
# IMPLEMENTATION GUIDE

## Control of Hazardous Energies (LOTO)

July 2021

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# How to use this Document (1/2)

This **IMPLEMENTATION GUIDE** should be read in conjunction with the other Saint-Gobain Standards and in particular the minimum requirements for Hazardous Energy Control systems.

It provides guidance on how the Group minimum requirements for Hazardous Energy Control systems can be met. It is divided into 6 main sections:

**Definitions**
A short section introducing some key concepts that will be referred to later in the document

**Hazardous Energy Control**
A description of the main strategies that can be used to control the risk of exposure to hazardous energy

# How to use this Document (2/2)

**System Procedures**
An outline of key site level procedures that should be part of a Hazardous Energy Control system including how to make and remove energy isolations.

**LOTO**
A description of the key elements of a Lockout Tag Out process including a description of how to create Equipment Specific Procedures.

**Alternative Measures**
An overview of the different Alternative measures that can be applied to protect workers from hazardous energy when LOTO is not practicable.

**Competence & Audit**
A summary of the competency requirements for those with roles in the Control of Hazardous Energy system.


# Key Definitions

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# Scope

All equipment and machinery that contain at least one source of hazardous energy is within the scope of the standard.

The standard requires a risk assessment to be conducted to determine if there is a risk of exposure to Hazardous Energy.

The Hazardous Energy Control System should be applied in proportion to the level of risk present.

For example, simple “plug and cord” equipment such electrical hand tools may require only basic control controls.

# Equipment

**When the Standard and this guide refer to “EQUIPMENT” it includes all MACHINERY, EQUIPMENT or PROCESSES that may contain hazardous energy.**

# Hazardous energy

Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, radiation or any other energy that, if not controlled, could cause injury to personnel or damage to the environment or property.

# Energy isolation

The physical separation of equipment from a source of energy (eg electrical, mechanical, hydraulic, pneumatic, chemical, thermal etc) in such a way that the separation  is secure (eg using a **LOCKOUT DEVICE**).

# Energy Isolating Device

A mechanical device that physically prevents the transmission or release of energy. Examples include:

- Manually operated circuit breakers
- Fuses
- Disconnect switches
- Line valve slip plates, blanks and physical disconnections
- Mechanical blocks or similar devices used to block or isolate energy

**IMPORTANT**
Push-button selector switches and other control-type devices are not energy-isolating devices




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# Lockout Device

A piece of equipment that prevents the unAuthorised or accidental operation of an energy-isolating device.

**LOCKS** are an essential element of these devices to ensure the isolation it has enabled is secure.

The devices should be of a robust construction and be resistant to tampering.

**LOCK OUT DEVICES** should only be used to secure **ENERGY ISOLATING DEVICES.**

These devices should be stored close to their intended place of use.




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# Lockout Lock

Lockout **LOCKS** (Safety Padlocks/Protective Lockout Devices) are an essential element to ensure the security of a **LOCKOUT DEVICE**.

They should be capable of withstanding the environmental conditions of the factory/process.

They should be standardized across the site using criteria such as color, shape, size or specific markings.

They should only be used for securing isolations.

Saint-Gobain recommends that in the case of personal locks no spare/duplicate keys should exist on site ("one person, one lock, one key").

# Information Tags

**INFORMATION TAGS** should be attached to **LOCKOUT DEVICES** to provide important information about ownership and status of **ENERGY ISOLATIONS**.

The **TAG** makes the isolation more visible and gives a clear warning to people nearby that the equipment is isolated and should not be used.

The wording on the **TAG** should include a “DANGER” warning and advice such as "Do Not Operate” or "Do Not Start“.

This information can also be displayed on the **LOCKOUT DEVICE** itself.




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# Lockout/Tagout (LOTO)

**LOTO** is a procedure designed to remove all hazardous energy from equipment before permitting work to start on it.

The **HAZARDOUS ENERGY** sources are physically and securely isolated by an **AUTHORISED PERSON** by applying **LOCKOUT DEVICES** such as locks and any remaining stored energy is dissipated.

The **AUTHORISED PERSON** retains control over the isolation to ensure the energy cannot be restored or the equipment restarted until all **LOCKOUT DEVICES** are removed.

# Zero Energy State

A piece of equipment or system that has had all its hazardous energy (supplied, potential, stored etc) securely removed can be described as being in a **ZERO ENERGY STATE**.

# Not Practicable

The Standard requires **LOTO** to be applied unless it is **NOT PRACTICABLE**.

Professional judgement should be used to decide this. Such judgments should be based on a balance of risk against the need for energy to be present to perform the task.

Examples where **LOTO** may not be **PRACTICABLE** include:

- Where energy is **REQUIRED** to effectively perform the task (eg belt alignment, some troubleshooting)
- Short duration low risk interventions (eg unloading product from a line).

When it is decided **LOTO** is **NOT PRACTICABLE,** the site should apply **ALTERNATIVE MEASURES** to reach an effective level of safety.



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1 Hazardous Energy Control

2 System Procedures

3 LOTO

4 Alternative Measures

5 Competence & Audit

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1 Hazardous Energy Control

2 LOTO

3 Alternative Measures

4 Common Procedures

5 Competence & Audit

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# Managing Hazardous Energy Risks

The Saint-Gobain Health & Safety Risk Assessment and Control Standard requires sites to apply the **HIERARCHY OF CONTROL** when deciding the most effective way to control a hazard. The same is expected when implementing Controls for Hazardous Energy.

When **ELIMINATION** is impossible and **SUBSTITUTION** does not reduce the risk sufficiently, sites need to implement a range of technical and organizational measures to ensure safe working around hazardous energy.

These measures can be described as a **CONTROL OF HAZARDOUS ENERGY SYSTEM**. This includes the use of **LOTO** to manage the remaining hazardous energy risks.

| Measure | Examples |
|---|---|
| Eliminate | Eliminate pinch points<br>Intrinsically safe containment<br>Eliminate interaction with energy source |
| Substitute | Reduce energy levels |
| Technical Measures | Guarding, barriers, interlocks etc |
| Organizational controls | Lights, beacons, alarms, procedures, **LOTO** etc |
| PPE | Gloves, glasses etc |



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# WHAT IS HAZARDOUS ENERGY CONTROL – A PROCESS-BASED VIEW

*Process*

Effective isolation and control over all sources of hazardous energy

*Ultimate Aim*

Prevention of injuries, fatalities or environmental harm caused by unintentional restart or release of hazardous energy

*Inputs*

Risk assessment:
- Electrical
- Pneumatic
- Hydraulic
- Thermal
- Potential
- Chemical
- Radiation

Laws & Regulations
Industry Standards

*Activities*

- Purchasing specification – buying machinery and equipment capable of effective energy isolation;
- Safety acceptance checks including hazardous energy control
- Hazard identification and risk assessment of routine and non-routine tasks;
- Training of AUTHORISED PERSONnel; awareness of staff;
- Procurement of lockout hardware;
- Control over lockout hardware
- Equipment-specific LOTO procedures; Safe Maintenance Procedures (SMPs)
- Periodic verification of competence and compliance.

*Outputs*

Safe execution of tasks, including but not limited to:
- Installing
- Repairing & Servicing
- Troubleshooting
- Adjusting
- Setting up & Testing
- Unjamming
- Inspecting
- Cleaning
- Dismantling

*Tools & Equipment*

Isolation points, locks, hasps, blocks, tags and other hardware

*People: Roles & Competence*

Identification of affected and AUTHORISED PERSONnel, training and awareness, competence verification.

