

LOCKOUT / TAGOUT (LOTO)

CONTROLLING HAZARIDOUS ENERGY

Best Practices, OSHA Compliance,
and Real-World Application

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Essential protocols for protecting workers
during servicing and maintenance.

THE HIGH STAKES OF HAZARDOUS ENERGY

THE HUMAN COST

120 
ANNUAL FATALITIES

50,000 
ANNUAL INJURIES

In the U.S. manufacturing sector, proper LOTO procedures are the only barrier preventing these statistics.

THE VIOLATION



Despite the risks, LOTO standards remain one of the most frequently cited violations in the industry.

THE ROOT CAUSES

-  **1. Missing Procedures** 
Missing procedures proper LOTO procedures can be non-complying risks, information and continue.
-  **2. Inadequate Training** 
Inadequate training in brief procedures are important events underlinal requirement.
-  **3. Poor Documentation** 
Documentation, cleanliness and poor documentation are becoming a trend and states is disorganized.

**IN MANUFACTURING ENVIRONMENTS, THE RISK OF UNEXPECTED STARTUP IS HIGH.
COMPLIANCE IS NOT JUST PAPERWORK; IT IS SURVIVAL.**

THE REGULATORY BASELINE: OSHA 29 CFR 1910.147



The Control of Hazardous Energy

Employers must establish a written 'Energy Control Program' based on three non-negotiable pillars:



1. PROCEDURES

Machines must be fully isolated from energy sources before any servicing begins.



2. TRAINING

Employees must be educated on the system, distinct to their roles.



3. INSPECTIONS

Periodic audits must verify the program's effectiveness annually.

IDENTIFYING THE ENEMY: COMMON ENERGY SOURCES

Manufacturing equipment often contains multiple energy sources. Each must be identified, isolated, and verified.



ELECTRICAL
(Motors, panels,
wiring)



HYDRAULIC
(Presses, lifts,
fluid power)



PNEUMATIC
(Compressors,
actuators)



THERMAL
(Ovens, heat
exchangers)



CHEMICAL
(Tanks, pipelines,
cleaning)



MECHANICAL
(Springs, flywheels,
moving parts)

THE HUMAN ELEMENT: ROLES & RESPONSIBILITIES



AUTHORIZED EMPLOYEES

The individuals who physically perform the LOTO. Must be trained in energy types, isolation methods, and specific procedures.



AFFECTED EMPLOYEES

Those who operate or work near the equipment being serviced. Must understand the purpose and impact of LOTO procedures.



ALL OTHER EMPLOYEES

Any other staff in the facility. Must be trained strictly NOT to restart equipment that is locked or tagged out.

THE HARDWARE: LOCKS VS. TAGS

All devices must be durable, standardized, and substantial.

LOCKOUT DEVICE



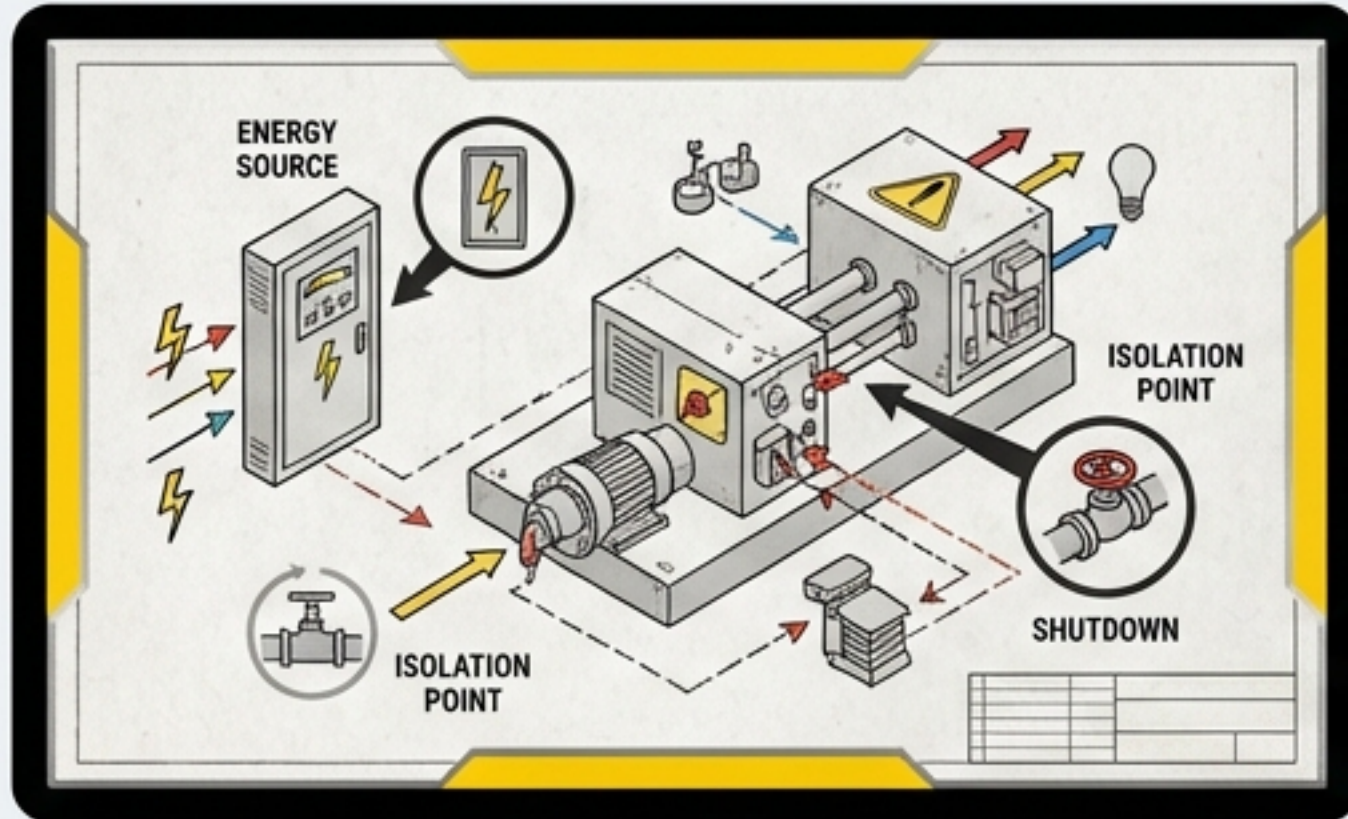
Physically prevents operation. Must be substantial enough to prevent removal without excessive force.

