

# LOCKOUT/TAGOUT PROCEDURES: A COMPREHENSIVE OVERVIEW

The origin, definition, use and advantages  
of lockout/tagout procedures.



**Rockwell  
Automation**

# Lockout/Tagout Procedures: Defined

## Overview

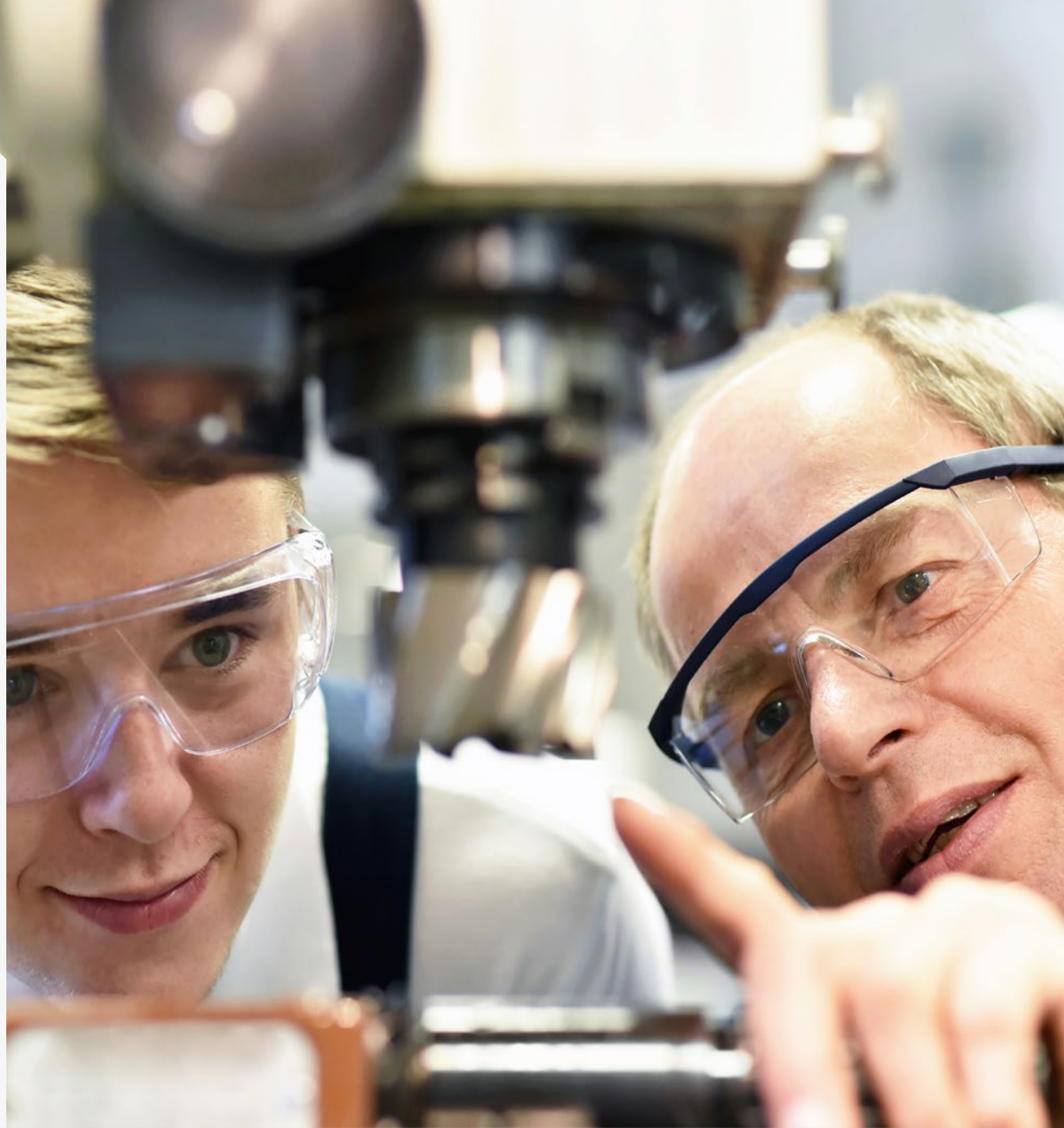
**Lockout** procedures are written steps used to bring a machine to a zero energy state. Locks are affixed to energy isolation devices to ensure the responsible employee maintains control over any hazardous energy. **Tagout** devices are used for the same purpose, but do not offer the same ability to maintain control. Tagout devices are more archaic and less accepted for employee protection.

Today, lockout/tagout generally refers to lockout devices and identification tags used in conjunction to identify the employee performing the actual isolation. By using a lockout/tagout procedure, employees can help protect themselves from unexpected re-energization or release of stored energy and companies can find greater efficiency and productivity through the use of these procedures.

The purpose of machine-specific lockout/tagout procedures is to guide an authorized employee through a sequential process that renders a piece of equipment safe in what is referred to as a zero-energy-state.

In other words, all energy forms have been removed, including electrical, pneumatic, hydraulic, and any potential energy or kinetic energy. These procedures also provide awareness of hazards the employee might be exposed to, a standard approach to inform others of equipment isolation, and return-to-service instructions.

Once the lockout/tagout procedures are followed by the authorized employee(s), service and maintenance can be performed on the equipment safely because all forms of energy are isolated and controlled by each individual person servicing the equipment. In short, when serviceable equipment is properly locked out, there is no chance for an unexpected start-up to occur.



# History of Lockout/Tagout Procedures

The Control of Hazardous Energy regulation, developed in 1982 by the United States Occupational Safety and Health Administration (OSHA) to help protect workers who routinely service equipment in the workplace, went into full legal effect in 1989 as statute 1910.147(c)(4)(i). As outlined in the statute, OSHA requires the use of machine specific lockout/tagout procedures for each piece of equipment that fails to meet all eight elements of the exemption criteria outlined within the statute.

The first lockout procedures were simple and text-based in nature, meaning that all steps were described in written text without the support of images or graphics. They provided employees basic information about how to properly shutdown and lockout the equipment.

When OSHA began its program of requiring lockout/tagout procedures, manufacturing and other worksites looked much different than they do today. At many companies, machines were not designed for the lockout process and local electrical disconnects were often not an option. Providing a visual tag (tagout) with safety information was the only solution. The lockout portion followed later.