*Method: Procedures and Signs*

Current and accurate equipment-specific lockout procedures, special cases procedures, PTW process

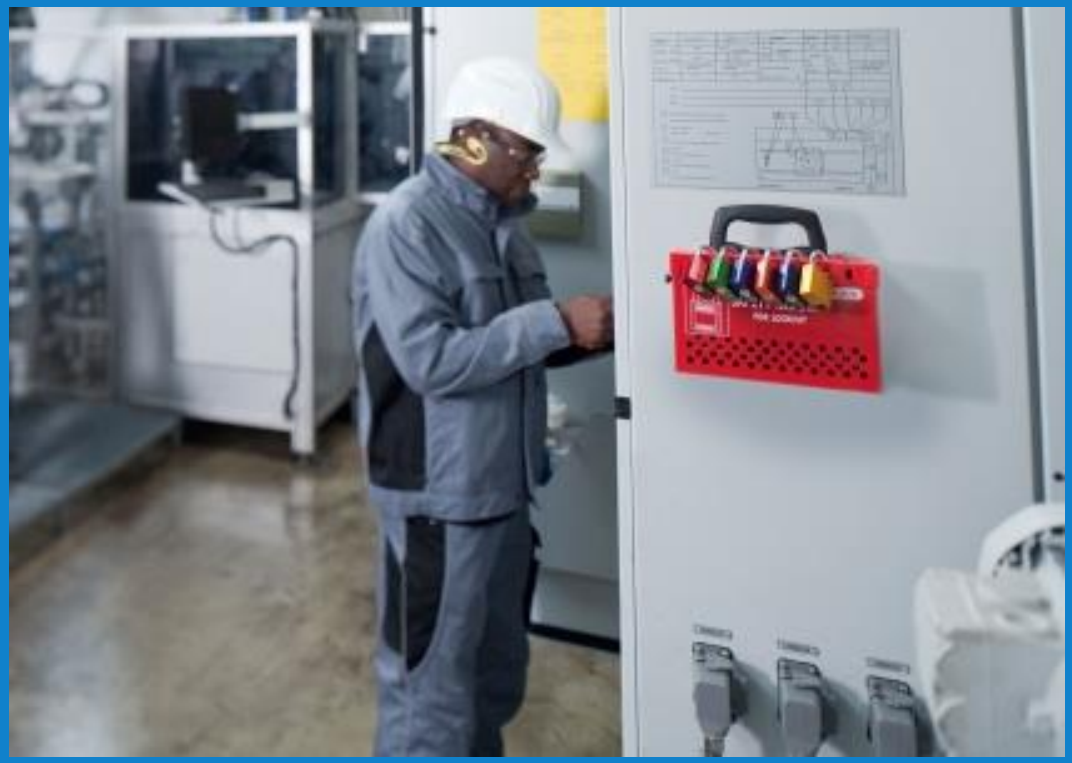
*Monitoring: Process auditing*

Regular validation of process effectiveness though formal observations (i.e. LOTO SMAT)

# Control Of Hazardous Energy System

A Control of Hazardous Energy System includes the definition of:

- Main **ROLES & RESPONSIBILITIES** for Hazardous Energy Control
- Acceptable **HAZARDOUS ENERGY CONTROL STRATEGIES**
  - LOTO Procedures
  - Alternative Measures
- **MATERIALS** and **EQUIPMENT** required for hazardous energy control
- **SAFE PROCEDURES** for tasks involving exposure to hazardous energy
- **TRAINING & COMPETENCE** requirements for all concerned persons





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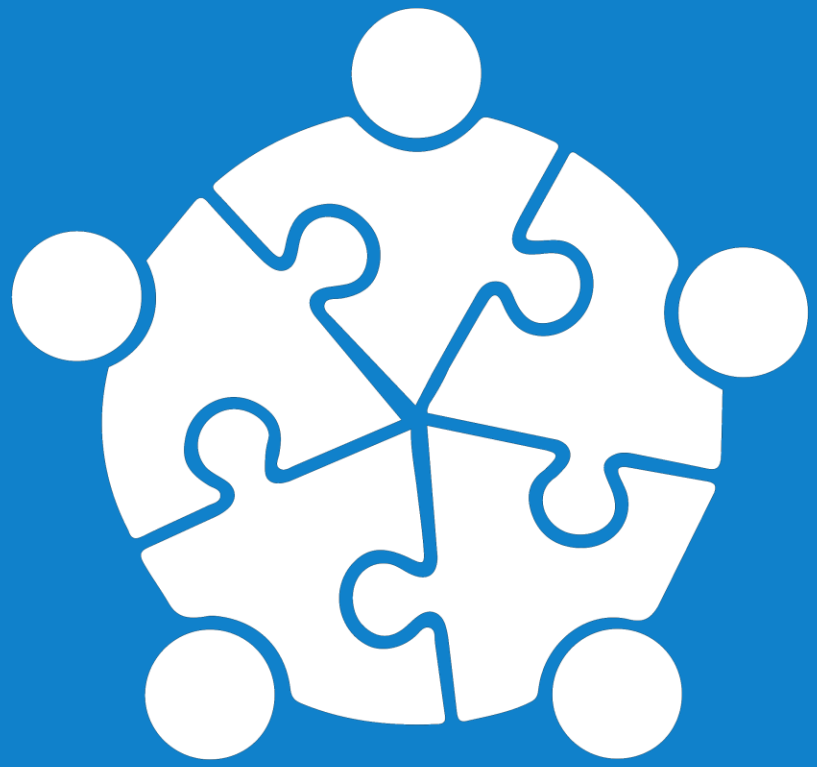
# ROLES, RESPONSIBILITIES & COMPETENCIES

Responsibility for the safe management of hazardous energy are distributed across a number of key roles. These include:

- Designers & Manufacturers
- Purchasers
- Site management
- Program Champion
- AUTHORISED PERSONs
- Affected Persons





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# ROLES, RESPONSIBILITIES & COMPETENCIES

| | DESIGNERS & MANUFACTURERS | PURCHASERS | SITE MANAGEMENT | SYSTEM CHAMPION (GUARANTOR) | AUTHORISED PERSONNEL | AFFECTED PERSONNEL |
|---|---|---|---|---|---|---|
| RESPONSIBILITIES | Design, integrate, build and install machines, equipment, or processes so that the end user can effectively control hazardous energy during all phases of its life cycle and explain how to do so in the user guide. | Ensure that all purchased machines, equipment or components are capable of being locked out and/or isolated from hazardous energy and are compliant with local regulations and relevant Saint-Gobain standards. | Sponsor and resource the development of the Control of Hazardous Energy System and monitor its effectiveness. Assign responsibly and authority to the program Champion (Guarantor) to act as an expert. | Develop the site Control of Hazardous Energy System. Monitor its effectiveness; Act as an expert for other stakeholders. Approve other staff as "AUTHORISED PERSONs". | Apply Control of Hazardous Energy procedures (LOTO and Alternative Measures). Coordinate all persons working under LOTO or Alternative measures to ensure adherence with rules | Follow the instructions of the AUTHORISED PERSON. Never interfere with application of LOTO or Alternative Measures or tamper with energy isolating devices. Never attempt to operate machines, equipment or process under isolation. |
| REQUIRED COMPETENCIES | Relevant professional qualifications and competences. | General knowledge regarding applicable industrial standards (CE, ISO, ANSI, CSA, etc.) and local regulatory requirements. Should also consult Control of Hazardous Energy System Champion (guarantor). | General knowledge of applicable industrial standards and local regulatory requirements. | Detailed knowledge of regulatory requirements, applicable industrial standards and best practices. | Specific knowledge of established procedures and competence in applying them. *! Must receive training and authorization (and results recorded) prior to performing their duties !* | Training on general awareness of the purpose of the Control of Hazardous Energy System and the site LOTO procedure. |



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# Roles, Responsibilities & Competencies

## System Champion

The Control of Hazardous Energy System Guarantor is

- Trained & competent
- In charge of ensuring program rules (including LOTO and Alternative Measures) are respected on the site
- Recognised as an Expert
- Able to answer questions about Control of Hazardous Energy
- Able to assist in the creation of new Energy Control Procedures.



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# ROLES, RESPONSIBILITIES & COMPETENCIES
# AUTHORISED PERSON

The person in charge of applying **ENERGY ISOLATIONS** and other controls and carrying out work on equipment. They:

- Have been trained in their duties and the correct methods of energy isolation
- Have been formally **VALIDATED AS COMPETENT**
- Have been **AUTHORISED** by the site management to perform their duties
- Are **CAPABLE** of coordinating multiple AUTHORISED PERSONs performing group isolation.




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# ROLES, RESPONSIBILITIES & COMPETENCIES
# Affected Person

**AFFECTED PERSONS** are people who normally use machines or equipment on which LOTO has been performed or who have other job responsibilities in the area.

They need to understand the site LOTO procedures and why they are important.

They should never attempt to lock out equipment themselves or attempt to restart equipment that has been locked out.




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# Hazardous Energy Control Strategies

The goal of a Hazardous Energy Control System is to ensure all potential exposures to hazardous energies are anticipated and effectively controlled.

The most secure ways to achieve this are to ensure all access to hazardous energy is removed (through equipment and machinery design) or by removing the energy itself (by achieving a **ZERO ENERGY STATE**).




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# Hazardous Energy Control Strategies

However, achieving a **ZERO ENERGY STATE** is not always possible. For example, if a task requires the presence of energy for some or all of its steps, complete removal of all energy sources is not practical (eg. testing of equipment, aligning a belt etc).

It can also be impractical to completely de-energize equipment for some simple, frequent, short duration interventions.



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# Hazardous Energy Control Strategies

The role of a Control of Hazardous Energy System is to ensure that, in all circumstances, interventions are **SAFE**.

This requires sites to develop a number of procedures for working safely where there is a risk of exposure to hazardous energy.

The next few slides describe the main strategies that can be employed in a building a Hazardous Energy Control System and a simple process for building one.



