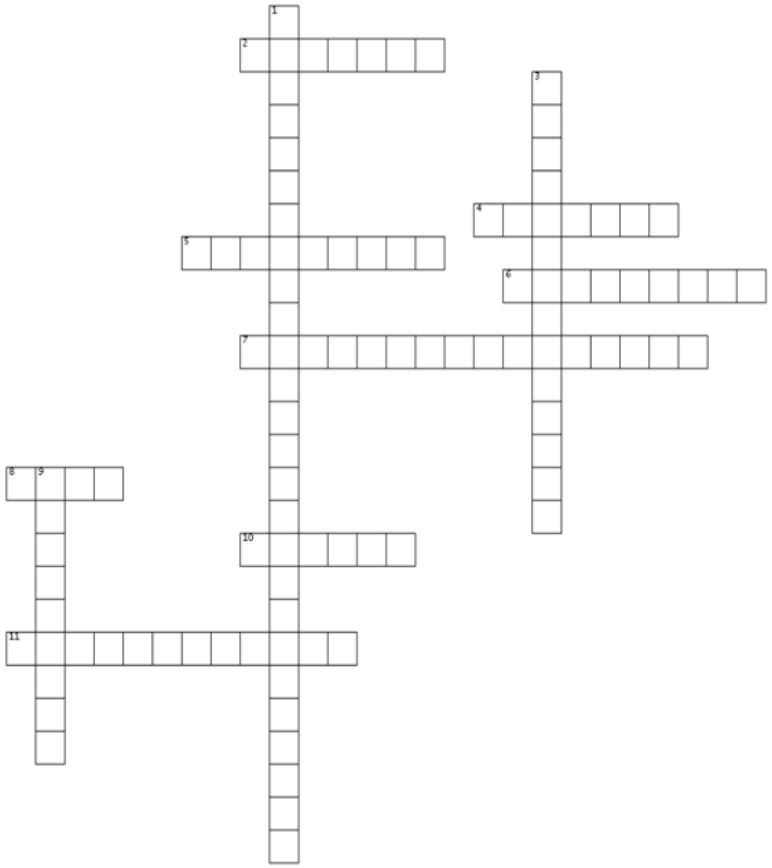
Prevent injury to employees

Definitions

Crossword Puzzle

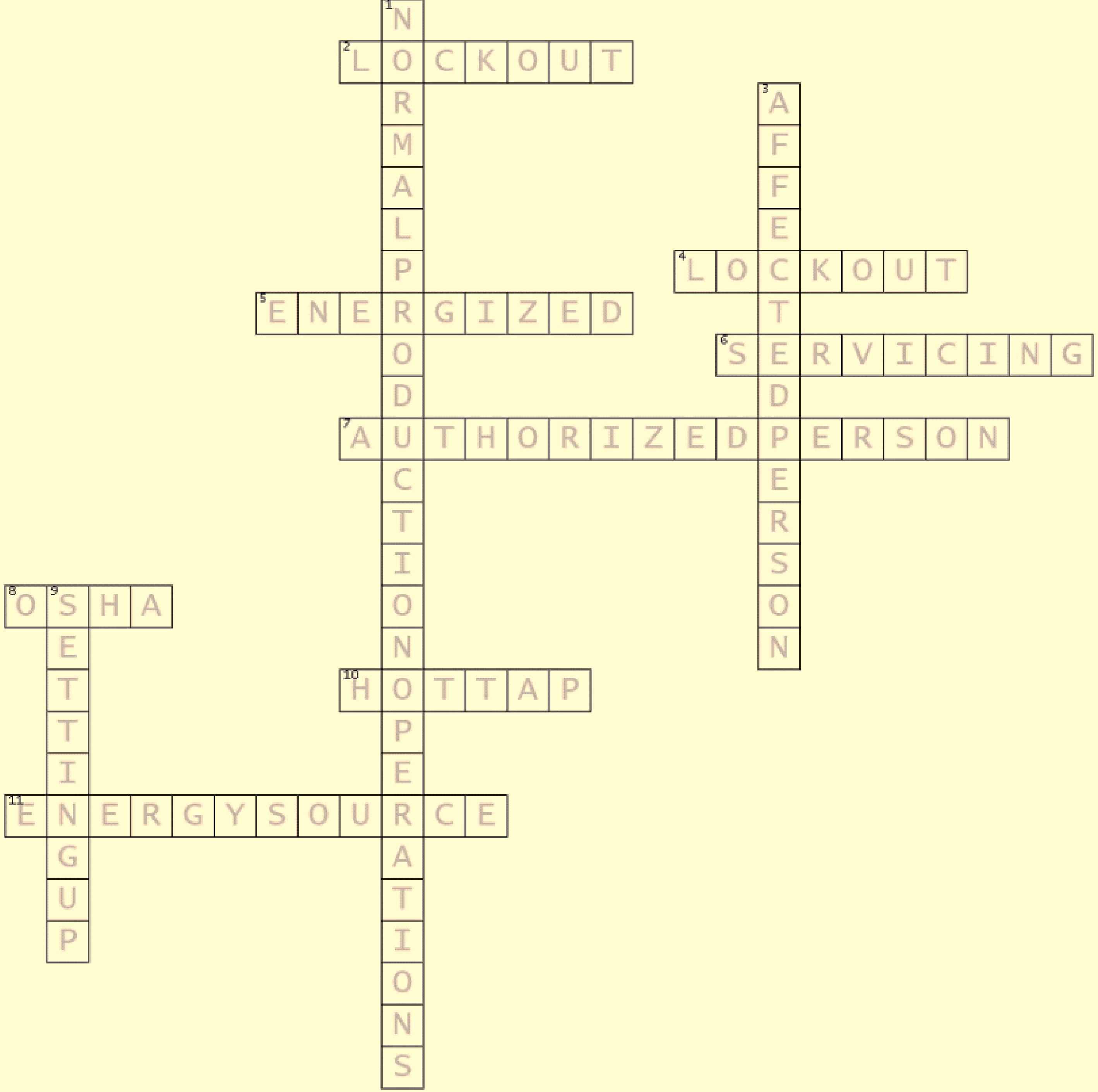
Word Search

LOTO Crossword Puzzle



LOTO Terminology – Word Search

E	Y	Z	L	A	C	I	N	A	H	C	E	M	N	V
C	E	T	F	W	I	S	O	L	A	T	I	O	N	E
N	L	T	I	I	G	M	I	H	S	O	I	N	O	R
A	E	R	T	L	N	S	T	A	R	T	U	P	V	I
N	C	A	A	Z	I	C	A	W	A	L	Q	N	Y	F
E	T	I	G	I	N	B	C	Z	J	D	W	W	G	I
T	R	N	O	T	I	F	I	C	A	T	I	O	N	C
N	I	I	U	R	A	G	N	S	M	S	Q	D	I	A
I	C	N	T	S	R	R	U	Y	N	C	V	T	C	T
A	A	G	T	E	T	O	M	E	B	O	I	U	I	I
M	L	E	N	F	E	U	M	H	N	P	P	H	V	O
V	A	E	A	W	R	P	O	T	S	E	T	S	R	N
M	I	C	N	O	I	T	C	E	T	O	R	P	E	Y
B	E	N	V	I	R	O	N	M	E	N	T	G	S	R
N	O	I	T	A	C	I	L	P	P	A	C	F	Y	Y


1 NORMAL PRODUCTION OPERATIONS
2 LOCKOUT
3 AFFECTED PERSON
4 LOCKOUT
5 ENERGIZED
6 SERVICING
7 AUTHORIZED PERSON
8 OSHA
9 SETTING UP
10 HOT TAP
11 ENERGY SOURCE