As lockout/tagout became more common and as employers saw the benefits of having an energy control program, procedures gradually became more detailed and intuitive to understand, thanks to the addition of graphical elements. Easy-to-read procedures tend to

facilitate the most efficient process. Today, lockout/tagout procedures are documented in a variety of ways, including line, graphical and electronic.

The documentation styles have changed but the process of lockout/tagout remains as one of the cornerstones of safety around industrial machinery. The principles of achieving the zero energy state have not changed, but the agencies charged with enforcing the regulations have evolved over time.

In the United States, there are 26 states with their own occupational safety and health divisions, separate from OSHA, but all are working toward the common goals of increased compliance, improved worker safety and decreased workplace incidents due to failure to properly lockout any appropriate piece of equipment. State plans must meet federal guidelines at a minimum but typically have additional requirements or stipulations.

Standards around the globe have also evolved to provide better guidance on how to comply with regulations. One newer standard, ISO 45001, establishes guidelines for creating and maintaining a health and safety management system designed to enhance health and safety in the workplace. ANSI ASSE Z244.1, CSA Z460, and ISO 14118 specifically address isolation of hazardous energy for the U.S., Canadian, and international audiences.

## WHEN:

1989

## WHO:

OSHA

## WHAT:

1910.147 Regulation

## WHY:

Unacceptable rates of workplace injuries

## HOW:

Requires employers to provide worker protection in the form of LOTO procedures

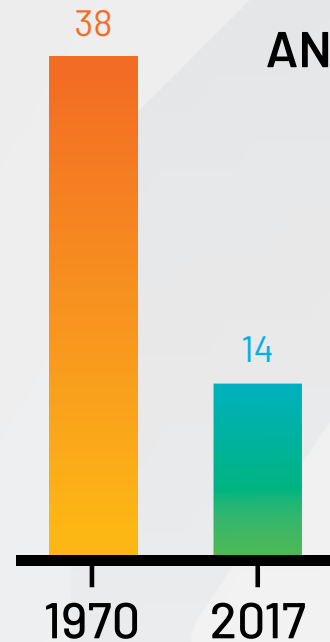
## 30 YEARS OF LOCKOUT/TAGOUT

OSHA statute 1910.147(c)(4)(i), established in 1989, required employers to create procedural safeguards against the unexpected energization or startup of machinery and equipment or the release of hazardous energy during service or maintenance.

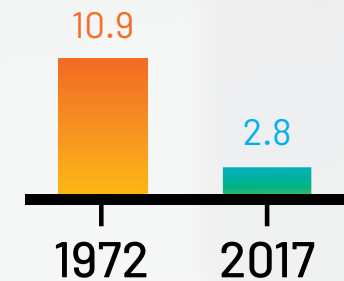
- Early priorities of the regulation revolved around tagout solutions. At the time of program implementation, most machines weren't designed to accept a padlock at the points of isolation. The tagout system, which provides a very basic level of protection, may have been the only solution at times.
- Implementation soon moved to a focus on lockout devices for isolation. Tags were used to identify which employee was executing the isolation.
- As the statute became Standard Operating Procedure at worksites across the country, it has resulted in a substantial reduction in employee injuries and fatalities.
- The Lockout/Tagout standard now prevents an estimated 120 fatalities and 50,000 injuries each year.

Source: <https://www.osha.gov/osh40/OSHATimeline.pdf>

## WORKER INJURIES, ILLNESSES, AND DEATHS HAVE BEEN STEADILY DECREASING SINCE THE IMPLEMENTATION OF OSHA REGULATIONS



**Worker Deaths per Day**



**Injuries or Illnesses per 100 Workers**

Source: <https://www.osha.gov/oshstats/commonstats.html>

# The Five Components of Lockout/Tagout

Lockout/tagout procedures are a major component of a compliant lockout/tagout program. The five required components are:

- **Corporate Policy:** Use this policy as the foundation of your organization's lockout/tagout program. Each policy is unique to each facility location and should adapt with time.
- **Machine-Specific Procedures:** Create machine-specific procedures for every piece of equipment in your facility and install that procedure right at the point of use. The existence of these procedures will not only help assure compliance, but also encourage the authorized employees to follow it when they are locking the equipment out.
- **Training:** Provide training to both authorized and affected employees. 'Authorized' are those who are applying the locks and 'affected' are those in the area during a lockout, such as operators. Don't forget about contractors working on your site – they are considered affected employees if they are in proximity of a lockout but not involved and you need to be sure they are trained and approved prior to applying a lock as they will then be considered authorized.
- **Locks and Devices:** Purchase locks and devices that are specific for lockout/tagout and uniform in make and color. Ensure enough locks, identification tags, and isolation devices are available for the volumes of equipment to be locked out and that all types of isolating devices are available for the various types of isolation points (ball valves, gate valves, breakers, etc.).
- **Annual Audits:** Review every lockout/tagout procedure at least yearly, and audit the authorized employees as well. This is done to confirm that your company's program integrity is maintained. Be sure to keep all of the data collected during the audit as proof of compliance.



**Corporate Policy**



**Machine-Specific  
Lockout/Tagout Procedures**



**Employee Training**



**Locks & Devices**



**Annual Audits**

# What Equipment is Exempt from a Lockout/Tagout Procedure?

**Creating a lockout/tagout policy designed for your facility's specific equipment needs is essential for ensuring compliance.**

Under very specific circumstances, a lockout/tagout procedure is not required. OSHA has defined eight criteria that a machine must meet in order to be exempt from needing a lockout/tagout procedure. Failure to meet even one item will result in the equipment needing a documented machine-specific procedure.

## THE EIGHT EXEMPTIONS ARE:

1. There can be no potential for stored or residual energy. Examples of residual energy include thermal sources or moving parts.
2. The machine must have only one energy source that can be easily isolated. Energy sources consist of electrical, compressed gases/air, steam, water, chemicals, fuels, etc.
3. The machine must be completely deactivated by the isolation of its single energy source.
4. The machine must be capable of being locked out during service.
5. The machine must be controlled and isolated by using only one lockout device. If multiple devices are needed, it is not exempt.
6. The employee must be able to have the device under their exclusive control during service.
7. The employee must be able to service the machine without creating additional hazards that could harm other workers.
8. The company can have no prior accidents on the machine due to uncontrolled energy.

To see the exact OSHA standard, reference [CRF 1910.147\(c\)\(4\)\(i\)](#).