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# HAZARDOUS ENERGY CONTROL STRATEGIES

| | | Types of Work | Done By | Frequency | Types of Controls used |
|---|---|---|---|---|---|
| ZERO ENERGY | **LOTO INTERVENTION** | Repairs, Maintenance, Unjamming, Cleaning, Servicing | AUTHORISED PERSON | Any | Documented Equipment Specific Procedure ensuring:<br>• Secure removal of ALL energies for the duration of the intervention<br>• Zero Energy State |
| ALTERNATIVE MEASURES | **PRODUCTION INTERVENTION (Low Risk)** | Short duration tasks intrinsic to the operation of the equipment (eg removing finished product) | AUTHORISED PERSON | Frequent, Routine | Alternative Measures such as:<br>• Documented Procedure/Work Instruction<br>• Secure use of equipment's built-in safety devices (guards, interlocks etc) |
| | **STANDARD INTERVENTION (Medium Risk)** | Setup, adjustments, inspections, trouble shooting | AUTHORISED PERSON | Routine, predictable | Alternative Measures such as:<br>• Documented Procedure<br>• Secure use of equipment's built-in safety devices (guards, interlocks)<br>• Secure removal of some energies |
| | **COMPLEX INTERVENTION (High Risk)** | Setup, adjustments, inspections trouble shooting, maintenance or **WHEN NO PROCEDURE or METHOD EXISTS** | AUTHORISED PERSON with appropriate certification | Non-routine, infrequent | Alternative Measures such as:<br>• Permit To Work & associated controls<br>• Documented Procedure<br>• Secure use of equipment's built-in safety devices (guards, interlocks)<br>• Secure removal of energies for PARTS of the intervention |



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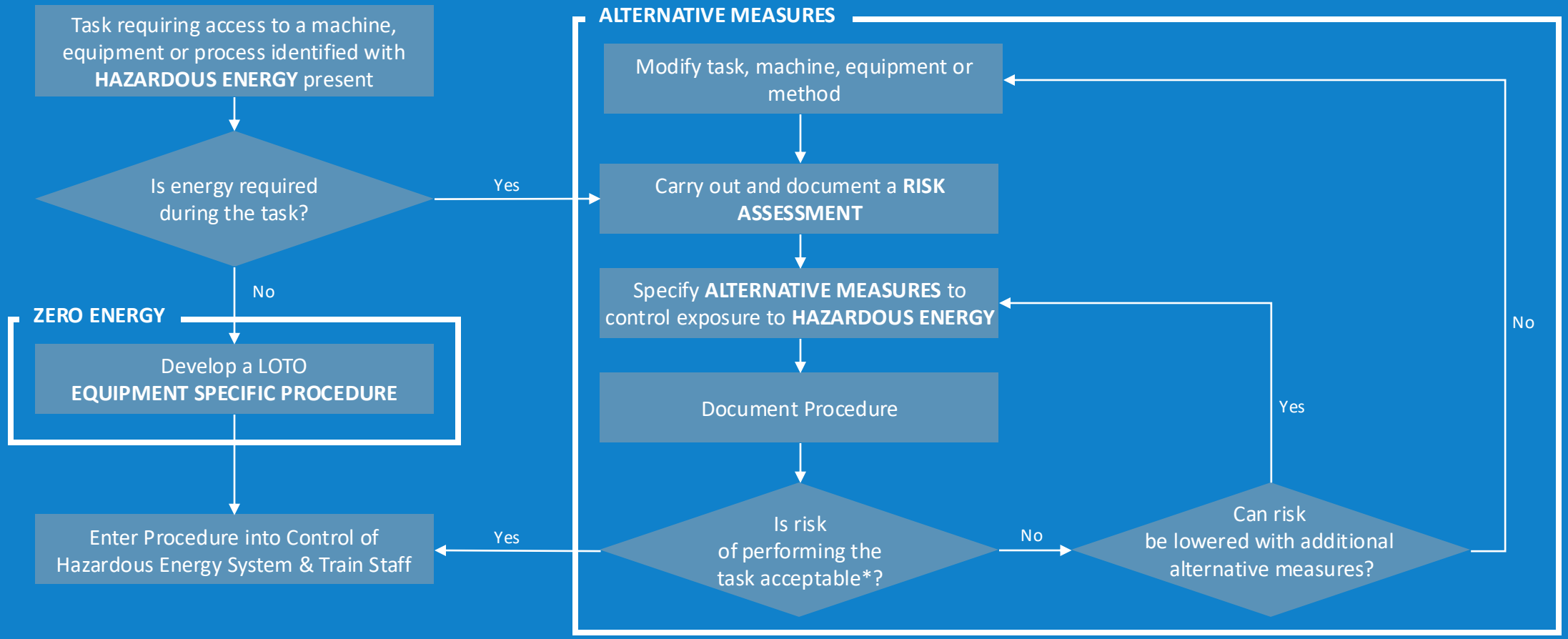
# Creating A Hazardous Energy Control System (Example)




*Effective protection compared to the use of LOTO

Based on ANSI z244.1 Figure 1



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# ENERGY CONTROL STRATEGIES: ZERO ENERGY STATE
# Lockout Tagout ("LOTO")

**WHEN TO APPLY:**

This strategy should be implemented for **ALL** interventions.

If it is demonstrated that it is **NOT PRACTICABLE** to complete an intervention at a **ZERO ENERGY STATE** other strategies should be considered.

**Example:**

Replace a worn part of a machine




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# ENERGY CONTROL STRATEGIES: Alternative Measures Production Interventions

**WHEN TO APPLY:**

When production operators need to access equipment frequently and for a short duration. These interventions are integral to the operation of the equipment.

The equipment must be OFF/STOPPED/ON HOLD/IN LOCAL but may still be energized during the intervention.

**This method should not be used for unjamming.**

**Example:**

Entering a caged area to make a small adjustment to equipment while relying on the built in safety features of the machine.

# ENERGY CONTROL STRATEGIES: ZERO ENERGY STATE
# Lockout Tagout ("LOTO")

**KEY CONTROL MEASURES:**

**EQUIPMENT SPECIFIC PROCEDURES** are developed (see **Section 3**) to guide **AUTHORISED PERSONS** through the steps necessary to ensure all energy is securely removed.

Sufficient appropriate **LOCKOUT DEVICES** & **LOCKOUT LOCKS** are available and are maintained.




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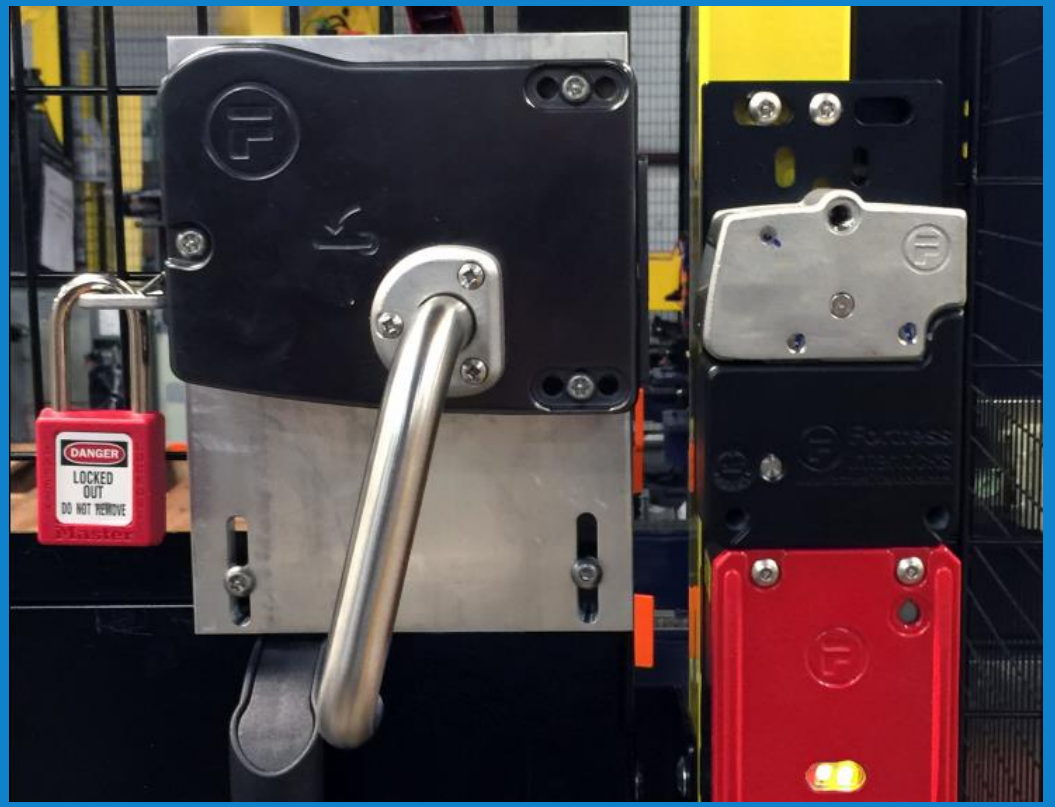
# ENERGY CONTROL STRATEGIES: Alternative Measures Production Interventions

**Key Control Measures:**

A written procedure exists for the intervention. It details the steps to be followed to ensure the intervention is completed safely. This can include instruction how to activate and built-in safety features of the equipment (eg interlocked guards etc).