Definitions

Affected versus authorized person

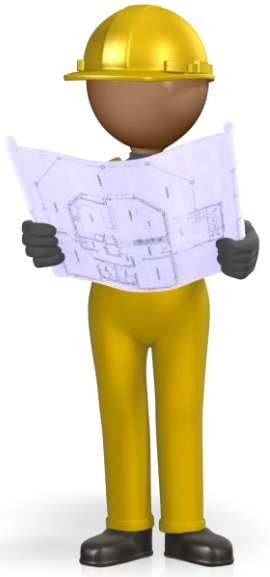
Energy isolating device

Energy source

Lockout versus tagout

Servicing and/or maintenance

AUTHORIZED



AFFECTED

OTHER

Definitions

Affected versus authorized person

Energy isolating device

Energy source

Lockout versus tagout

Servicing and/or maintenance

Definitions

Affected versus authorized person

Energy isolating device

Energy source

Lockout versus tagout

Servicing and/or maintenance

Definitions

Affected versus authorized person

Energy isolating device

Energy source

Lockout versus tagout

Servicing and/or maintenance

Definitions

Affected versus authorized person

Energy isolating device

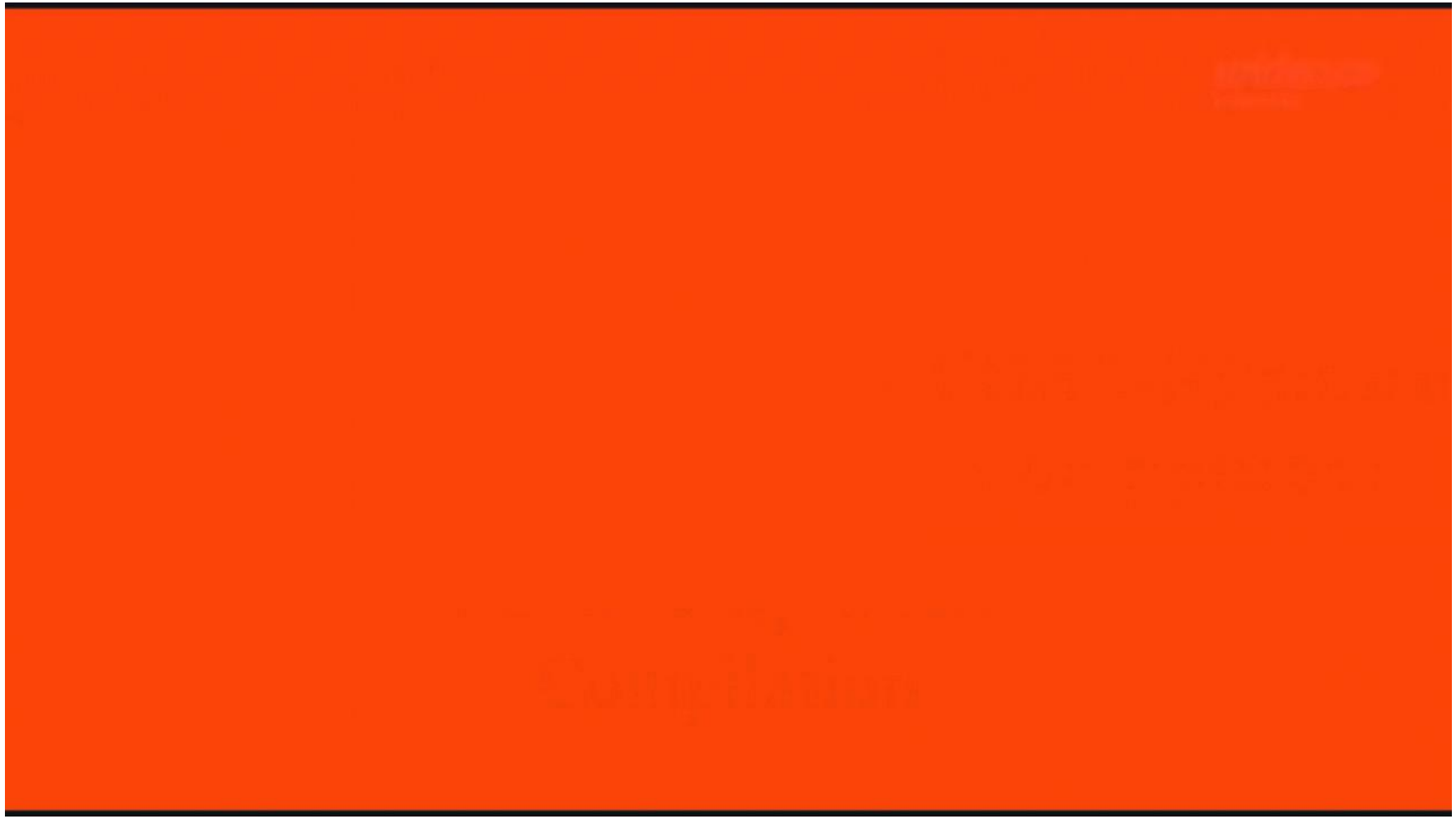
Energy source

Lockout versus tagout

Servicing and/or maintenance

An SUV was stuck in a trash compactor in Southborough on Thursday. Fire officials were able to get the driver out. *Courtesy of the Southborough Fire Department*

Lockout/Tagout or Not?



Session 1 – Review

Need for lockout

Scope, application and purpose of standard

Key definitions

QUESTIONS?

Session 2

Lockout/Tagout Program

Session 2

Lockout/Tagout program components

Program development

Employer responsibilities

Employee responsibilities

Energy Control Program

Employer responsibility

Ensure program is followed

Core program components

- Energy control procedures
- Employee training
- Periodic inspections

Lock Out Tag Out Program

LOTO Written Program

Survey workplace – equipment inventory under LOTO

Identify all hazardous energy sources of equipment

Identify energy-isolating devices

Select and procure protective hardware

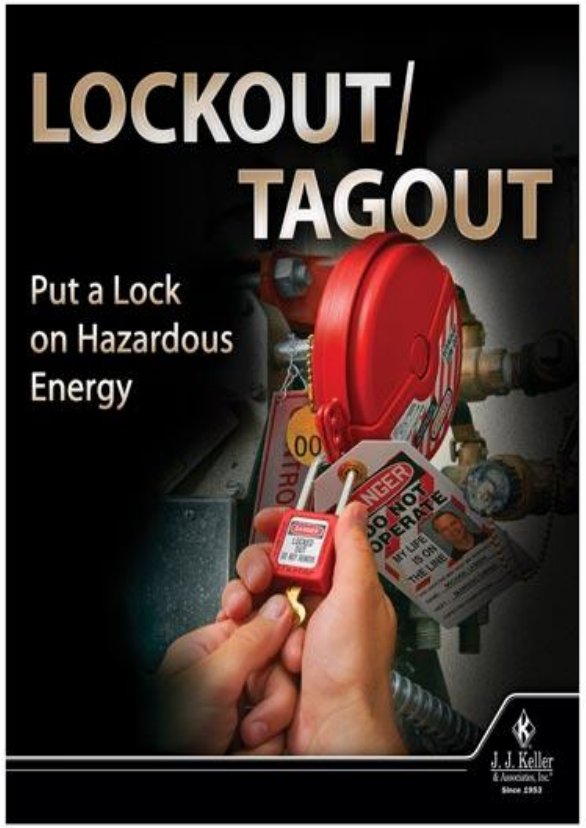
Assign duties and responsibilities

Determine shut-down, de-energization, energization an start-up sequences

Written procedures

Training

Periodic inspections



Your Lockout/Tagout Program

Hazardous Energy – Survey Your Facilities

Basic Questions for Your Facility

What is “your industry?”

What equipment is in the facility?

What is/are the energy sources?

Who performs….what duties?

Who provides service and maintenance?

Service and Maintenance (Words)

Constructing

Maintaining and/or servicing

Installing and setting up

Adjusting, inspecting, modifying

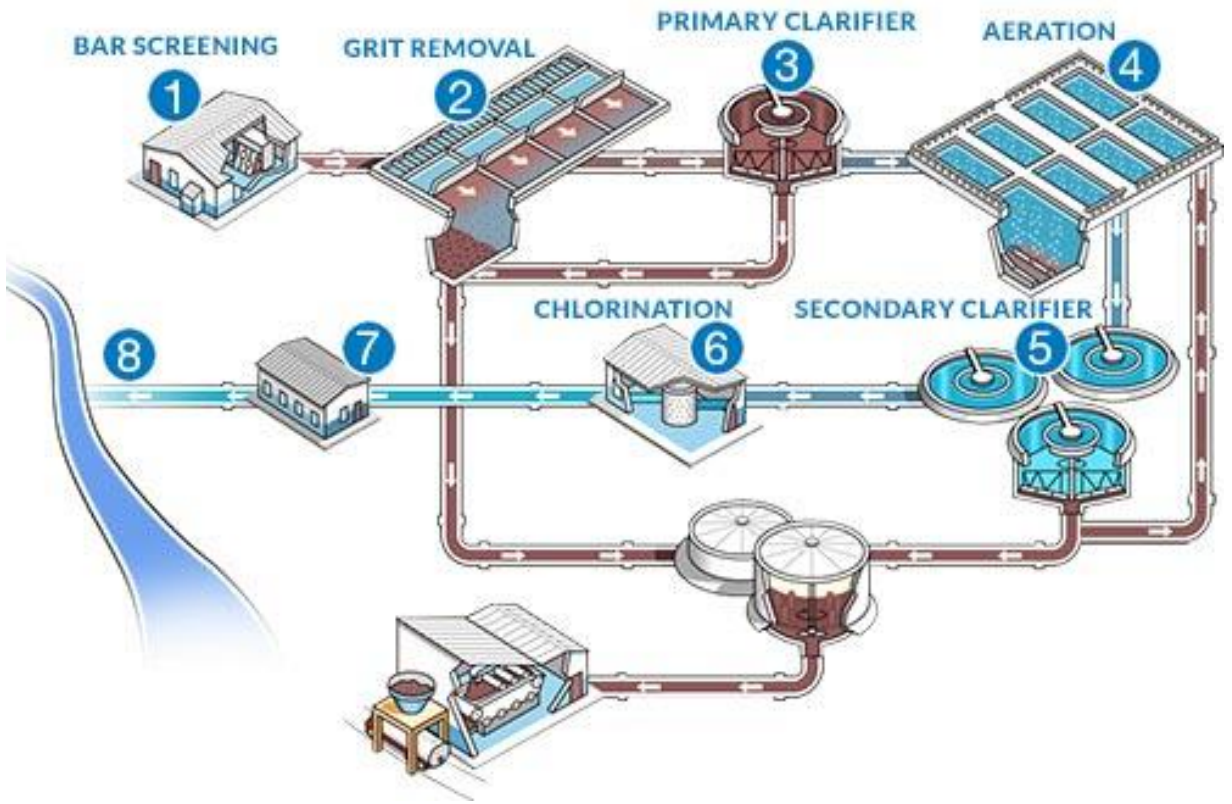
Lubricating, cleaning or unjamming

Tool changes

Note: LOTO applies to all workers performing these tasks, regardless of job titles

Wastewater Treatment

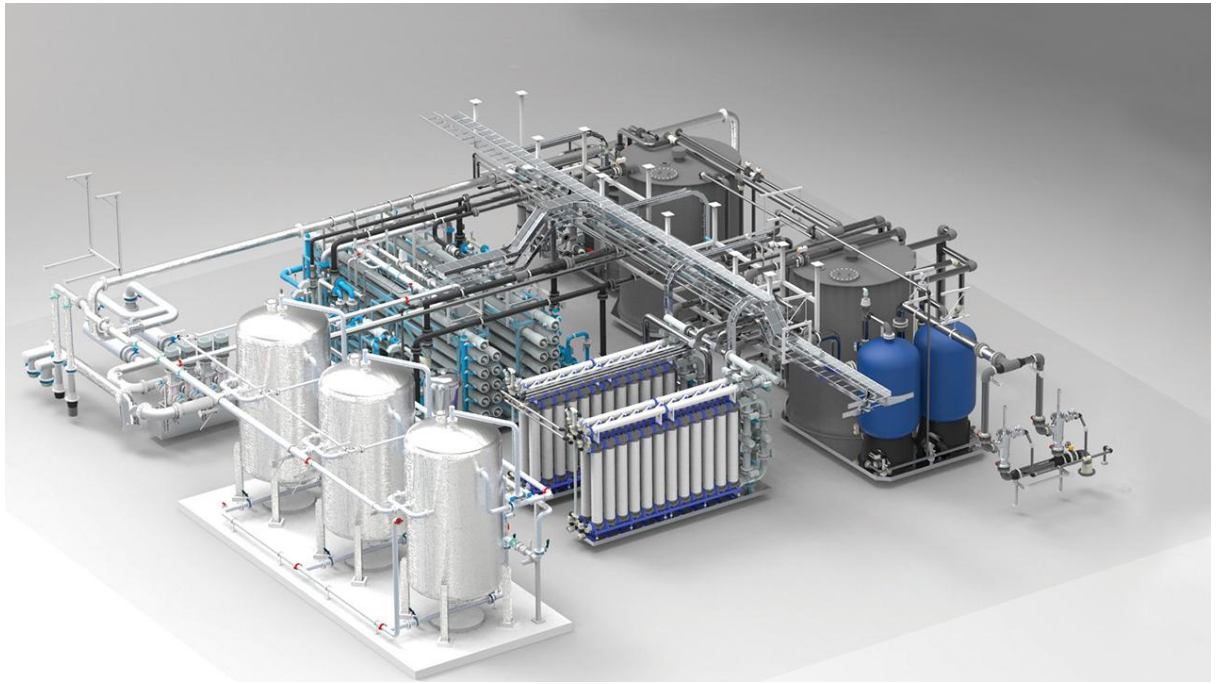
Kinetic (mechanical) energy **in the moving parts of mechanical systems**