## #1 Most Cited Regulation

In 2018, for the 24th year in a row, OSHA's regulation 1910.147, titled "The control of hazardous energy (lockout/tagout)," made the top 10 most cited regulation list. Currently, it's the number one most cited regulation in the manufacturing industry.

A citation for violating the lockout/tagout regulation may come as a surprise to many manufacturers. Most programs start in a compliant state, but changes over time often result in noncompliance. Changes to individual equipment mean machine specific procedures must change, new employees need to be trained, and audits are sometimes difficult to keep up with.



# Requirements for all authorized employees

**Once the safety criteria are established in the written policy, training and education must be shared with employees.**

Performing maintenance or servicing equipment can be dangerous to employees, therefore only authorized employees are allowed to perform maintenance or servicing of equipment. OSHA clearly defines who is an authorized employee, the responsibilities of an authorized employee, and who is an affected employee.

By OSHA standards an authorized employee is a person who locks or tags out equipment to perform servicing or maintenance. This includes employees who:

- perform energy source isolation
- implement lockout and/or tagout on machines or equipment
- dissipate potential (stored) energy
- verify energy isolation
- implement actions to release LOTO
- test or position machines or equipment

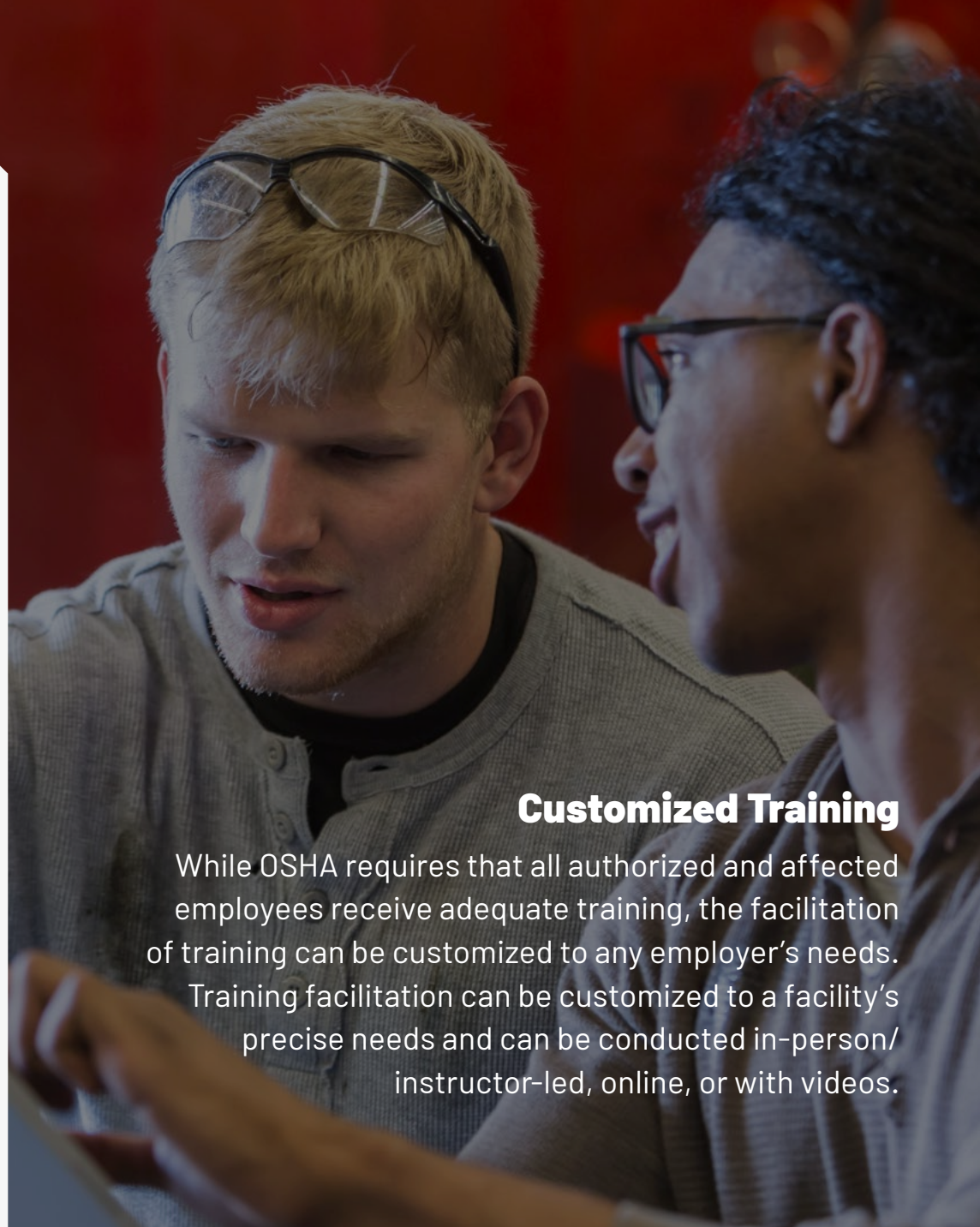
## AUTHORIZED EMPLOYEES

Authorized employees are required to attend training on applicable hazardous energy, types, and magnitudes in the workplace. In the training, authorized employees learn how to perform lockout/tagout while servicing or performing maintenance; they need to know the proper steps for isolating and locking out energy sources and should be trained on methods for verifying the accuracy of the lockout.

Authorized employees must also understand how to isolate energy in more complex situations, such as group lockout, shift changes, and other special circumstances. In performing all lockout scenarios it is the authorized employee's responsibility to notify all employees in the area that a lockout is being performed. In doing so, they ensure no one interferes with the lockout, and they secure the safety of all authorized and affected employees.

## AUTHORIZED VS. AFFECTED EMPLOYEES

Everybody plays a role when it comes to the safety and wellbeing of employees; however, these roles may differ depending on a person's job title and training that they have been provided with. When it comes to lockout/tagout, there are two major groups of employees: the authorized employees and the affected employees. An affected employee, for example an operator, is an employee who is affected by lockout/tagout, and who is not authorized to lockout equipment. An authorized employee is an employee, such as a maintenance mechanic, who has had proper training and is allowed to lockout equipment.



### Customized Training

While OSHA requires that all authorized and affected employees receive adequate training, the facilitation of training can be customized to any employer's needs. Training facilitation can be customized to a facility's precise needs and can be conducted in-person/instructor-led, online, or with videos.

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# Alternative Measures for Lockout/Tagout

In some specific instances, Alternative Protective Measures (APMs) can be used as a complement to traditional lockout/tagout procedures.