It is **RECOMMENDED** that when the whole body must enter the danger zone (an area where **HAZARDOUS ENERGY** has not been securely removed) the safety devices should be secured in their "open" "safe" position using a **LOCKOUT LOCK** as a minimum.

All operators are trained in the procedure.



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# ENERGY CONTROL STRATEGIES: Alternative Measures Standard Interventions

**WHEN TO APPLY:**

When an **AUTHORISED PERSON** has to access equipment to perform short duration tasks. This may involve removal of guards or deactivation of other safety devices.

**Example:**

Removal of a fixed guard to visually check components.




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# ENERGY CONTROL STRATEGIES: Alternative Measures Standard Interventions

**Key Control Measures:**

A procedure exists that details how the equipment should be made safe before allowing work to begin.

The procedure may include the removal of some or all energy sources using secure isolation methods for all or part of the intervention.

Additional **ALTERNATIVE MEASURES** should be detailed in the procedure (see slide 95).

It is **RECOMMENDED** that if an intervention requires more than 3 isolations it should be considered as a **COMPLEX INTERVENTION** even when a procedure exists.

# ENERGY CONTROL STRATEGIES: Alternative Measures When Does An Intervention Become Complex?

**Complex Interventions can be identified by assessing:**

- The result of the risk assessment for the intervention
- The size of the equipment to be worked on (If it is large there are potential issues with coordination between workers and line of sight)
- The accessibility of **ENERGY ISOLATING DEVICES** and their method of isolation
- The number of workers and different work teams (eg different trades, contractors, operators) involved in the intervention
- The number of **ENERGY ISOLATING DEVICES** that need to be locked out and managed (it is recommended that when there are more than 3 isolations required for the task it should be considered complex)
- The length of time the equipment will remain locked out
- The number of AUTHORISED PERSONs involved
- The level of interdependence of components in the system or between systems on which the intervention is planned

# ENERGY CONTROL STRATEGIES: Alternative Measures Complex Interventions

**WHEN TO APPLY:**

When an engineer has to make a complex intervention on equipment or when no safe procedure exists.

**EXAMPLE:**

Inspection of equipment in both energized and de-energized states to determine the source of an issue.



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# ENERGY CONTROL STRATEGIES: Alternative Measures Complex Interventions

**MAIN CONTROL MEASURES:**

A full **RISK ASSESSMENT** should be conducted by competent **AUTHORISED PERSONS** and a safe method devised under a **PERMIT TO WORK** (PTW).

The PTW should specify **ALTERNATIVE MEASURES** to control exposures to hazardous energy (eg how the restoration of energy for testing purposes will be managed)

When energy is required to be removed this should always be achieved using secure energy isolations defined in the PTW.



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1 Hazardous Energy Control

2 System Procedures

3 LOTO

4 Alternative Measures

5 Competence & Audit

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# Hazardous Energy Control System Procedures

The following section describes methods and procedures that should be defined in a site's Hazardous Energy Control System and should be applicable to all energy control strategies and intervention types (LOTO, Production, Standard and Complex interventions).



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# 2 System Procedures

**MAKING SECURE ISOLATIONS**

RESTORING ENERGY

CONTINUITY OF ISOLATIONS

ADDITIONAL REQUIREMENTS

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# Making Secure Isolations:

Secure Isolations are key elements in creating EQUIPMENT SPECIFIC, OPERATING and MAINTENANCE procedures that require the secure removal of energy. Applying secure isolations should involve the following steps:

**NOTIFY** all affected employees that the equipment will be locked out

**IDENTIFY** all energy types and sources in use


**SHUTDOWN** the equipment normally

**ISOLATE** the equipment from its energy sources

**LOCKOUT & TAG** the energy isolating devices

**REMOVE or RESTRAIN** any remaining energy

**CONFIRM** the equipment is unpowered

**BEGIN** the work

The steps to achieving secure isolations should be detailed along with other necessary precautions in a procedure and only be completed by **AUTHORISED PERSONS.**



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# Secure Isolations: NOTIFY

All **AFFECTED PERSONS** need to be informed before applying isolations to any equipment.

This is to ensure they understand:

- The equipment will stop and be taken out of service
- That they should not interact with the equipment or any energy isolation during the work
- Why the work is being done by whom and for how long

When necessary, the boundary of the work should be clearly marked with a warning barrier.




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# Secure Isolations: IDENTIFY

The next task is to identify which sources of energy that need to be removed.

This can be a simple exercise if a procedure already exists (eg. EQUIPMENT SPECIFIC, OPERATING or MAINTENANCE procedure).

If no procedure exists and it is not practical to develop one before starting the work, a **PERMIT TO WORK** should be used to control the work until a procedure can be created.

This should include the need for an expert to study all available information to define which sources of energy are present, which ones need to be removed and how to securely remove them.



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# Secure Isolations: SHUTDOWN

The next task is to **SHUTDOWN** the equipment. This should be done following the normal documented shutdown procedure for the equipment.

Once the equipment has been shutdown it may be necessary to wait for some energy to dissipate before proceeding (eg allowing equipment to cool).



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# Secure Isolations: ISOLATE

The next task is to **ISOLATE** the equipment.

If a procedure exists, the **ENERGY ISOLATION POINTS** and **LOCKOUT DEVICES** will already be identified.

Each energy source should then be isolated as defined in the procedure or PTW.

It is recommended to adopt visual management techniques to highlight **ENERGY ISOLATION POINTS** (see Additional Rules).

# Secure Isolations: LOCKOUT

The next task is to **LOCKOUT** each energy isolating device.

This is achieved by attaching a **LOCKOUT DEVICE** to each **ENERGY ISOLATING DEVICE** and securing it using a **LOCKOUT LOCK**.

Existing procedures should define the **LOCKOUT DEVICE** that should be used for each **ENERGY ISOLATING DEVICE**.




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# Secure Isolations: Tag

It is recommended that each **LOCKOUT DEVICE** or **LOCKOUT LOCK** has a **TAG** attached to it.

The **TAG** should clearly identify the **AUTHORISED PERSON** who applied the device and may include additional information such as the date and reason for applying it.

**TAG**s should always be used in conjunction with a **LOCKOUT DEVICE** or **LOCK**.

Applying a **TAG** alone does not constitute an isolation/lockout.




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# Secure Isolations: REMOVE or RESTRAIN

The next task is to **REMOVE** or **RESTRAIN** any residual energy.

Some types of energy may remain residual in the system (eg pneumatic pressure) after they have been isolated from their source or when they cannot be completely isolated (eg gravity). In such cases it is necessary to take steps to either release (purge) or restrain this energy.

The required equipment and methods should be detailed in the procedure or PTW.



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# Secure Isolations: CONFIRM (1/2)

Now that the equipment has been isolated and purged from all known sources of energy it should be in a "Zero Energy State".

This needs to be confirmed. The simplest way to do this is by attempting to restart the equipment using the normal restart procedure.

However, it may be necessary to check that some energies are absent by using appropriate test equipment (such as amp-meters) that give a visual indication of the presence of an energy.

Existing procedures should define the best method to verify the isolation.




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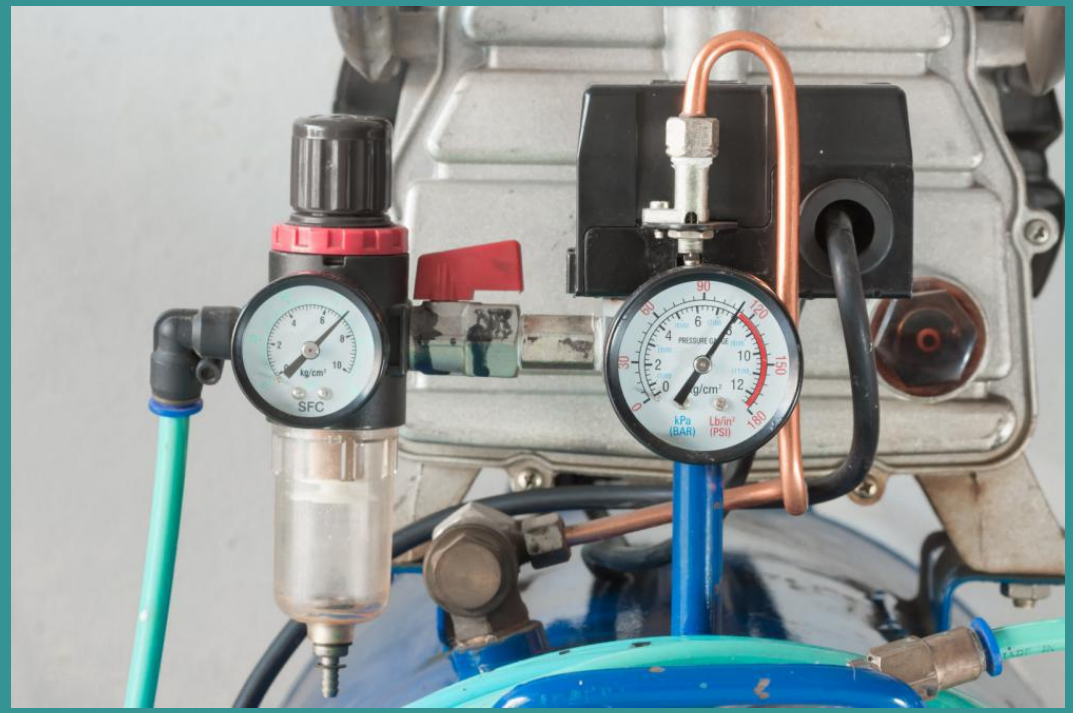
# Secure Isolations: CONFIRM (2/2)