Potential (mechanical) energy, stored energy or energy caused by its position

Water Treatment

Kinetic (mechanical) energy **in the moving parts of mechanical systems**



Potential (mechanical) energy, stored energy or energy caused by its position

Buildings, Schools, Facilities

Kinetic (mechanical) energy **in the moving parts of mechanical systems**

Potential (mechanical) energy, stored energy or energy caused by its position

Buildings, Schools, Facilities

Kinetic (mechanical) energy **in the moving parts of mechanical systems**

Potential (mechanical) energy, stored energy or energy caused by its position

Buildings, Schools, Facilities

Kinetic (mechanical) energy **in the moving parts of mechanical systems**

Potential (mechanical) energy, stored energy or energy caused by its position

Garages

Kinetic (mechanical) energy **in the moving parts of mechanical systems**

Potential (mechanical) energy, stored energy or energy caused by its position

Basic Questions for Your Facility

Written procedures? Accessible to worker?

Authorized, affected and “other” …training?

What LOTO hardware will be used? Purchasing?

Inspections? Documentation?

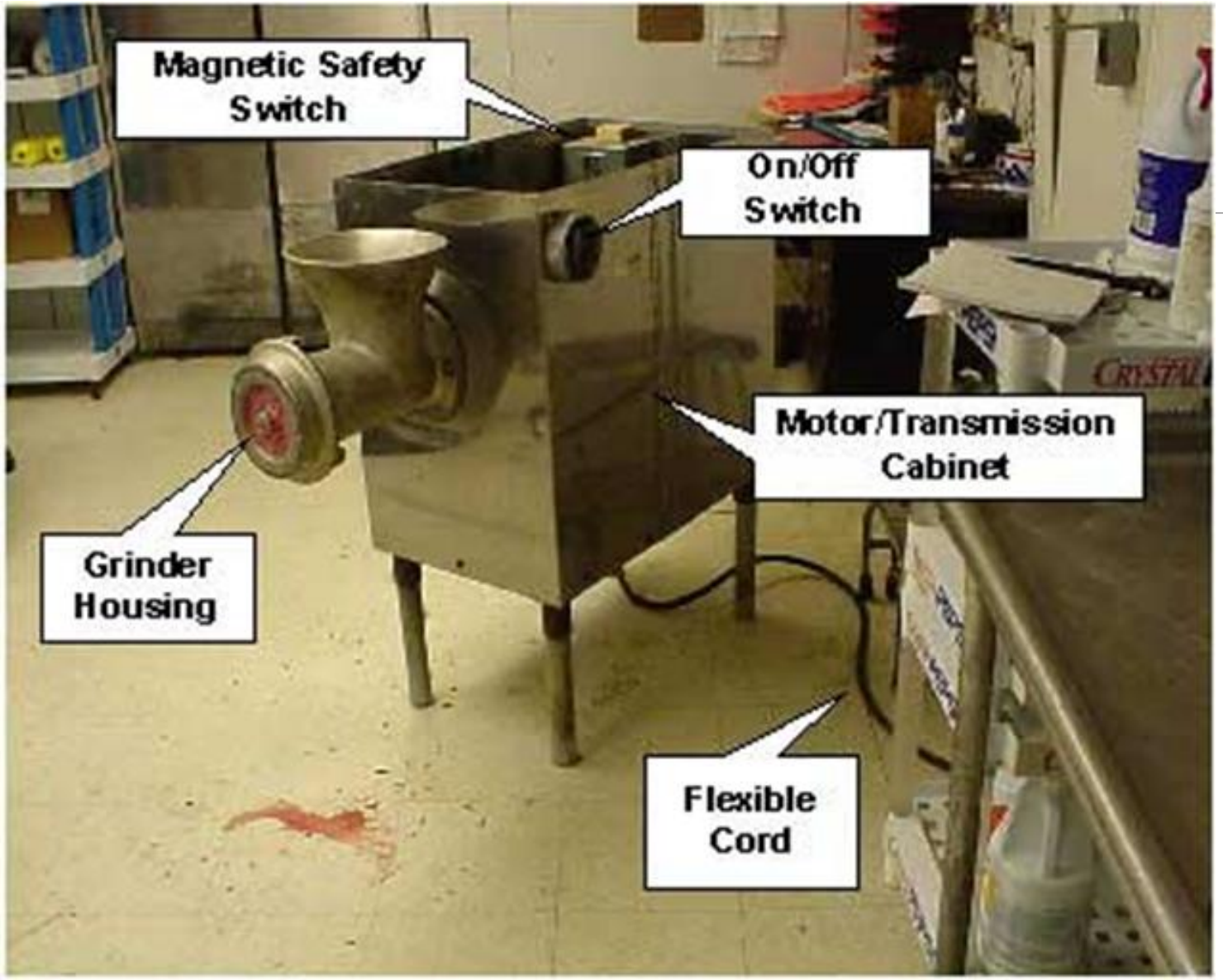
Cleaning – Meat Grinder

15-year-old worker suffered right arm amputation

Retail grocery store

Caught by auger of meat grinder

Victim was reassembling a grinder after cleaning without de-energizing and locking out power supply


Magnetic Safety Switch
On/Off Switch
Motor/Transmission Cabinet
Grinder Housing
Flexible Cord

Cleaning – Meat Grinder

Inserted auger into grinder's housing and reached through feed-throat with his right hand to guide it into engagement

He bumped against on/off switch

Grinder started, and the auger pulled his hand and arm into the housing

Forms of Hazardous Energy

What is energy?

…the capacity of acting or being active; capacity of a physical system to perform work; available power

What is hazardous energy?

…capable of causing harm; involving or exposing one to risk; perilous

OSHA – Energy Source

Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy

What are some other sources of energy?

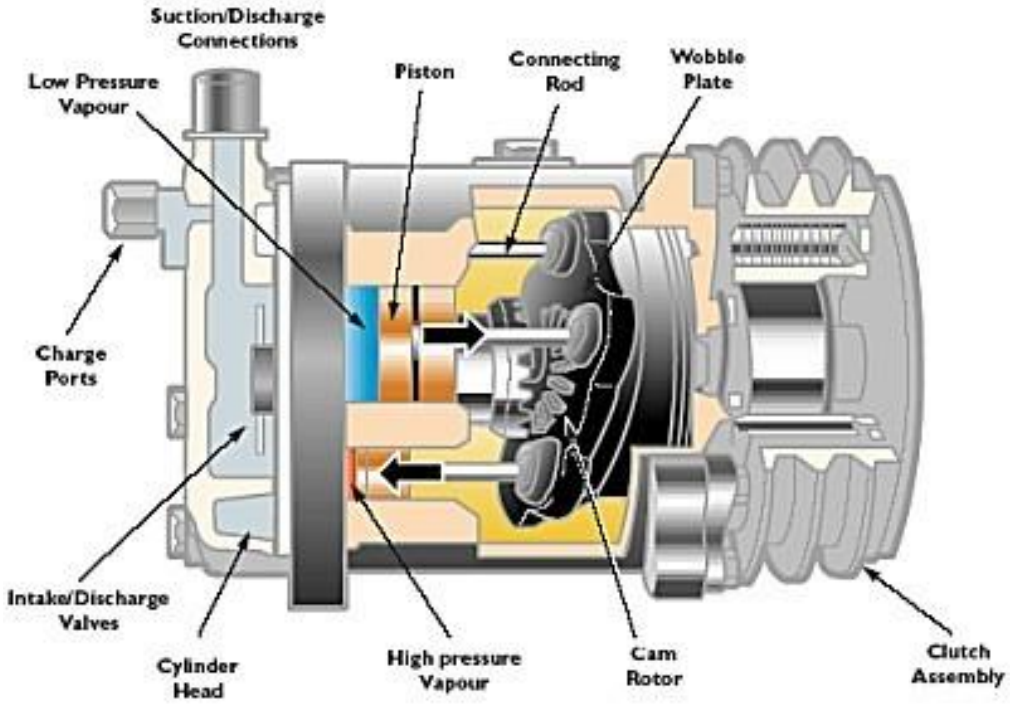
Forms of Hazardous Energy

Kinetic (mechanical) energy in moving parts of mechanical systems

Potential energy stored in pressure vessels, gas tanks, hydraulic or pneumatic systems, and springs …potential energy can be released as hazardous kinetic energy

What is Kinetic Energy?

What is Potential Energy?