Certain machine tasks that are “routine, repetitive and integral to production” may use alternative measures under the minor servicing exception to **OSHA’s LOTO regulation** (see OSHA exception language on page 12). APMs are typically applied to minor servicing tasks that require frequent access, such as a tool change or machine adjustment. They may require lockout of only a section of equipment rather than an entire machine or reliance on a safety control system that provides equivalent levels of protection.

When used to perform the specified tasks, alternative measures provide equivalent levels of protection from hazardous energy sources while helping to improve worker safety and productivity by streamlining worker activities and only isolating relevant hazards.

In order to justify the use of alternative measures, the machine user must perform a systematic evaluation of the tasks being performed and the alternative safeguards that are available. Most machine safety standards prescribe a lifecycle approach to accomplish this task. The machine safety lifecycle is a common methodology to promote proper identification, deployment, and documentation for alternative measures.



The following excerpt from OSHA's LOTO regulation identifies the conditions that allow use of alternative measures:

## 1910.147(A)(2)(II)(B)

An employee is required to place any part of his or her body into an area on a machine or piece of equipment where work is actually performed upon the material being processed (point of operation) or where an associated danger zone exists during a machine operating cycle.

*Note: Exception to paragraph (a)(2)(ii):* Minor tool changes and adjustments, and other minor servicing activities, which take place during normal production operations, are not covered by this standard if they are routine, repetitive, and integral to the use of the equipment for production, **provided that the work is performed using alternative measures which provide effective protection (See Subpart O of this Part).**

It is also possible to use this methodology to seek a variance from the LOTO regulation for tasks that are not routine, repetitive, or integral to production but still require energy to be applied. This is not a trivial matter, and a great amount of diligence and detail is required. To see an example of a successful application for a permanent variance from the OSHA LOTO regulation, see "Federal Registers - Nucor Steel Connecticut Incorporated; Grant of a Permanent Variance".



# Safety Lifecycle

## IN A NUTSHELL, THE MACHINE SAFETY LIFECYCLE INCLUDES THE FOLLOWING STEPS:

1. **Risk Assessment** to identify and quantify risks
2. **Safety Functional Requirement Specification** to select and specify among the multiple possibilities which is the most recommended corrective measure to reduce the risk
3. **Design Verification** to define the project to implement the corrective measures identified before and make sure that they reduce the risk as required on the risk assessment
4. **Installation and Validation**, which is basically executing the proper installation of the safety solution at the machine and testing if it works as planned at the functional specification for both normal and abnormal operation modes
5. **Maintain and Improve** to make sure that the system keeps operational and functional over time



*Comply with Standards*



*Reduce Risk*



*Optimize Production*

# REQUIRED COMPONENTS OF A LOCKOUT/TAGOUT PROCEDURE

Lockout/tagout policies are the foundation of an energy control program. These policies provide the blueprint for lockout/tagout procedure requirements, and also include such crucial points as: identifying who is responsible for developing and maintaining the program, outlining what type of procedures will be most effective and documenting the training requirements.


Procedures are vitally important in the everyday safety of the employees of a company. Therefore, every procedure should contain clear and concise instructions and information as to how to lockout a specific piece of machinery (see Figure 1).

The information required on each procedure, according to OSHA standards, is as follows:

- A statement of the intended use of the procedures
- Methods for shutting down the machine and controlling hazardous energy
- Steps for the placement and removal of lockout locks, tags, and devices, and;
- Ways to verify the machine has been properly locked out

Procedures also should include information about the specific type of energy, the magnitude of the energy, location of isolation, and any additional techniques to be utilized for lockout/tagout.

Refer to regulation [1910.147\(c\)\(4\)\(i\)](#) for a full list of requirements.


**LOCKOUT/TAGOUT PROCEDURE**  
OSHA CFR 1910.147

Description: Air Compressor 1		Equipment #: COMP-1	
Area: South Utility Building	Location: Compressor Room	Rev: 0	Date: N/A
Origin Date: 1/2/2019			


4 **Isolation Points to be Locked and Tagged**


NEXT AUDIT DUE  
**JAN 2020**


NEXT AUDIT DUE  
**JAN 2021**

NEXT AUDIT DUE  
**JAN 2022**


NEXT AUDIT DUE  
**JAN 2023**

**South Side View**  



**West Side View**  


**North Side View**  


REFERENCE MACHINE SHUTDOWN STEPS BEFORE LOCKING OUT					
ID	Source	Device	Location	Method	Check
	Electrical 480V	Padlock	Isolation point on South side of unit.	Move electrical disconnect to off. Lock out.	Attempt restart at CP-1.
	Pneumatic Outlet - 100 PSI	Ball valve device	Isolation point on North side of unit.	Turn valve to closed position. Lock out.	Visually verify zero pressure status.
	Chilled Water Inlet - 40 PSI	Padlock	Isolation point located above unit.	Turn valve to closed position. Lock out.	Visually verify zero pressure status.
	Chilled Water Outlet - 40 PSI	Padlock	Isolation point located above unit.	Turn valve to closed position. Lock out.	Visually verify zero pressure status.
Thermal Energy 200 F			Be sure to wait until unit reaches a safe temperature before servicing. Wear proper PPE before beginning work.		
Kinetic Energy 1800 RPM			Be sure to wait until all moving parts have come to a complete stop. If necessary, use a block or chain to prevent equipment from moving while servicing.		



Any machine modifications must be shown in procedure. Contact safety department to update procedure.  
**Safety Is Your Responsibility!**



Page 1 of 1      SAMPLE - South Utility Building - Compressor Room - Air Compressor - COMP-1.xlsx

However, conveying this information does not make a complete lockout/tagout procedure. Additionally, OSHA recommends that a specific lockout step be documented to properly instruct the authorized employee how to correctly lockout a machine. The lockout shutdown sequence should include the following:

1. Notify all affected employees that servicing is required and the machine is going to be locked out; this needs to be done before lockout is performed.
2. The authorized employee should familiarize themselves with the procedure; employees must have knowledge of the energy sources & their hazards and understand how to lock them out.
3. The employee shall locate the devices needed to lockout the equipment.
4. If the machine or equipment is operating, shut it down by the normal stopping procedure.
5. Energy sources need to be isolated and controlled. Lockout or tagout devices should be applied to each source by the authorized employee.
6. Stored or residual energy must be dissipated or restrained by methods such as blocking or chaining, bleeding off pressure, or repositioning parts. If there is a possibility of re-accumulation of energy, verification must be continued throughout the lockout.
7. Finally the employee must verify the lockout has effectively been applied by testing the machine for re-energization using the machine controls or other means.