If there is a possibility of re-accumulation of any type of stored energy to a hazardous level:

- There should be continued verification of the isolation during any work or until the risk of accumulation no longer exists
- Purge devices should be left open and locked out





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# Secure Isolations: BEGIN Work

At this point it should be safe to begin work on the equipment.



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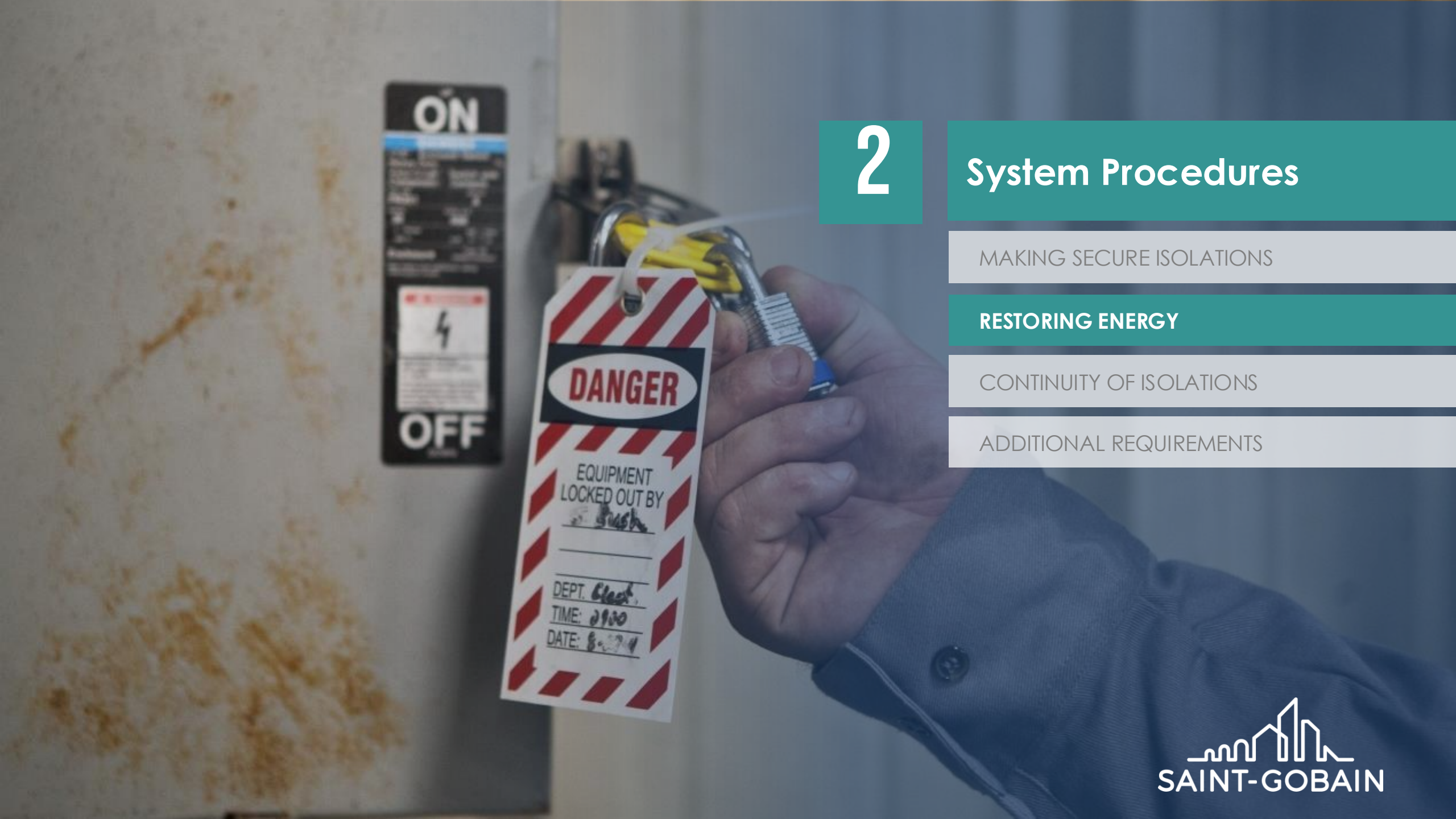


# 2 System Procedures

MAKING SECURE ISOLATIONS

**RESTORING ENERGY**

CONTINUITY OF ISOLATIONS

ADDITIONAL REQUIREMENTS

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# Restoring Energy & Restarting Equipment

Once work has been completed energy should be restored and the equipment returned to service.

The process of restoring energy and restarting the equipment should be documented in a procedure and only be performed by ATHORISED PERSONS.

An example process is explained on the next few slides.




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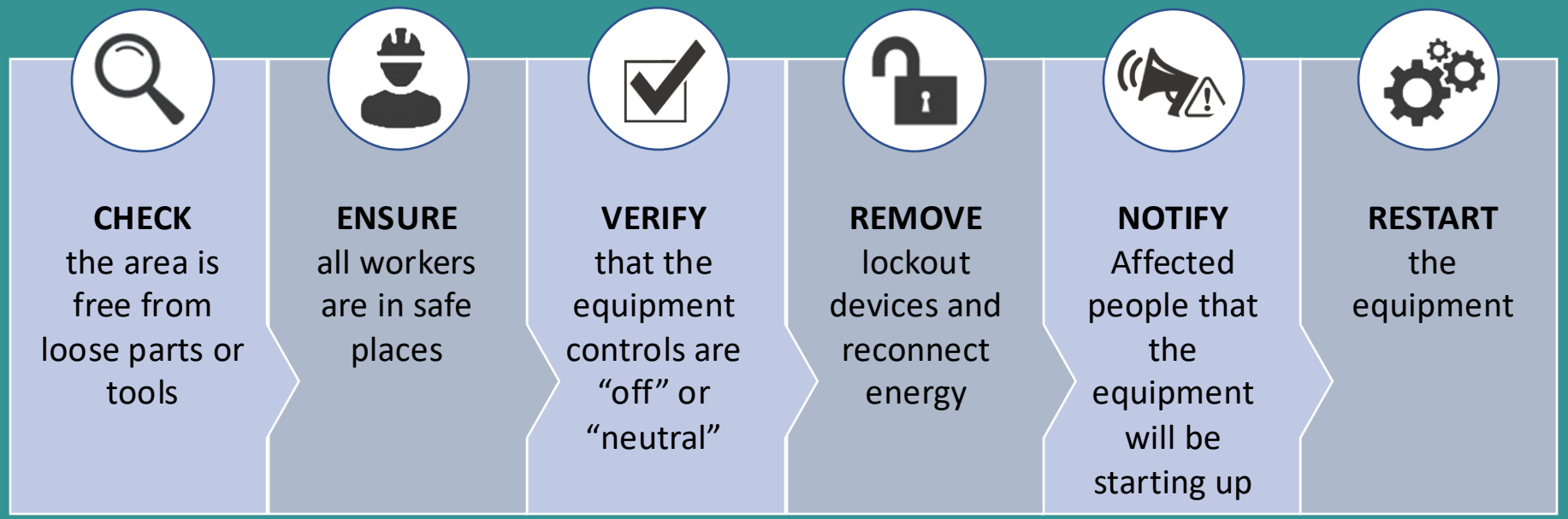
# How to Restore Energy & Restart

Example Method:



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# Restore Energy & Restart: CHECK & ENSURE

Before beginning to restore energy to the equipment the **AUTHORISED PERSON** should check the area to ensure that:

- The equipment is in a safe state to start (guards are in place etc)
- There are no lose or spare parts in the area
- There are no tools or other equipment left in the area
- There are no people in the area.