Forms of Hazardous Energy

Thermal energy (high or low temperature) resulting from mechanical work, radiation, chemical reaction, or electrical resistance

Any other active or stored energy sources that could harm a worker

Definitions

Energized

…connected to an energy source or containing residual or stored energy

De-energized

…disconnected from all energy sources and ***not containing residual or stored energy*** *(isolation)*

Energy Isolating Devices

Energy Isolating Device

Mechanical device that **physically** prevents transmission or release of energy, including but not limited to the following:

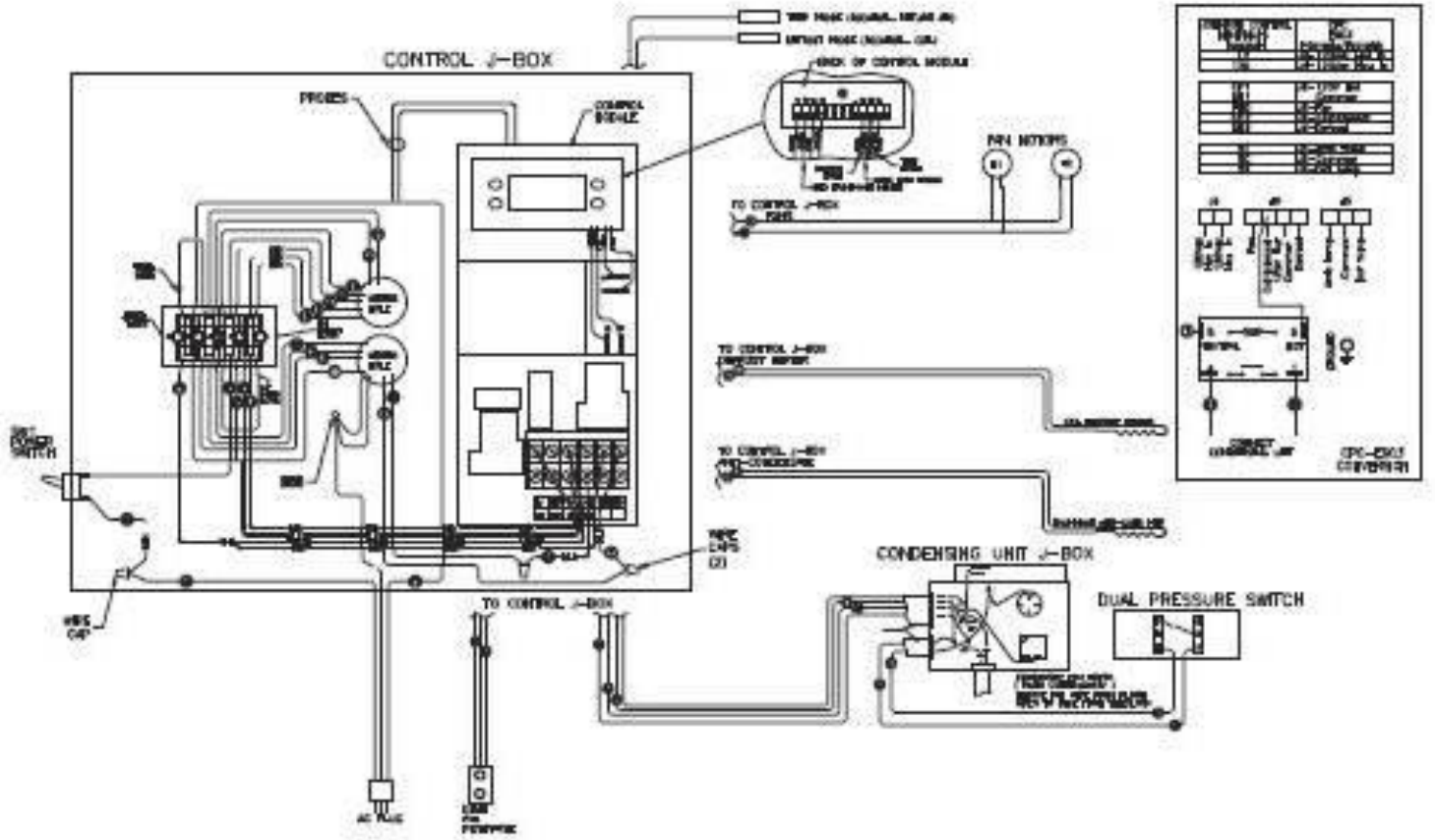
- Block
- Line valve
- Disconnect switch
- Manually operated switch by which conductors of a circuit can be disconnected from all ungrounded supply conductors;
- Any similar device used to block or isolate energy

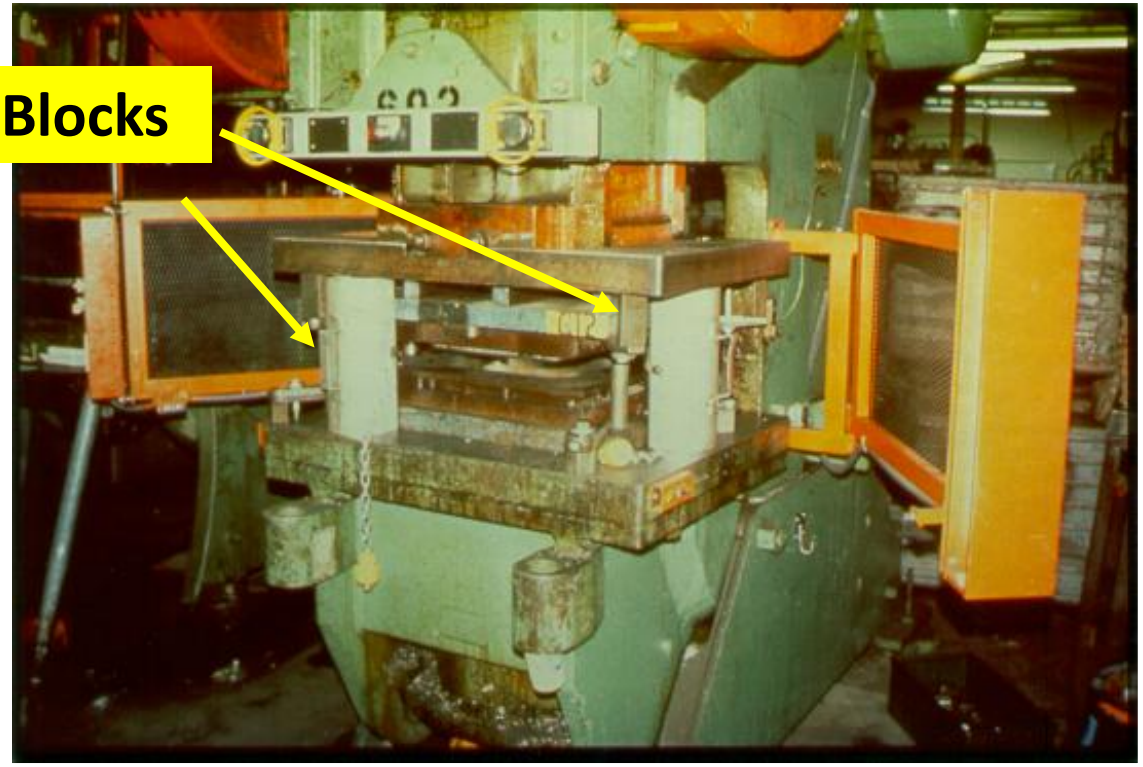
Energy Isolation Devices

Push buttons, selector switches, and other control circuit type devices are **not energy isolating devices**

Such controls interrupt power, but do not isolate power

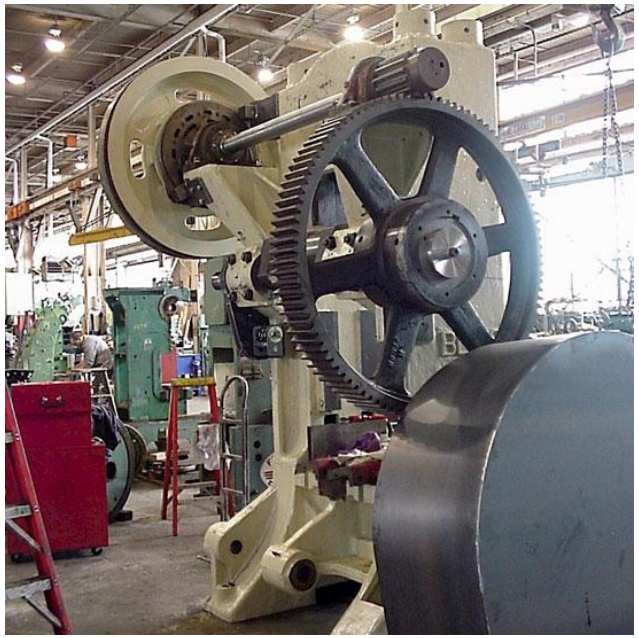
Is it Important to Know the System to be Worked On?