This lockout sequence documentation needs to provide clear and concise instructions to all authorized employees for safely locking out a piece of equipment.

## Best practices for creating lockout/tagout procedures

- Keep the wording simple and consistent between procedures.
- Include only the basic principles of what the technicians need to know.
- Use pictures to enhance the procedures and show specific isolation points.
- Color coordinate energy sources to easily identify what needs to be locked out.
- Have a consistent layout between procedures.
- Try to keep the procedure to a single page.
- Have someone knowledgeable write the procedures.

# Ways to Document Types of Lockout/ Tagout Procedures


**Procedural safeguards like lockout/tagout only work if they are executed properly.** The way the procedure is documented can make a big difference to the person trying to carry it out correctly. The different types of procedure documentation - which vary depending upon each company's size and needs - are described on the following page.

It is up to each company to determine which documentation format is going to be most effective for your employees and equipment. When authorized employees are locking out equipment, especially complex pieces, it is generally recommended to utilize a graphical format. Graphical procedures tend to provide the clearest, most easily accessible and visually appealing guidance for employees, so as to not confuse or distract them from performing the lockout safely. Proper location and identification of all energy sources is also essential.



# Graphical Procedures

The current best practice for lockout/tagout procedure formats is undoubtedly the picture-based graphical approach. By including high resolution photos of the equipment, isolation points, control points and specific shutdown components, authorized employees are able to quickly grasp how to lock out the equipment. Including graphical tags with this solution helps integrate the procedure with the isolation point and makes the lockout/tagout process much more efficient.



**Rockwell Automation**

**LOCKOUT/TAGOUT PROCEDURE**  
OSHA CFR 1910.147

Developed by	Reviewed by	Revised by
RA	RA	

Description: Chiller

Equipment #: CH2

Area: Utilities

Location: Chiller Room

Rev: 0

Date: N/A

Origin Date: 1/2/2019

5

Isolation Points to be Locked and Tagged

CAUTION

Pressurized refrigeration loop to be serviced by authorized personnel only.


NEXT AUDIT DUE  
JAN 2020

NEXT AUDIT DUE  
JAN 2021


NEXT AUDIT DUE  
JAN 2022

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JAN 2023


**West Side View**





**West Side View**




**West Side View**



REFERENCE MACHINE SHUTDOWN STEPS BEFORE LOCKING OUT

ID	Source	Device	Location	Method	Check
E-1	Electrical 480V	Padlock	Isolation point on North side of unit.	Move electrical disconnect to off. Lock out.	Attempt restart at CP-1.
W-1	Chilled Water Inlet - 80 PSI	Cable device	Isolation point on West side of unit.	Turn valve to closed position. Lock out.	Visually verify zero pressure status.
W-1	Chilled Water Outlet - 80 PSI	Cable device	Isolation point on West side of unit.	Turn valve to closed position. Lock out.	Visually verify zero pressure status.
W-1	Condenser Water Inlet - 80 PSI	Cable device	Isolation point on East side of unit.	Turn valve to closed position. Lock out.	Visually verify zero pressure status.
W-1	Condenser Water Outlet - 80 PSI	Cable device	Isolation point on East side of unit.	Turn valve to closed position. Lock out.	Visually verify zero pressure status.
	Thermal Energy 200 F		Be sure to wait until unit reaches a safe temperature before servicing. Wear proper PPE before beginning work.		
	Kinetic Energy 1800 RPM		Be sure to wait until all moving parts have come to a complete stop. If necessary, use a block or chain to prevent equipment from moving while servicing.		

DANGER




Page 1 of 1

Any machine modifications must be shown in procedure. Contact safety department to update procedure.

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SAMPLE - Utilities - Chiller Room - Chiller - CH2.xlsx

DANGER



# Text-based Procedures

Text-based formats are enough to meet minimum lockout/tagout compliance standards, but they are becoming less common. Like all procedures, these briefly describe the equipment or machines they apply to, followed by a list of steps that must be followed to properly lock out the equipment. A set of numbered steps or a checklist of possible sources, noting those present in a given piece of equipment, is included.

ES&Sservices.com

Subject: AIR COMPRESSOR #1	EQUIPMENT #: 7022
DEPARTMENT-AREA: SOUTH UTILITY BUILDING - UTILITIES	PAGE : 1
	OF: 1
APPROVED BY:	EFFECTIVE: 1-20-2010
	REVISED: 0

**Note:** Only shut down Air Compressor #1 when Air Compressor #2 is fully operational. Shutting down both compressors will affect facility operations.

**PURPOSE:**  
To prevent injury to personnel when performing maintenance or operation of equipment.

**POLICY:**  
The following lockout/tagout procedure will be followed to ensure that appropriate lockout devices or tagout devices are used to disable machines or equipment, preventing unexpected energization, start-up or releasing of stored energy, and thus helping prevent injury to personnel.

**PROCEDURE:**  
**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.  
**Perform Machine Stop.** If the machine or equipment is operating, shut it down by the normal stopping procedure.  
**Locate** and identify power sources, potential hazards and all control devices.

**Lock out**

Step	Source	Location	Method
1	Electrical 4400V	Isolation point located on MCC- L7274M	Move electrical disconnect to off. Lockout with Padlock
2	Electrical 480V	Isolation point located on North side of unit	Move electrical disconnect to off. Lockout with Padlock
3	Pneumatic 120 PSI	Isolation point located above unit	Turn valve to closed position. Lock out with Cable device.
4	Cooling Water Inlet 40 PSI	Isolation point North side of unit	Turn valve to closed position. Lock out with Cable device.
5	Cooling Water Outlet 30 PSI	Isolation point North side of unit	Turn valve to closed position. Lock out with Cable device.
6	Thermal Energy 300F	Be sure to wait until head has dissipated from machine until cool to touch before servicing. Wear proper PPE before beginning work.	
7	Kinetic Energy 600 RPM	Be sure to wait until all moving parts have come to a complete stop. If necessary, use a block or chain to prevent equipment from moving while servicing.	