A visual inspection is often sufficient but in some instances this check may have to be recorded.

# Restore Energy & Restart: VERIFY

The next step is to check that all of the equipment start-up controls are in an “off” or neutral position and any purge valves have been closed.

This is important to prevent unexpected start-up of equipment or leakage of fluids once energy has been restored.

# General LOTO Restart: REMOVE & RECONNECT

The next step is to remove the lockout devices from all energy isolation points.

It may be necessary to remove these devices in a defined order depending on the equipment in question (eg if a purge valve had to be locked open to prevent re-accumulation of energy).

When this is the case, the order should be defined in the procedure or Permit to Work.




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# General LOTO Restart: NOTIFY

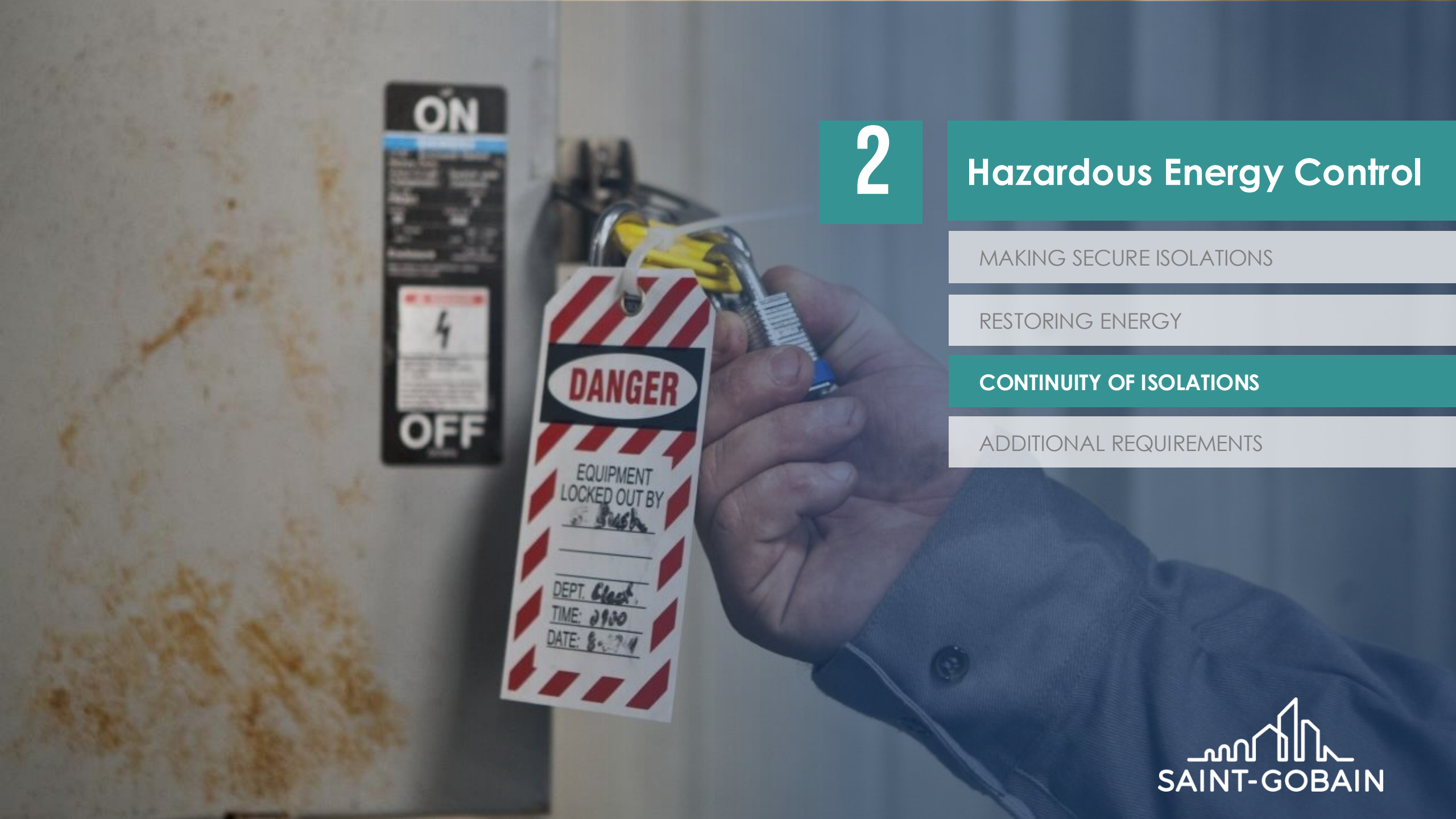
Before restarting the equipment, it is necessary to inform all **AFFECTED PEOPLE**.

This ensures that everyone who may be close to or interact with the equipment are aware that it is about to be reenergized and returned to service.

# General LOTO Restart: RESTART

Once all the previous steps have been completed the equipment can be restarted by following its normal start procedure.

After the equipment has been successfully energized and it is verified that it is working correctly, it can be returned to normal service.




# 2 Hazardous Energy Control

MAKING SECURE ISOLATIONS

RESTORING ENERGY

**CONTINUITY OF ISOLATIONS**

ADDITIONAL REQUIREMENTS

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# Continuity of Isolations:

It is important that the removal of hazardous energy remains under control throughout the work.

This requires that all isolations should be secure and under the control of an AUTHORISED PERSON.

Certain situations require specific procedures to ensure continuity:

- Isolations left unattended during a work shift
- Handing isolations over to another AUTHORISED PERSON.




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# Continuity of Isolations: Unattended During a Shift

When isolations have been left unattended during a shift (eg the work team leaves the area for a lunch break)the **AUTHORISED PERSON** should reconfirm that the isolations remain effective and the other necessary precautions are still in place before allowing work to restart.




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# Continuity of Isolations: Change of AUTHORISED PERSON

There are two main procedures that can be followed when AUTHORISED PERSONs need to change:

- SCENARIO 1: Face to Face
  When the outgoing **AUTHORISED PERSON** is able to meet and handover their responsibilities directly to the new **AUTHORISED PERSON**
  **EXAMPLE:** At the end of a work shift and the job is given to the oncoming shift to complete
- SCENARIO 2: Delayed
  When the outgoing **AUTHORISED PERSON** cannot meet the new **AUTHORISED PERSON** to hand over their responsibilities
  **EXAMPLE:** At the end of a work shift but the job cannot be continued until the next day



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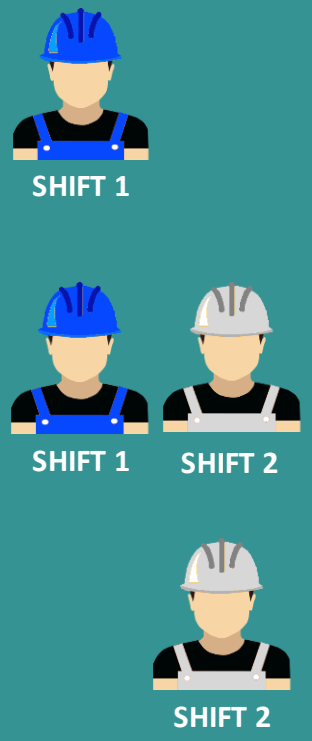
# Continuity of Isolations: SCENARIO 1: Swap Locks

The outgoing **AUTHORISED PERSON** should take the new **AUTHORISED PERSON** to each installed Lockout Device.

For each Lockout device the new **AUTHORISED PERSON** applies their lock then the outgoing **AUTHORISED PERSON** removes theirs. At the end of the process the new **AUTHORISED PERSON** will have applied their locks to all isolation points guaranteeing continuity.

This method is not adapted to SCENARIO 2 where a handover cannot be made face to face.