Blocking

Bull Gears



Flywheels

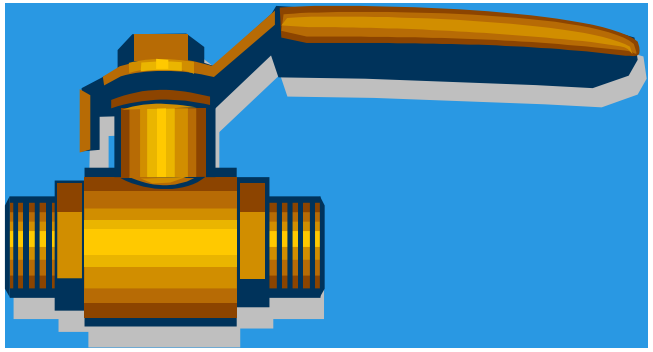
Momentum – Energy

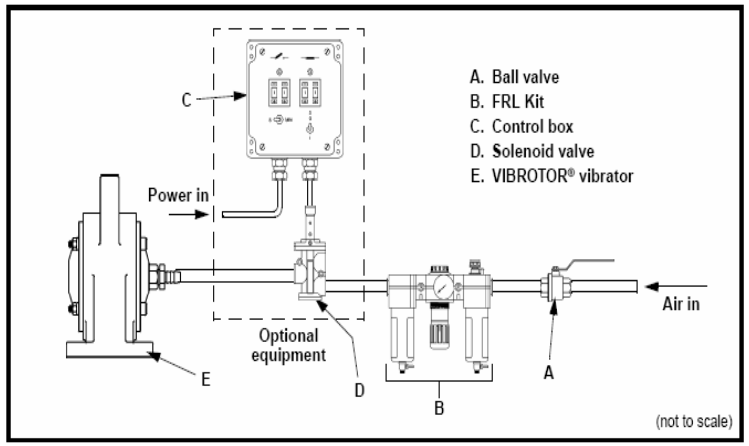
Electrical Isolation Devices

Pneumatic Valve Isolation Examples

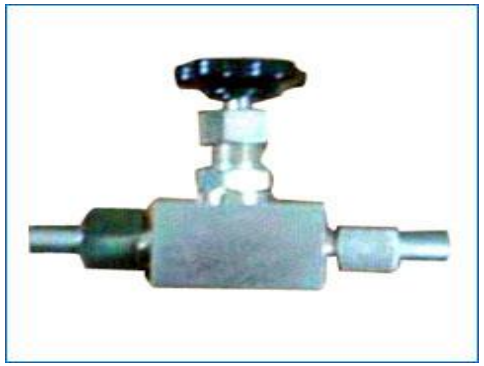
Piston

Handle Lever





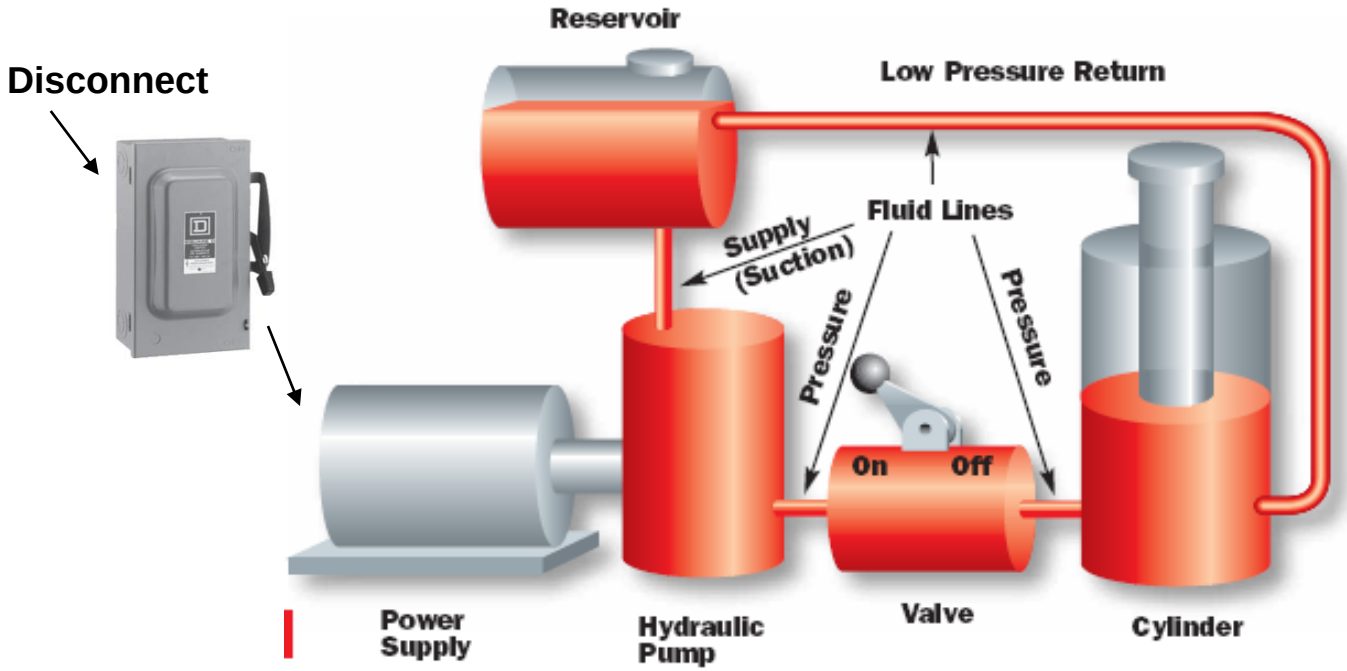
Note: Some are self-exhausting, but not all



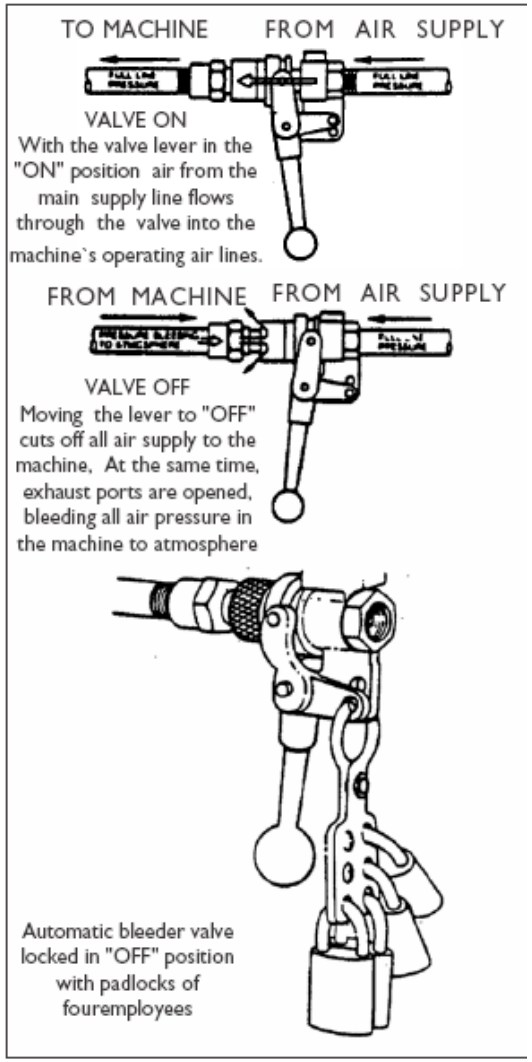
Gate Valve

Pneumatic Valve Isolation Examples

Common Hydraulic Isolation



While there are different kinds of pumps, actuators, valves, etc., the basic design of the hydraulic system is essentially the same for all machinery.



Self-Exhausting Air Valve

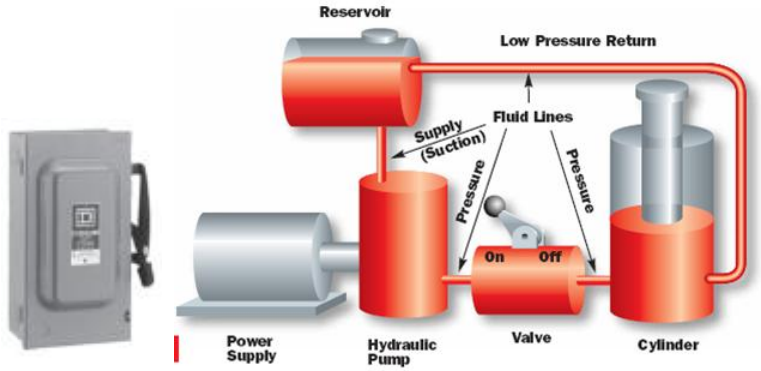
Common Hydraulic Isolation

Most pumps are operated by electric motors

Open and lockout disconnects for pump motors

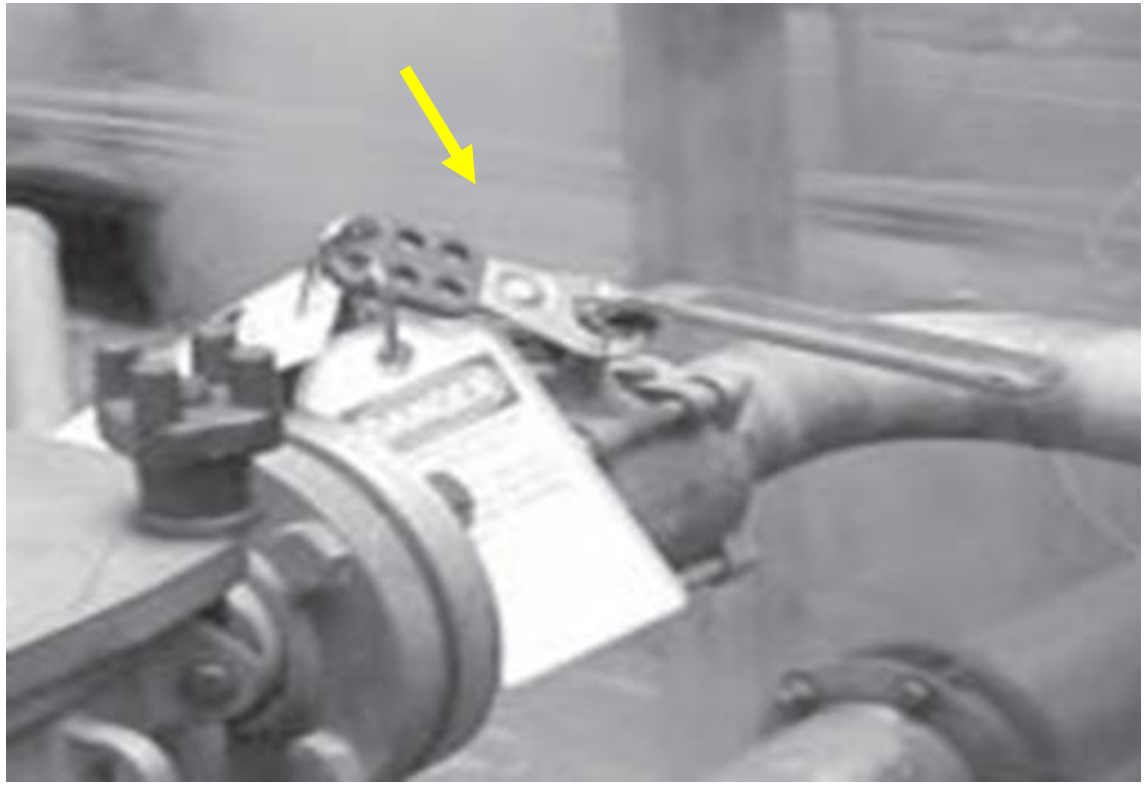
Stored energy and accumulators must be relieved

Hydraulic pumps may be driven by battery-powered motors (e.g., forklifts)



While there are different kinds of pumps, actuators, valves, etc., the basic design of the hydraulic system is essentially the same for all machinery.