**Dissipate Energy.** Isolate all power sources by blocking bleeding and venting energy that may be stored.


**Attempt to 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.

**RESTORE TO SERVICE SEQUENCE:**  
**Check Machine:** Check the machine or equipment and the immediate area around the machine to ensure that nonessential items such as parts and tools have been removed and that the machine or equipment components are operationally intact including replacements of guards.  
**Check Area:** Check the work area to ensure all employees have been safely positioned or removed from the area.  
**Verify Machine:** Verify the controls are in neutral.  
**Remove Lockout:** Remove the locks, tags, and lockout devices and reenergize the machine or equipment.  
**Notify:** Notify affected employees that the servicing or maintenance is completed and the machine is ready for use.

# Line Drawing Procedures

Line drawings became very popular in the 1990's as a better alternative to text-based procedures. They took less time to create than text-based procedures and they also gave the authorized employee a clearer understanding of the instructions. Many line drawings procedures are still in place.

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**Rockwell Automation**

**LOCKOUT-TAGOUT PROCEDURE**  
OSHA CFR 1910.147

Developed by	Reviewed by	Revised by
RA	RA	

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Description: Cooling Tower #1      Equipment #: CT-1  
 Location: Rooftop      Area: Central Tower Platform      Rev: 0 - Date: N/A      Origin Date: 5/1/2019

**5 Isolation Points to be Locked and Tagged**

**Note**  
Drain cooling tower if it presents a hazard during service.

NEXT AUDIT DUE  
MAY 2015

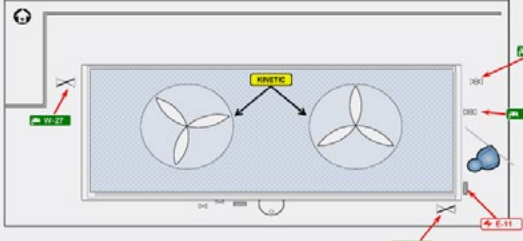
NEXT AUDIT DUE  
MAY 2016

NEXT AUDIT DUE  
MAY 2017

NEXT AUDIT DUE  
MAY 2018

Purpose: To protect authorized employees against unexpected or unplanned activation of equipment or energy while servicing equipment.  
 Scope: Utilize this procedure for any task that requires you to raise your body in terms of the equipment or if you have to leave the area while the equipment is in service.

**ZERO ENERGY STATE LOCKOUT-TAGOUT PROCEDURE**



ALWAYS PERFORM A MACHINE STOP BEFORE LOCKING OUT DISCONNECTS

Enforcement: Failure to properly follow lockout-tagout procedures may result in disciplinary action.  
 Preliminary Machine Stop Instructions: Communicate to central utilities that the cooling tower needs to be shut down remotely. After equipment is shut down remotely, locate local control panel and move selector switch to Power Off.

ID	Source	Device	Location	Method	Check	Return to Service Order
E-11	Electrical 480V	Padlock	Isolation point on Southeast side of tower. Ground level.	Move E-11 knife switch disconnect to off. Lock out with indicated device.	Attempt fan restart. Test with voltmeter.	4
W-27	Cooling Water Inlet - 40 PSI	Padlock	Isolation point on West side of tower. Located 9' above ground level.	Turn W-27 valve to closed position. Lock out with indicated device.	Reference local gauge to ensure pressure has bled off.	3
W-28	Cooling Water Outlet - 40 PSI	Padlock	Isolation point on Southeast side of tower. Ground level.	Turn W-28 valve to closed position. Lock out with indicated device.	Reference local gauge to ensure pressure has bled off.	2
W-29	Makeup Water Inlet - 15 PSI	Ball valve device	Isolation point on East side of tower. Ground level.	Turn W-29 valve to closed position. Lock out with indicated device.	Reference local gauge to ensure pressure has bled off.	1
W-30	Makeup Water Inlet - 15 PSI	Ball valve device	Isolation point on East side of tower. Ground level.	Turn W-30 valve to closed position. Lock out with indicated device.	Reference local gauge to ensure pressure has bled off.	If applicable
KINETIC	Kinetic Energy 750 RPM		Be sure to wait until cooling fan blades have come to a complete stop. If necessary, use a block or chain to prevent equipment from moving while servicing.			


**SHUTDOWN SEQUENCE - LOCK/TAG, TRY, TEST**


1. Notify
2. Review Procedure
3. Stop Machine
4. Isolate Energy
5. Lockout Energy
6. Dislodge Energy
7. Verify De-energized

**RESTORE TO SERVICE SEQUENCE**

1. Check Machine
2. Check Area
3. Verify Machine
4. Remove Lockout
5. Notify

Refer to corporate policy or training manual for detailed shutdown and restore to service instructions.  
 OPENING A GUARD DOES NOT CONSTITUTE A LOCKOUT