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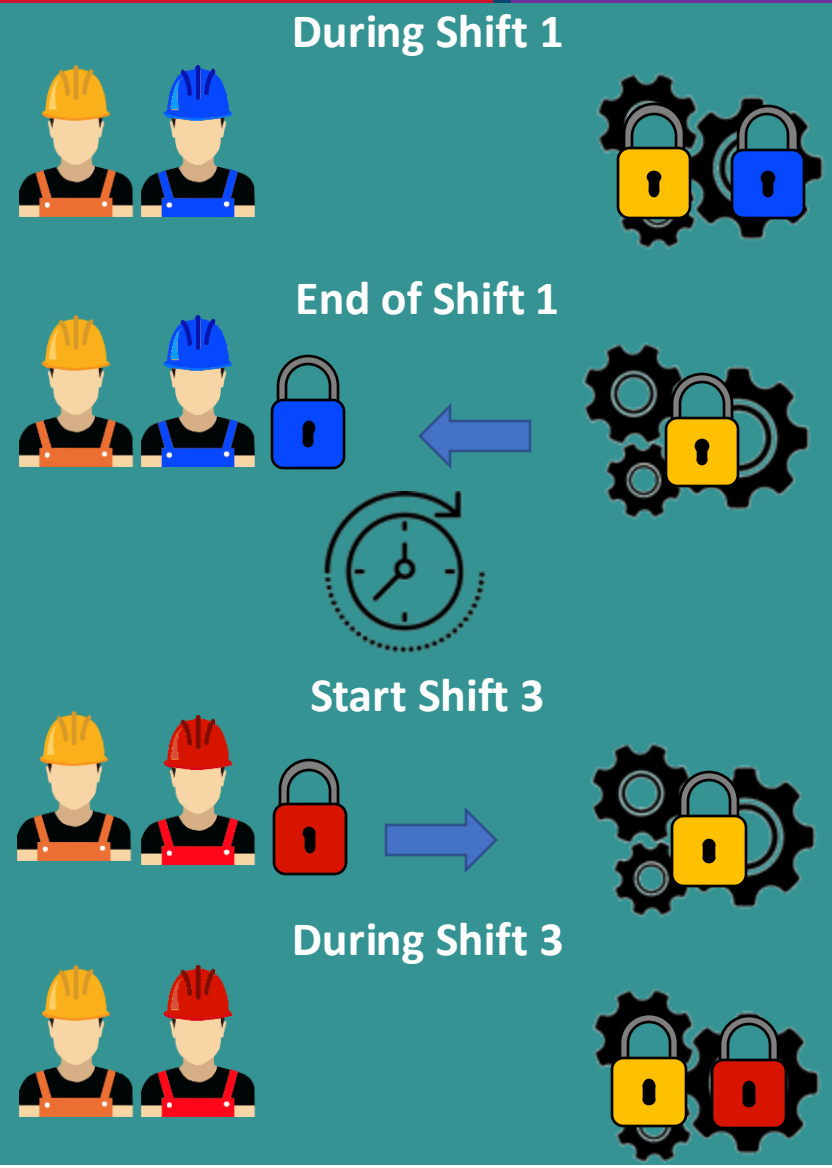
# Continuity of Isolations: SCENARIO 1 & 2: Transfer Locks

This solution requires the definition of additional roles in the Control of Hazardous Energy system, such as a "Senior **AUTHORISED PERSON**" on each shift.

The Senior **AUTHORISED PERSON** applies a Transfer Lock to all devices. It is the first lock to be applied and it remains in place for the duration of the work. It is the last to be removed at the end of the work.

All Senior **AUTHORISED PERSONS** should have access to the keys for these locks.

The presence of the transfer locks guarantees continuity of isolation when **AUTHORISED PERSONS** change.



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# Continuity of Isolations: Scenario 1 & 2: Shop Locks

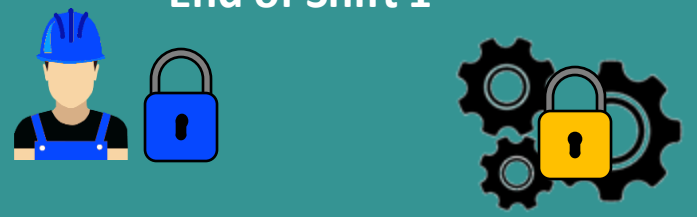
Similar to the Transfer Lock this system requires that a "shop lock" be placed on each isolating device before the **AUTHORISED PERSON** removes their lock at the end of their work period.

"Shop locks" are "keyed alike" and each **AUTHORISED PERSON** has a copy of the key. It is removed after the oncoming **AUTHORISED PERSON** has applied their lock at the start of the next work period.

This ensures even if all other locks are removed as people finish their work shift or need to stop work for technical reasons, the energy isolation remains securely in place.

**During Shift 1**

**End of Shift 1**



**Start Shift 3**

**During Shift 3**



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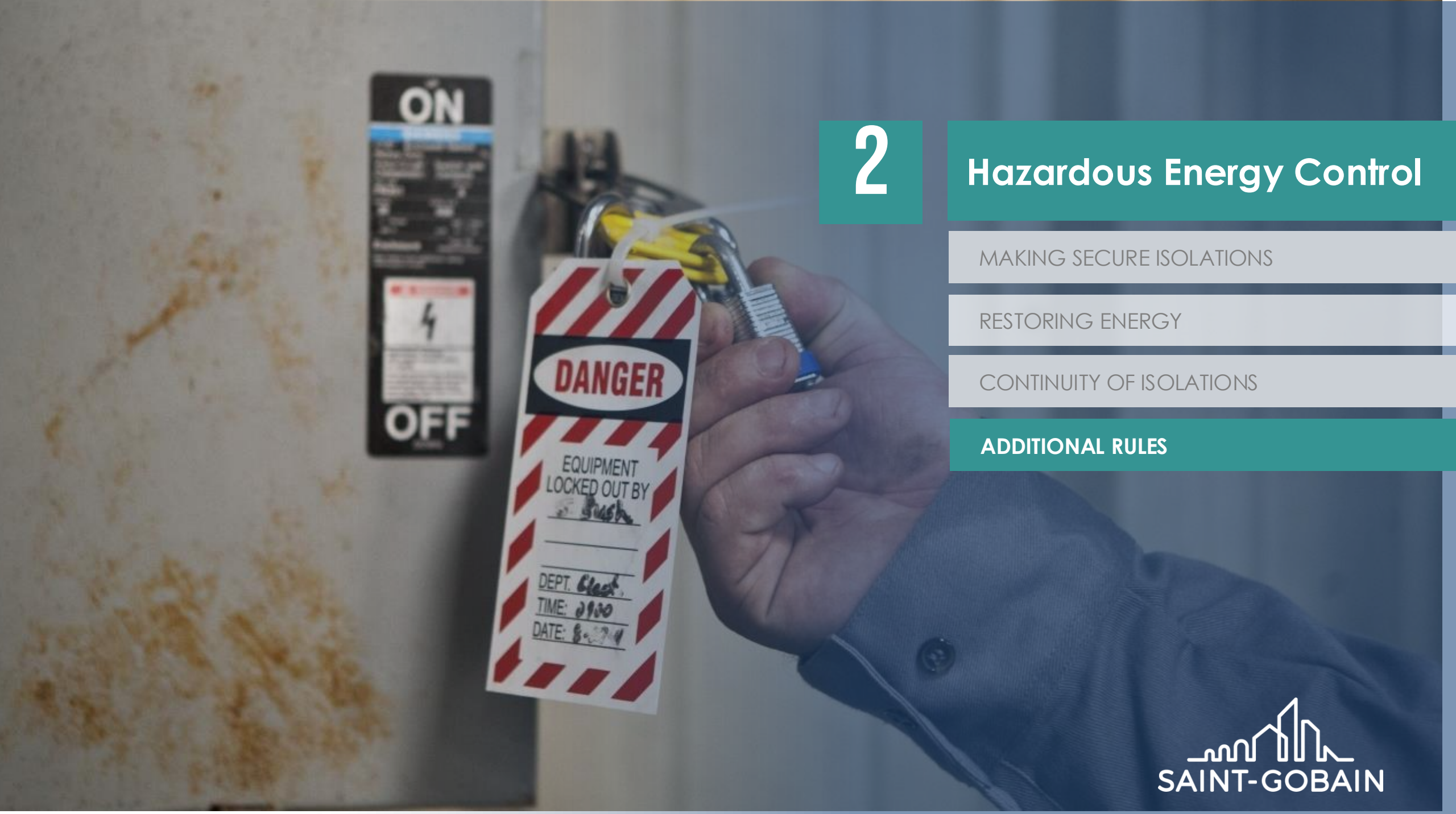


# 2 Hazardous Energy Control

MAKING SECURE ISOLATIONS

RESTORING ENERGY

CONTINUITY OF ISOLATIONS

**ADDITIONAL RULES**

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# Additional Rules

The Control of Hazardous Energy system should establish additional rules to cover topics such as:

1. Visual Management of Energy Isolating Devices
2. Group Isolations
3. Forced removal of Lockout devices
4. Maintenance of Isolation and Lockout Devices
5. Auditing of the Control of Hazardous Energy System




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# Additional Rules:
# 1. Visual Management (1/2)

It is recommended that sites adopt a common visual management system to help their workers identify the correct **ENERGY ISOLATING DEVICE** or other points where **LOCKOUT DEVICES** need to be attached.