Valve Isolation



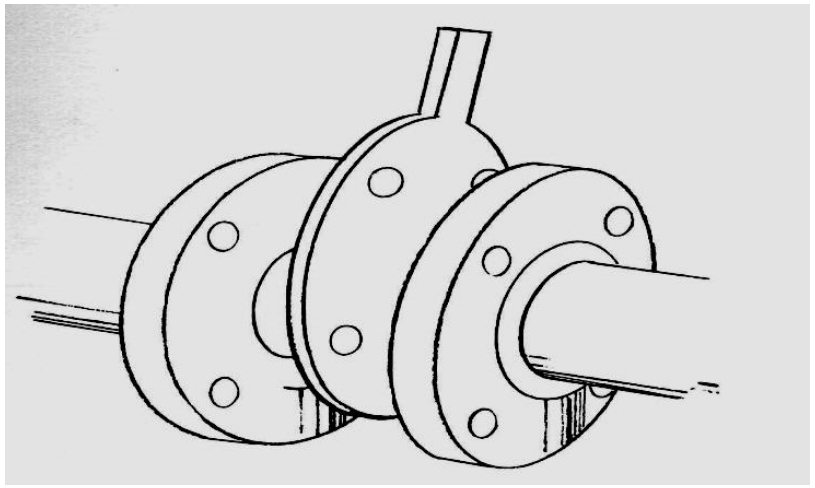
Distilled water line ball valve with handle perpendicular to pipeline (ball valve closed)

Lockout hasp passes through valve handle hole and hole fixed in valve body

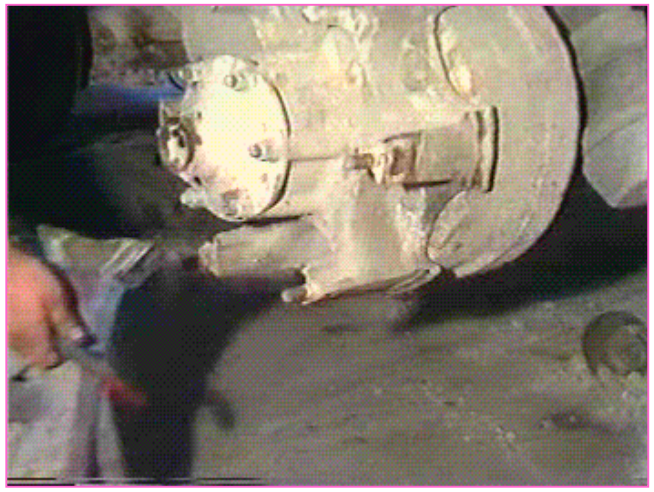
2 padlocks (each with a tag) pass through separate lockout points on hasp (2 people working on this task)

Pipe Isolation Examples

Blank Flange

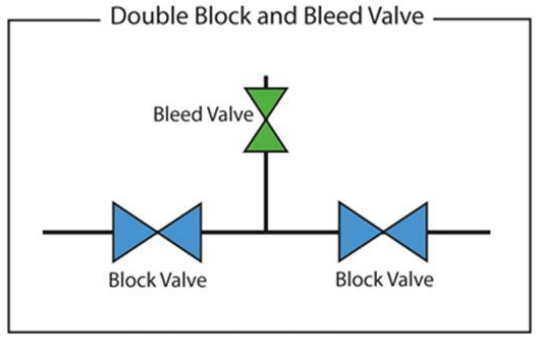


Blocking Line



Breaking Line

Chemical Piping Isolation



Double block and bleed

Method of process isolation

Two physical barriers (valves, blinds, etc.) with bleed-off in-between

Each barrier can be operated, secured, and tested independently

Two valves in series without bleed-off in-between are counted as a single valve (barrier)

Stored Energy – Render Safe

Discharge capacitors

Block or release springs

Relieve system pressure

Drain fluids

Vent gases

Allow system to cool/warm or use PPE

Allow momentum of mechanical motion to stop

Other methods?

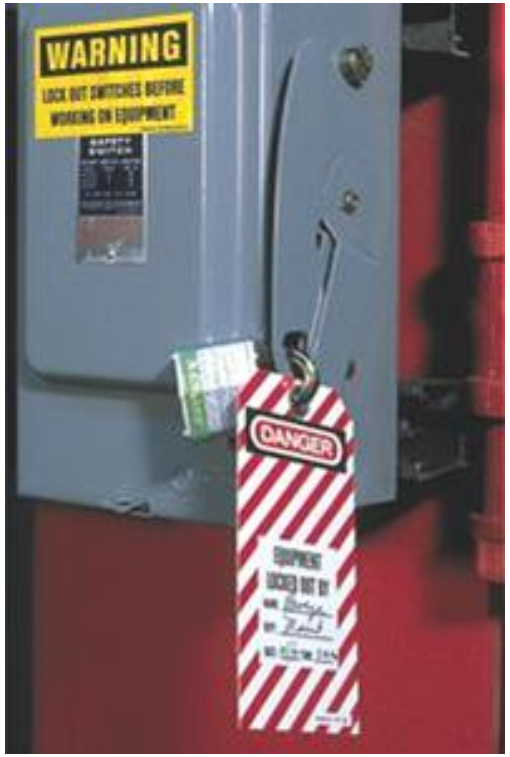
Session 2 – Review

Lockout/Tagout program components

Program development

Employer responsibilities

Employee responsibilities



QUESTIONS?

Session 3

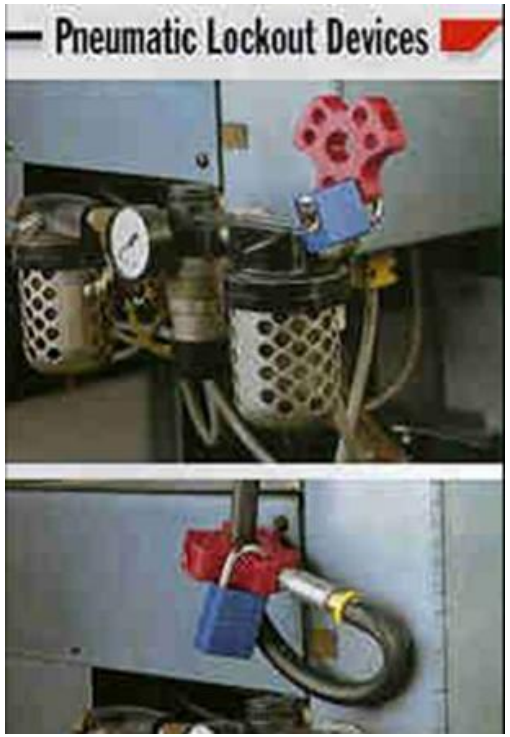
Lockout/Tagout Equipment

Protective Hardware Selection and Procurement

Definitions

Lockout device. A device that uses 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.

Protective Materials and Hardware



- Locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners, and other hardware
- Identifiable for isolation, securing, blocking machines or equipment from energy sources

Locks versus Tags

If it **CAN** be locked out…

It **SHALL** be locked out!

Full Employee Protection

"Tagout" program – attach tag at same location as lockout device would have been attached

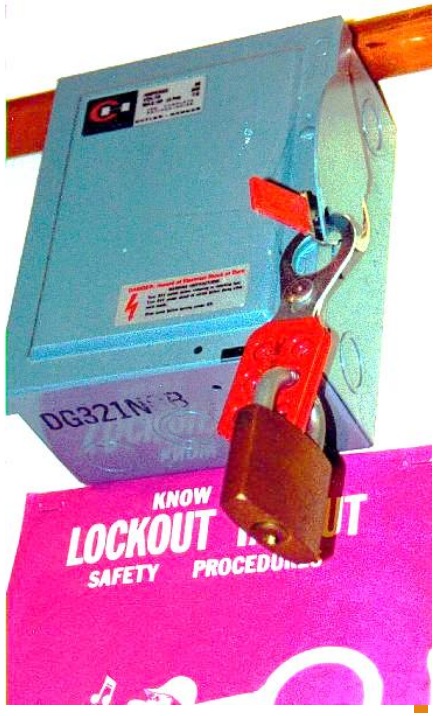
Employer must demonstrate "tagout" program will provide **same level of safety as lockout program**

Full Employee Protection

Employer must demonstrate full compliance

- Provisions of standard
- Any additional means needed to provide same safety as lockout device

Additional means: removing an isolating circuit element; blocking a controlling switch; opening an extra disconnecting device; or removing a valve handle



Electrical Lockout Devices

Fluid and Gas Lockout Devices

Valve Lockouts

Clamp attaches to butterfly handles, preventing trigger handle from being squeezed. Valve cannot be repositioned!

Use blocking arm to lock out quarter-turn ball valves.

Use cable attachment to lock out gate valves.

Use two blocking arms to lock out 3-, 4- or 5-way valves, or to lock valves in the throttled position for operational control.

Group Lock Box

Simplifies lockout of large equipment

After machine or process is locked out, keys to isolation device are placed in lock box

Each authorized work team member places a personal lock to the group lock box

Protective Materials and Hardware

Provided by employer

Singularly identified

Durable to environment

Standardized – within facility

Substantial – prevent removal

Proper wording

- Do Not Start. Do Not Open. Do Not Close. Do Not Energize. Do Not Operate.

Is this Correct?

Is this Correct?

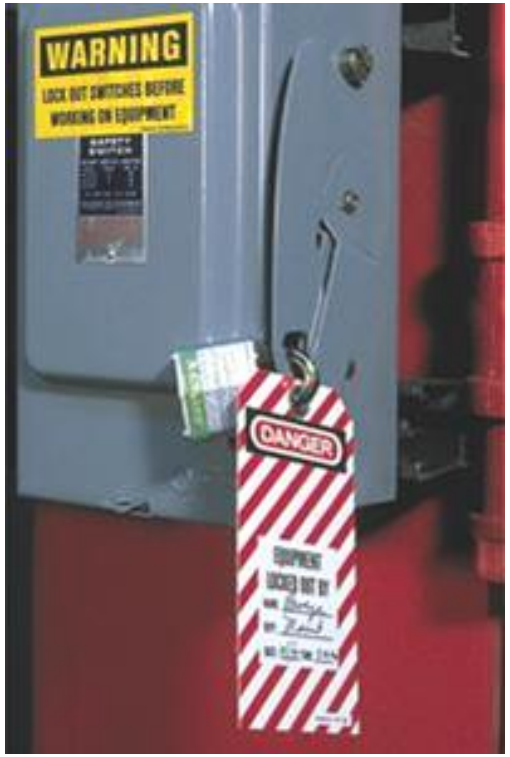
Session 3 – Review

Lockout/Tagout equipment

Locks versus tags

Types of equipment

Specifications



QUESTIONS?