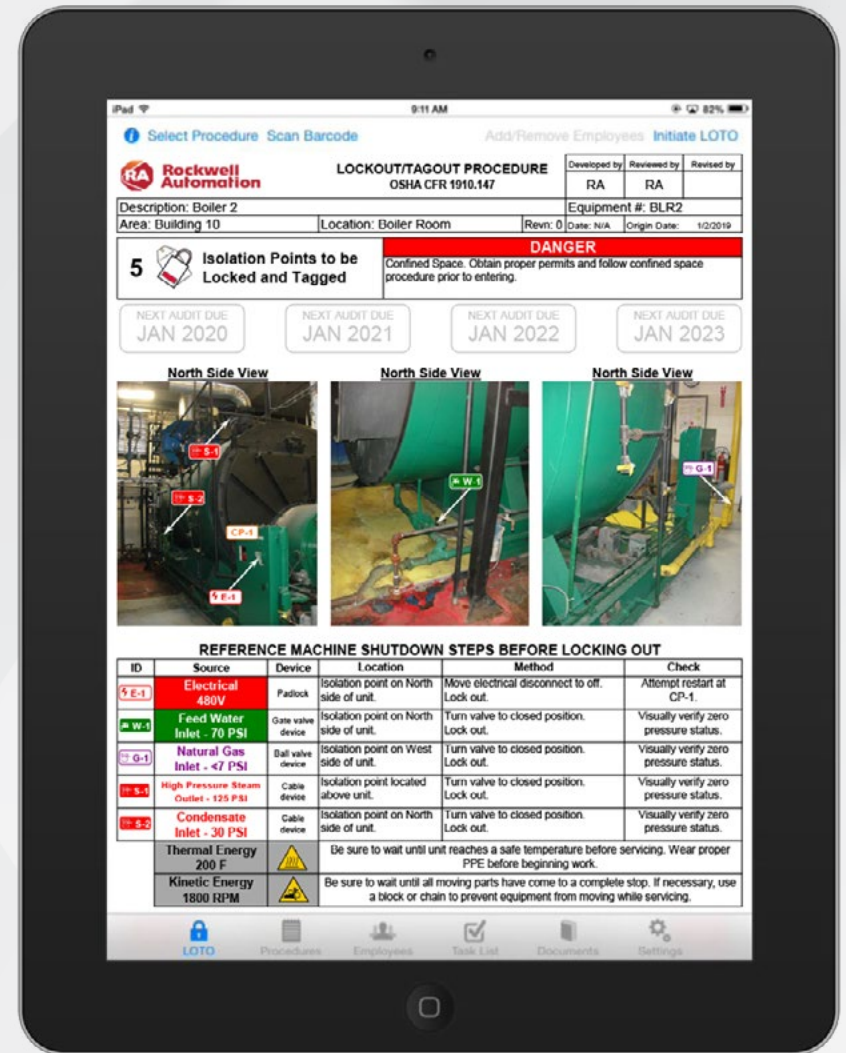


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Schematic Example Procedure


# Fully Electronic Procedures

Many companies are now moving to electronic copies of procedures. Digital versions may be text-based, line drawings or graphical procedures. In order to fully implement such a program, companies must have access to tablets readily available for authorized employees as well as solutions available for onsite contractors. For facilities that still print lockout/tagout procedures, the usage of tablets helps with: ensuring procedures are always up to date, providing multiple media options and enabling quick and accurate auditing.



# Custom Format and Graphical/Line Drawing Hybrid

An alternate method for creating lockout/tagout procedures is to add pictures of the lockout steps along with an overview map showing the isolation points in the line drawing. This method is sometimes used for large pieces of equipment or system-based lockout/tagout procedures where the complexity of the process necessitates a specialized format.


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**LOCKOUT-TAGOUT PROCEDURE**  
OSHA CFR 1910.147

Description: Cooling Tower #1	Equipment # CT-1	Developed by	Reviewed by	Revised by
Location: Rooftop	Area: Central Tower Platform	RA	RA	
Rev: 0 - Date: N/A		Origin Date: 5/1/2019		

**5** **Isolation Points to be Locked and Tagged**  
 Note: Drain cooling tower if it presents a hazard during service

NEXT ALERT DUE  
MAY 2013

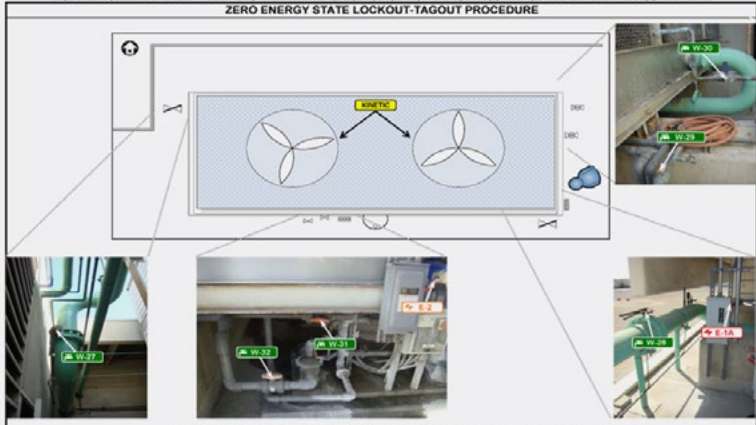
NEXT ALERT DUE  
MAY 2014

NEXT ALERT DUE  
MAY 2015

NEXT ALERT DUE  
MAY 2016

Purpose: To protect authorized employees against unexpected or unattended activation of equipment or energy while servicing equipment.  
 Scope: Utilize this procedure for all scheduled PM activities, any maintenance task that requires one to place your body in harm's way of the equipment or if you have to leave the area while the equipment is in service.

ZERO ENERGY STATE LOCKOUT-TAGOUT PROCEDURE



ALWAYS PERFORM A MACHINE STOP BEFORE LOCKING OUT DISCONNECTS

Enforcement: Failure to properly follow lockout/tagout procedures may result in disciplinary action.  
 Communicate to central utilities that the cooling tower needs to be shut down remotely.  
 After equipment is shut down remotely, locate local control panel and move selector switch to **Coast Off**.

Preliminary Machine Stop Instructions						
ID	Source	Device	Location	Method	Check	Return to Service Order
E-1A	Electrical 480V	Panel	Isolation point on Southeast side of tower. Ground level.	Move E-1A kniveswitch disconnect to off. Lock out with indicated device.	Attempt fan restart. Test with voltmeter.	4
W-27	Cooling Water Inlet - 40 PSI	Panel	Isolation point on West side of tower. Located 1' above ground level.	Turn W-27 valve to closed position. Lock out with indicated device.	Reference local gauge to ensure pressure has bled off.	3
W-28	Cooling Water Outlet - 40 PSI	Panel	Isolation point on Southeast side of tower. Ground level.	Turn W-28 valve to closed position. Lock out with indicated device.	Reference local gauge to ensure pressure has bled off.	2
W-29	Makeup Water Inlet - 15 PSI	Ball valve device	Isolation point on East side of tower. Ground level.	Turn W-29 valve to closed position. Lock out with indicated device.	Reference local gauge to ensure pressure has bled off.	If applicable
W-30	Makeup Water Outlet - 15 PSI	Ball valve device	Isolation point on East side of tower. Ground level.	Turn W-30 valve to closed position. Lock out with indicated device.	Reference local gauge to ensure pressure has bled off.	1
KINETIC	Kinetic Energy 750 RPM		Be sure to wait until cooling fan blades have come to a complete stop. If necessary, use a block or chain to prevent equipment from moving while servicing.			

SHUTDOWN SEQUENCE - LOCK/TAG, TRY, TEST

1. Notify
2. Review Procedure
3. Stop Machine
4. Isolate Energy
5. Lockout Energy
6. Dissipate Energy
7. Verify De-energized

RESTORE TO SERVICE SEQUENCE

1. Check Machine
2. Check Area
3. Verify Machine
4. Remove Lockout
5. Notify

Refer to corporate policy or training manual for detailed shutdown and restore to service instructions.  
**OPENING A GUARD DOES NOT CONSTITUTE A LOCKOUT**

DANGER

ES

DANGER

Page 1 of 1
Safety Is Your Responsibility!
Cooling Tower Example 1

# The Benefits of Proper Lockout/Tagout Procedures

Properly created and utilized lockout/tagout procedures provide greater safety and compliance, and can have a positive impact on your company's bottom line.