TAGOUT DEVICE



Serves as a warning indicator. Must state clearly that the machine is not to be operated.

IMPLEMENTATION BEST PRACTICES: PREPARATION



STEP 1: DEVELOP MACHINE-SPECIFIC PROCEDURES

- ➔ Identify ALL energy sources and isolation points.
- ➔ Include step-by-step instructions for shutdown, isolation, lockout, and verification.
- ➔ **Tip:** Use diagrams or photos for clarity.



STEP 2: USE STANDARDIZED DEVICES

- ➔ Assign color-coded locks to specific departments or roles.
- ➔ Ensure tags include employee name, date, and specific reason for the lockout.

IMPLEMENTATION BEST PRACTICES: EXECUTION

STEP 3: TRAIN AND RETRAIN



Conduct hands-on training with real equipment. Address complex scenarios like group lockouts, shift changes, and contractors. Refresh annually.

STEP 4: VERIFY ISOLATION (THE TRYOUT)



This is the **critical fail-safe**.

- ⚠️ Attempt to start the machine to confirm it is de-energized.
- ⚠️ Check gauges, valves, and control panels.
- ⚠️ Use 'tryout' procedures to ensure a ZERO ENERGY STATE.

IMPLEMENTATION BEST PRACTICES: ACCOUNTABILITY



STEP 5: MAINTAIN DOCUMENTATION

"If it isn't documented, it didn't happen."

- ⚠ • Keep records of procedures, training, inspections, and incidents.
- ⚠ • Use digital checklists or forms to streamline compliance.

ANNUAL INSPECTIONS



Employers must conduct annual inspections to verify effectiveness. This includes a mandatory review with authorized employees.

LEARNING FROM TRAGEDY: REAL-WORLD INCIDENTS

CHEMICAL HAZARD



Ohio Meat Processing (2023)

Employee suffered chemical burns falling into a vat during maintenance. **Failure to implement LOTO procedures** led to a **\$278,000 OSHA fine**.

MECHANICAL HAZARD



Conveyor Jam Incident

Worker **crushed** when a jammed conveyor released unexpectedly. The machine was **not locked out; stored mechanical energy** was overlooked.

ELECTRICAL HAZARD



Arc Flash Burn (2019)

Technician sustained **third-degree burns**. **Failure to verify de-energization**. Equipment had **multiple energy sources**, but only one was isolated.

THE LOTO CHECKLIST: PHASE 1 (SHUTDOWN)



PRE-LOCKOUT PREPARATION

- Notify affected employees
- Review machine-specific procedure
- Gather locks, tags, and tools
- Identify all energy sources



SHUTDOWN & ISOLATION

- Power down equipment
- Isolate energy sources (breaker, valve)
- Apply lockout devices
- Attach tagout devices with info

THE LOTO CHECKLIST: PHASE 2 (VERIFY & RESTORE)



STORED ENERGY CHECK

- Release pressure (hydraulic/pneumatic)
- Discharge capacitors
- Block mechanical movement
- Vent gases or drain fluids



VERIFICATION

- Attempt to start equipment
- Check gauges and indicators
- Confirm ZERO ENERGY STATE



RESTORATION

- Remove tools, reinstall guards
- Clear personnel
- Remove locks (Authorized only)
- Notify affected employees

DOCUMENTATION: THE LOCKOUT/TAGOUT RECORD SHEET

LOCKOUT/TAGOUT RECORD SHEET

Machine/Equipment: _____

Location: _____ Date: _____ Time: _____

Authorized Employee: _____

Energy Sources Identified:

☐ Electrical ☐ Hydraulic ☐ Pneumatic
☐ Thermal ☐ Chemical ☐ Mechanical

Lockout Devices Applied:

☐ Padlock ☐ Valve Lock ☐ Circuit Breaker Lock
☐ Tagout Device

Stored Energy Released: ☐ Yes ☐ No

Sign-Off:

Verification Method: _____

Work Completed By: _____

Locks Removed By: _____

Restoration Time: _____

FINAL THOUGHTS: BEYOND COMPLIANCE

Lockout/Tagout is more than a requirement—it is a life-saving protocol. In manufacturing, one missed step can lead to tragedy. By implementing clear procedures, thorough training, and regular audits, facilities protect their workforce and maintain operational integrity.

A strong LOTO program reflects a company's commitment to safety, accountability, and professionalism.