Session 4

Lockout/Tagout Procedures

Energy Control Procedures

Employers must develop **written machine-specific** procedures to control potentially hazardous energy

Written Energy Control Procedures

Prepare for shutdown

Notify affected employees

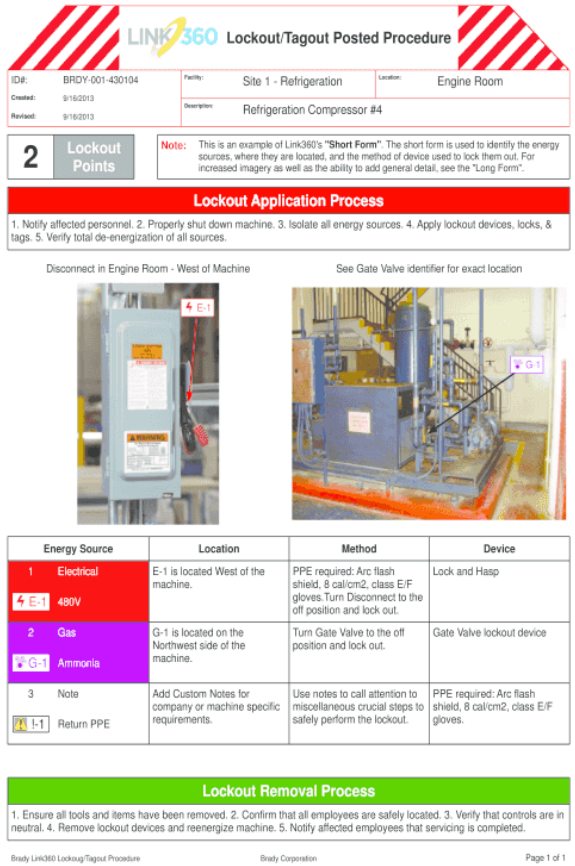
Shutdown

Isolation

Apply locks and tags

Release or secure stored energy

Verification



LINK360 Lockout/Tagout Posted Procedure

ID#: BRDY-001-430104
Created: 9/16/2013
Revised: 9/16/2013
Facility: Site 1 - Refrigeration
Location: Engine Room
Description: Refrigeration Compressor #4

2 Lockout Points

Note: This is an example of Link360's "Short Form". The short form is used to identify the energy sources, where they are located, and the method of device used to lock them out. For increased imagery as well as the ability to add general detail, see the "Long Form".

Lockout Application Process

1. Notify affected personnel. 2. Properly shut down machine. 3. Isolate all energy sources. 4. Apply lockout devices, locks, & tags. 5. Verify total de-energization of all sources.

Disconnect in Engine Room - West of Machine

See Gate Valve identifier for exact location

Energy Source	Location	Method	Device
1 Electrical E-1 480V	E-1 is located West of the machine.	PPE required: Arc flash shield, 8 cal/cm2, class E/F gloves.Turn Disconnect to the off position and lock out.	Lock and Hasp
2 Gas G-1 Ammonia	G-1 is located on the Northwest side of the machine.	Turn Gate Valve to the off position and lock out.	Gate Valve lockout device
3 Note I-1 Return PPE	Add Custom Notes for company or machine specific requirements.	Use notes to call attention to miscellaneous crucial steps to safely perform the lockout.	PPE required: Arc flash shield, 8 cal/cm2, class E/F gloves.

Lockout Removal Process

1. Ensure all tools and items have been removed. 2. Confirm that all employees are safely located. 3. Verify that controls are in neutral. 4. Remove lockout devices and reenergize machine. 5. Notify affected employees that servicing is completed.

Brady Link360 Lockout/Tagout Procedure Brady Corporation Page 1 of 1

1. Prepare for Shutdown

Understand equipment hazards

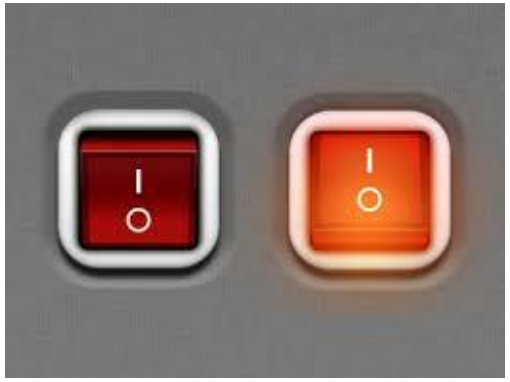
- Type and magnitude of energy
- Hazards
- Means of control

Notify other workers

2. Notifications

- Notify all workers in area – work will be done
  - Affected
  - Other
- Ensure they are clear of equipment
  - Remain clear of equipment

3. Shut Down Equipment



Use normal shut down procedures

Turn all switches to OFF/neutral

4. Isolate All Energy Sources

Use energy isolation devices to prevent transmission or release of energy

5. Apply Locks and Tags

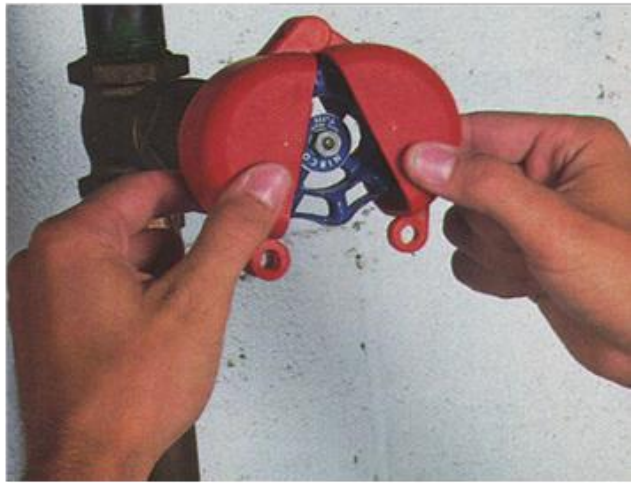
Valves

Breakers

Disconnects

Mechanical blocks

Others?



6. Release or Block Stored Energy

Block/disconnect lines

Block or release springs

Block elevated parts

Relieve system pressure

Drain fluids

Vent gases

Allow system to cool (or use PPE)

Apply additional locks and tags

7. Verify Equipment Isolation

Ensure other workers are clear of potential hazards

Check locking devices – secure?

Attempt normal startup

Return control to OFF/neutral

Perform Maintenance, Service, Tasks

Release from Lockout

Remove tools – assemble equipment

Personnel outside of danger zones

Notify others – removal of devices

Remove LOTO devices – only by authorized employee who applied it

Restore energy

Authorized Employee Not Available?

Under direction of employer

Specific procedures and training developed, documented and incorporated into program

Equivalent safety

Verify employee not at site

Make all reasonable efforts to contact authorized employee

Ensure employee has knowledge of LOTO removal before resuming work

Review – LOTO Procedure

1. Prepare for shutdown
2. Shut down equipment
3. Isolate all energy sources
4. Apply locks and tags
5. Release stored energy
6. Verify equipment isolation
7. Perform work
8. Release from Lockout

VacuBlast Cabinet w/Dust Extractor

Type magnitude

Electrical 415 volts

Pneumatic 100 psi

Required equipment

Tagout tags (2)

Interlocking hasps (2)

Padlocks (2)

Ball Valve Lockout (1)

I. Shut Down Procedures

1. Authorized employee shall know type and magnitude of energy machine utilizes…and understand all associated hazards
2. Notify all affected employees of pending lockout or tagout system and specific reasons for LOTO
3. Electrical: Press **"STOP"** button to completely de-energize machine

II. Isolation Procedures

1. Electrical: Located between two machines
2. Turn main service isolator to **"OFF“** to isolate electrical power
3. Pneumatics: Located on right side of machine
4. Rotate main air valve to **“CLOSED”** position to block air service

III. Lockout Procedures

1. Electrical: Lockout main isolator using interlocking hasp and padlock
2. Pneumatics: Lockout air service valve using a ball valve lockout, interlocking hasp, and padlock

IV. Verification Procedures

Electrical

1. “Try” machine start controls – **"ON/OFF"** switch to **“ON”** position and observe machine
2. Switch **"ON/OFF“** switch to **“OFF”** position
3. Verify blade openings on electrical conductors or energized parts
4. Test for no voltage on phase-to-phase and phase-to-ground before beginning work

IV. Verification Procedures

Pneumatic

1. Verify isolation of air service
2. Verify dissipation of residual air

Verify Equipment Isolation

Verification of isolation and de-energization by authorized employee before work on machines or equipment that have been locked out or tagged out

Verify Equipment Isolation

Are all personnel clear of hazards?

Are locking devices secure?

Attempt normal startup

Return control to OFF/Neutral

Verification

Test circuits

Test cycling

Visually inspect position

Manual trying

Monitor movement or discharge

Observe bleeds, gauges, indicators, etc.

Other available means?

Use techniques with best degree of isolation assurance

Do not rely on pressure gauges alone to indicate pressure. They are often inoperable.

V. Returning to Service

1. Check machine and area to ensure nonessential items have been removed and components intact
2. Check work area to ensure all employees are safely positioned or removed from work area
3. Electrical: Remove padlock and interlocking hasp from main isolator and turn isolator to **"ON"** position

V. Returning to Service

4. Pneumatics: Remove ball valve lockout, interlocking hasp, and padlock from air service line and rotate main air service valve to **“OPEN”** position
5. Notify affected employees – machine ready for use

Shift or Personnel Changes

Specific procedures

Continuity of protection

What procedures could achieve this continuity of protection?

QUESTIONS?

Session 5

Periodic Inspections

Periodic Inspections

What is the frequency of the inspection?

Who conducts these inspections?

Why is the inspection needed?

What is required in the “periodic” inspection?

Is there a difference between the inspection for lockout procedures and tagout procedures?

Periodic Inspections

- Energy control procedures – at least annually
- Performed by “authorized employee” – other than one(s) utilizing this energy control procedure
- Correct deviations or inadequacies
- Include review of responsibilities between inspector and each authorized and affected employee

Periodic Inspection – Certification

Identify machine or equipment

Date of inspection

Employees involved

Inspector’s name

Session 6

Training and Communication

Definitions

"**Authorized employee**" A person who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment.

An affected employee becomes an authorized employee when that employee's duties include performing servicing or maintenance covered under this section.

Definitions

"**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 under lockout or tag-out, or

an employee whose job requires him/her to work in an area in which such servicing or maintenance is being performed.

Training and Communication

Would the training be different for these employees?