## IMPROVED WORKER SAFETY

Just as lack of controls and lack of employee training can lead to a dangerous workplace, the adoption of safety and risk management best practices can help manufacturers keep employees safer and be more productive. According to LNS Research, companies that implement safety-related best practices perform better when it comes to delivery, equipment effectiveness and incident rates. In other words, a strong culture of safety can be a true differentiator for your company and its safety record. Lockout/tagout procedures, in conjunction with a hierarchy of administrative controls that influence the way employees work, can dramatically increase worker safety. Those controls include policy changes, documented procedures, or various forms of training. These changes actively help prevent accidents in the workplace.

Developing and implementing a lockout/tagout program, complete with written procedures and trainings, can prevent many lost-time accidents. Compliant lockout/tagout procedures provide the needed information for employees to safely work on equipment and a good LOTO training informs authorized employees on related hazards and methods for control.



## STREAMLINED COMPLIANCE

Compliance with state and federal safety regulations, including OSHA, is a goal of all companies, regardless of size. Ensuring that your documented lockout/tagout procedures are both comprehensive and compliant will result in a safer workplace and reduced concern for safety violations or fines. In addition, workplace supervisors will know that they are doing all they can to provide a secure environment focused on safety and productivity.



## CASE STUDY

### LARGE GLOBAL BEVERAGE COMPANY

#### Challenges for the client:

- Frequent equipment cleaning, adjustments and clearing jams on a high number of machines
- Time spent on these tasks increased overall downtime and impacted productivity

#### Rockwell Automation solutions:

- Implemented a customized, combined lockout/tagout procedures and alternative protective methods
- Electronic lockout/tagout management platform with real-time downtime data and procedure audits information

#### Quantifiable Results:

- Improved OEE by 7.1% to 10.6%
- Reduced time needed per activity by 65%



## INCREASED PRODUCTIVITY

Beyond improved safety and compliance, there is a quantifiable productivity return on investment associated with advanced lockout/tagout procedures. The procedures will allow your authorized employees to more quickly lockout equipment and restore it to service which will result in more equipment availability, less time spent by the authorized employee, and also less equipment/process down time. Depending on how much a production minute and employee hour costs you, you may notice a return on investment in as little as a few months.

While researching, preparing and implementing lockout/tagout procedures can be time-consuming, the end result has a very positive impact on overall productivity. As one North Carolina-based company found, involving all stakeholders in the creation of lockout/tagout procedures led to achieving greater consistency in lockout/tagout compliance and a positive effect on productivity.

With a focus on providing graphical procedures in a collaborative atmosphere, the project was completed in just one week. Visual aids identified lockout points, including pictures within the procedures, graphical tags that highlighted isolation points and physical tags at the isolation points. The end result was a comprehensive lockout/tagout process that engaged workers and supervisors and led to compliance and heightened productivity.

## WHAT ARE THE CONSEQUENCES OF NON-COMPLIANCE?

If your organization does not properly execute lockout/tagout procedures, it can result in a higher risk for worksite accidents, greater likelihood of being fined by OSHA, and increased equipment downtime.

## CASE STUDY

### AUTOMOTIVE INDUSTRY SUPPLIER

#### Challenges for the client:

- Improved lockout/tagout knowledge and training needed for authorized employees
- Lack of clear lockout/tagout procedures posed a safety risk to employees and resulted in production delays
- Lockout/tagout required a significant amount of time (both in locking out the equipment and in restarting)

#### Rockwell Automation customized solutions:

- Detailed review and subsequent update to the client's lockout/tagout program
- Comprehensive list of all equipment that required lockout/tagout
- Developed a fully compliant lockout/tagout program
- Worked with client to implement an annual audit of their lockout/tagout process, as part of safety standards

#### Quantifiable Results:

- Reduced safety risk
- Improved machine uptime



# DON'T FORGET TO AUDIT!

Annual auditing is a key part of maintaining your LOTO program and procedures. Auditing will help you continue to get the most out of these benefits in the long term.



Verify all required procedures are in place, accurate, and optimized to the ideal lockout process.



Inspect each employee on proper lockout process and retraining employees to achieve effective utilization of the lockout/tagout program.



Provide comprehensive documentation of audit completion to properly record the effort dedicated to maintenance of your investment.

**This checklist can guide you through the process.**

# The **future** of lockout/ tagout procedures is here.

Looking forward, lockout/tagout procedures will begin to embrace and integrate new technologies to further improve on safety and productivity. **Software options that streamline the lockout/tagout process** are already on the market and helping manufacturers to modernize and digitize their programs. Nowadays, employees are already able to use their smartphones or tablets to connect to the company database, select a procedure, and show others they are working on the equipment with just a few clicks. Barcodes or QR codes can be applied to the machine, making it quick for employees to scan and produce the necessary procedures.

And, with the use of contemporary technologies like Augmented Reality (AR), the possibilities to improve both the user experience and the execution of tasks are endless. **AR enables easier lockout execution** by indicating the exact location of devices that need to be locked and the sequence to be followed. With AR technology, all scheduled tasks can be emailed or texted to the correct maintenance personnel, with a direct link to the machine needing service. Supervisors will be able to monitor the progress online and create annual reports from the information provided. Tracking which machines need repair the most will help identify units that may need an upgrade and where funds should be allocated.

In addition, supervisors and managers will be able to monitor individual machines and complete facilities across the globe. This visibility will provide improved capabilities to help ensure that all audit tasks are executed on time, all relevant documentation is readily available when needed and, most importantly, all downtime information related to lockout/tagout is easily accessed to enhance the understanding of the machine utilization and efficiency.



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# Lockout/Tagout: Three Key Takeaways

1

The purpose of machine specific lockout/tagout procedures is to guide an authorized employee through a sequential process that renders a piece of equipment safe.





2

Lockout/tagout procedures are one of the mandatory components for a compliant lockout/tagout program, and an audit process is fundamental to keep it updated.

3

A properly implemented lockout/tagout program can help customers to streamline compliance, reduce overall risk and increase productivity.

LEARN MORE ABOUT LOCKOUT/TAGOUT PROCEDURES AT [ROK.AUTO/LOTO](https://rok.auto/lototakeaways)

Connect with us.    

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