Training – Authorized Employee

Recognition of applicable hazardous energy sources

Type and magnitude of energy in workplace

Methods and means for energy isolation and control

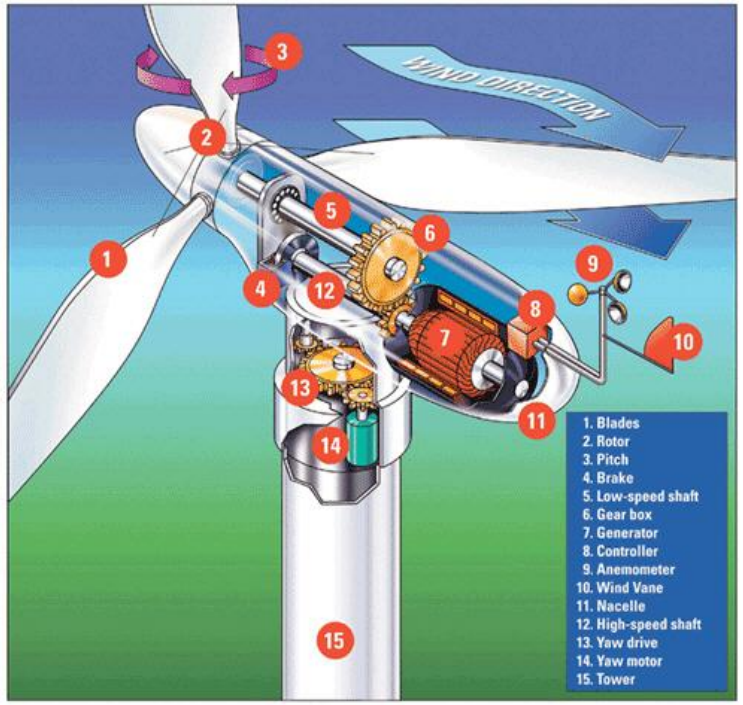


Photo: American Wind Energy Association

Training – Affected and Other Employees

Affected employees – purpose and use of energy control procedures

Others – procedures and prohibitions during LOTO (e.g. no restarting or reenergizing equipment)

Training "Tag-Out"

In addition to previous requirements…

Limitations of tags

No tag removal without proper authorization

Never bypass, ignore or defeat tag

Tags – legible and understandable

Environmental considerations – durability

False sense of security – explained

Means of attachment – no inadvertent/accidental detachment

Training and Communication

Understandable

Acquire knowledge and skills

Application, usage and removal of energy controls

Ensure purpose and function of program

Retraining

When would “retraining” be needed?

Required?

Retraining

Change/s

- Job assignment
- Machines
- Energy control procedures

Equipment or processes present new hazards

Inspections reveal deficiencies

Employer believes there are deviations from program

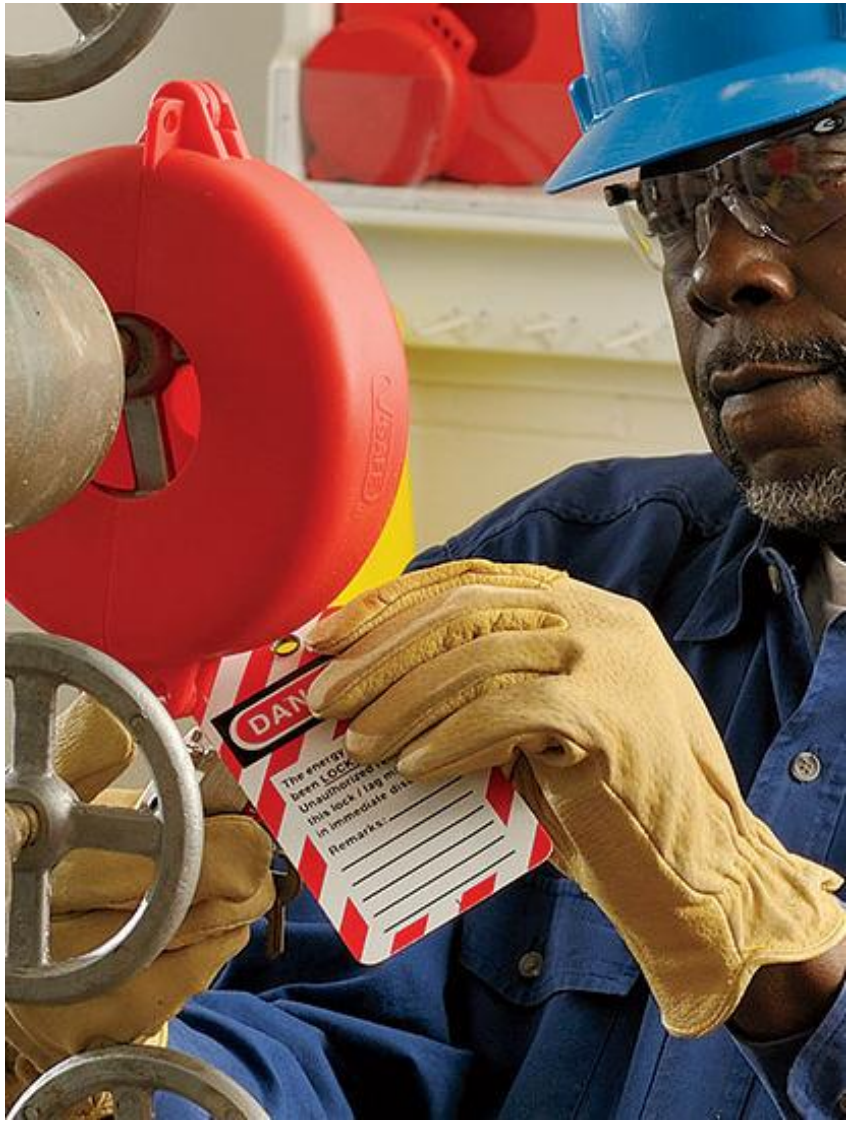
Training – Certification

Training accomplished

Up-to-date

Employee's name

Date/s of training



Training and Communication

Review

Who must be trained?

What must be included in the training?

How frequently should training be conducted?

QUESTIONS?

What if the authorized employee is not available?

Additional Requirements

Removing locks or tags for testing or positioning of machines, equipment or components

Clear machine or equipment of tools and materials

Remove employees from machine or area

Remove lockout or tagout devices

Energize and proceed with testing or positioning

De-energize all systems and reapply energy controls to continue servicing and/or maintenance

Outside Personnel – Contractors

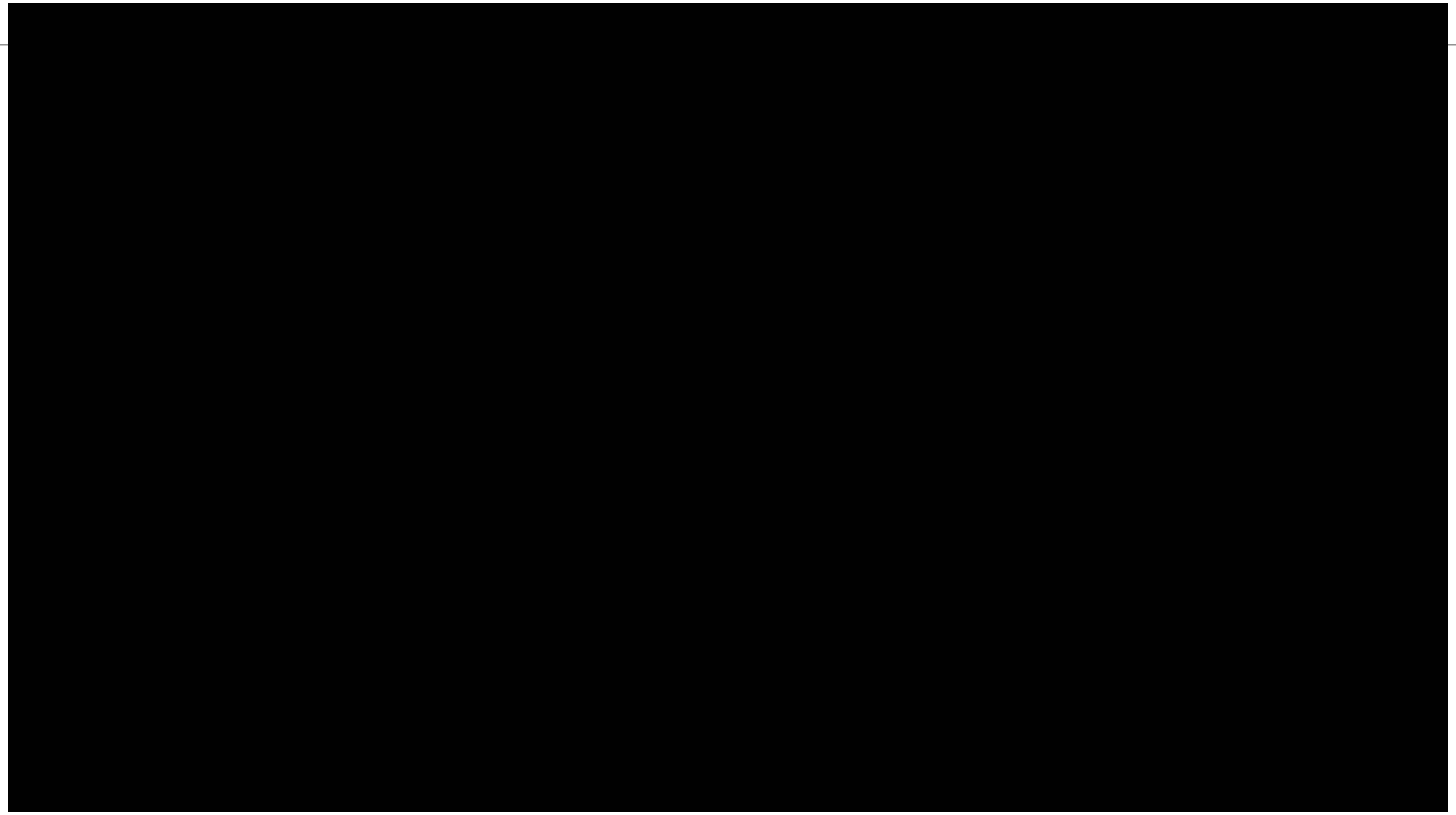
On-site employer – employees

Outside employer – employees

Communication

Understand and comply with respective LOTO procedures

Contractor – Dupont Facility



Review – LOTO Procedure

1. Prepare for shutdown
2. Shut down equipment
3. Isolate all energy sources
4. Apply locks and tags
5. Release stored energy
6. Verify equipment isolation
7. Release from Lockout

Review – Learning Objectives

Discuss – scope, application, purpose and key definitions

Describe – activities covered by LOTO requirements

Describe – activities NOT covered by LOTO requirements

Identify and discuss – control measures for various case studies

Review – Learning Objectives

Discuss – elements of an energy control program

Explain – process for a workplace energy source inventory

Develop – written procedure for a designated piece of equipment

Discuss – training/communication of authorized; affected; and “other” personnel

Identify – requirements for periodic inspections

QUESTIONS?

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