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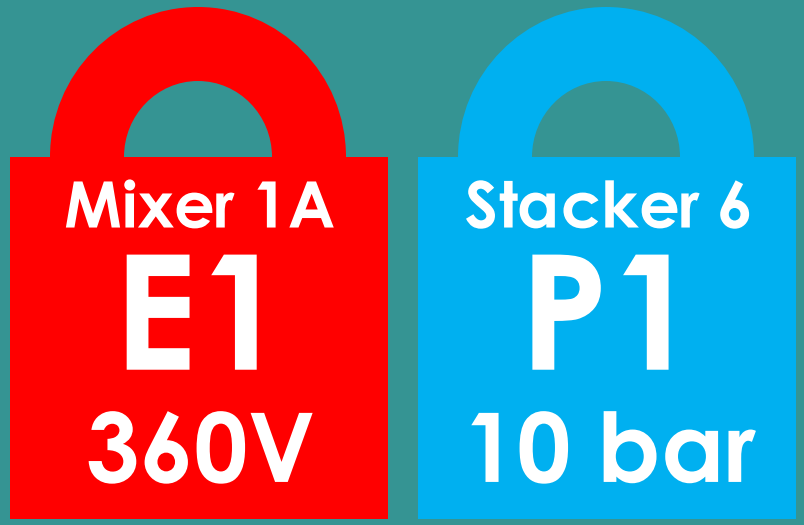
# Additional Rules:
# 1. Visual Management (2/2)

All Energy Isolating Devices should be labelled or marked using a standard format that is common across the entire site.

The Identification label should include the:

- Machine, equipment or process supplied,
- Type of energy supplied
- Magnitude of energy supplied.

The labelling or marking should be durable in order to withstand the environment in which it will be placed.



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# Additional Rules:
# 2. Group Isolations (1/3)

When more than one person will work on the equipment under isolation, it is necessary to ensure that everyone has the same level of protection.

Group isolation rules should be created to manage this process.



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# Additional Rules:
# 2. Group Isolations (2/3)

In **GROUP ISOLATIONS** one person should be nominated as the **AUTHORISED PERSON** for the task to ensure clear coordination and communication. All team members understand that their instructions must be followed.

They should discharge their duties that include:

- Communicate to affected persons
- Identify energy sources
- Disconnect hazardous energy sources
- Apply lockout devices to the energy isolation devices
- Verify that the equipment is in a zero energy state.




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# Additional Rules:
# 2. Group Isolations (3/3)

Each team member must then secure each lockout device. The 2 most common ways to achieve this are:

- The **AUTHORISED PERSON** applies group lockout devices on each energy isolating device allowing each person to apply their own locks to them
- The **AUTHORISED PERSON** places the keys for all the lockout devices that were fitted into a group isolation lock box and then each person applies their personal lock to the lock box.

Both systems ensure that energy cannot be restored until all members of the work team remove their lock(s).


Group Lockout device


Group Lock Box



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# Additional Rules: 3. Forced Removal of Lockout Devices (1/2)

Sites should have procedures to allow for the forced removal of lockout devices. This can occur when lockout devices are left on equipment in error, if keys are lost or in emergencies.




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# Additional Rules:
# 3. Forced Removal of Lockout Devices (2/2)

Forced removal procedures should ensure before a device is forcibly removed that:

- The impact of removing the isolation device has been established and appropriate precautions taken when necessary
- There is no alternative to the forced removal of the device
- The owner of the device has been informed or if they have left the site that they cannot return without first being informed.
- All **AFFECTED PERSONS** have been communicated with.




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# Additional Rules:
# 4. Maintenance of Isolation & Lockout Devices

There should be a schedule for inspection and maintenance of isolation and lockout devices.

Both devices need to be checked to ensure they are in good condition and in working order.

A damaged valve that allows fluid to pass or a broken lockout device that is no longer secure can result in workers being exposed to hazardous energy.



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# Additional Rules:
# 5. Auditing of the Control of Hazardous Energy System

There should be regular audits of the Control of Hazardous Energy System. The audits should cover all aspects of the system to ensure they are working as intended.

Audits should include:

- Checks that the GUARENTOR, AUTHORISED & AFFECTED PERSONS understand their responsibilities including where relevant practical demonstrations or live examples.
- Checks that procedures (system, equipment specific and others) are updated, accurate, clear and accessible
- Checks that procedures are known and respected
- Spot checks of work where energy isolations should be applied.



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1 Hazardous Energy Control

2 System Procedures

3 LOTO

4 Alternative Measures

5 Competence & Audit

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# IMPLEMENTING LOTO

**LOTO** should be used to control exposure to **HAZARDOUS ENERGY** whenever possible.

**LOTO** requires that the machinery or equipment in question has all its hazardous energy securely removed (i.e. taken to a **ZERO ENERGY STATE**) for the duration of the intervention.

When the task dictates a need for energy to remain (or be introduced during the work) **ALTERNATIVE MEASURES** should be developed (see Section 4).




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Talk about LOTO equipment before this slide



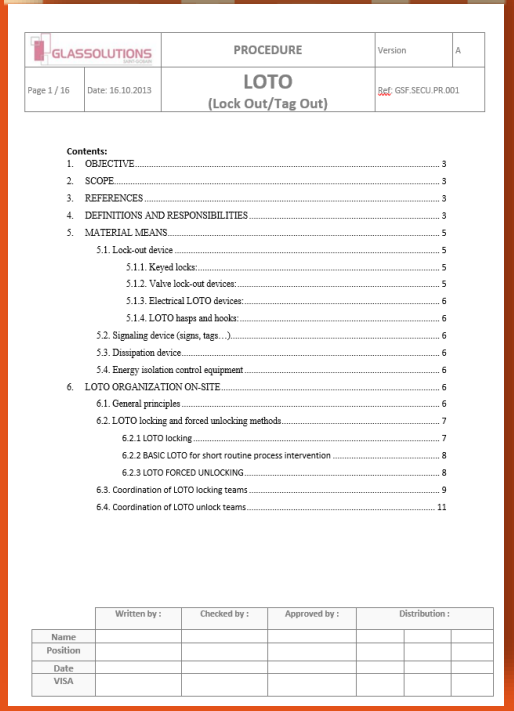
# The 3 pillars of a LOTO system

There are 3 key parts of an efficient LOTO system:

**Trained and competent PEOPLE (see Section 5)**
Who are aware of their and their colleagues roles and responsibilities

**EQUIPMENT SPECIFIC PROCEDURES**
Detailing the isolations that need to be made in order to bring the equipment to a **ZERO ENERGY STATE** and how to apply them.

**LOCKOUT DEVICES, LOCKS & MATERIAL**
Sufficient quantities of Lockout Devices, locks etc to meet the site requirements and that are maintained in a good condition



GLASSOLUTIONS | PROCEDURE | Version A | Page 1 / 16 | Date: 16.10.2013 | LOTO (Lock Out/Tag Out) | Ref. GSF.SECU.PR.001

Contents:



| | Written by : | Checked by : | Approved by : | Distribution : | | |
|---|---|---|---|---|---|---|
| Name | | | | | | |
| Position | | | | | | |
| Date | | | | | | |
| VISA | | | | | | |

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Replace brady



# Equipment Specific Procedures (ESP)

**EQUIPMENT SPECIFIC PROCEDURES (ESP)** are the central element of a LOTO system. These procedures are in addition to other procedures that describe how the overall system should function and be maintained.

They are created to give clear practical instructions on how to remove **HAZARDOUS ENERGY** from specific pieces of equipment and describe which **LOCKOUT DEVICES** are required to secure the removal of the energies.

Any piece of machinery or equipment that presents a risk of exposing people to **HAZARDOUS ENERGY** should have an **ESP** developed for it.




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# Basic Content of an ESP

An ESP should detail:

- The **HAZARDOUS ENERGIES** present and the location of their **ENERGY ISOLATION DEVICES**
- The sequence and method to securely isolate all energy sources from the equipment
- The **LOCKOUT DEVICES** required to secure the isolation points,

to bring a specific piece of equipment to a **ZERO ENERGY STATE.**

The procedure should also detail how the energy isolations can be validated and how they should be removed to safely return the equipment to service.




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# How ESPs Work

ESPs should be available on or near the equipment they concern.

Only **AUTHORISED PERSONS** who are trained and competent have permission to follow these procedures and apply the necessary **LOCKOUT DEVICES** to take the equipment to a **ZERO ENERGY STATE**.

The **AUTHORISED PERSON** is then able to work on the equipment (alone or with a team under their direction) without risk of exposure to **HAZARDOUS ENERGIES**.

Once the work is complete the **AUTHORISED PERSON** should follow the ESP to safely return the equipment to service.



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# Creating An ESP (1/7)

**EQUIPMENT SPECIFIC PROCEDURES** should be developed by a team.

The team should have the following competencies as a minimum:

- Working knowledge of the site Control of Hazardous Energy system, including LOTO
- Relevant technical competences (mechanical, electrical, etc)
- Practical experience of operating and working on the equipment

EHS should be involved in a supporting and validating role.

# Creating An ESP (2/7)

The first step in creating ESPs is to build an inventory of all equipment on site that are driven by or contain at least one source of energy (supplied, residual or potential). Building this inventory is  also a good opportunity to check machinery safety compliance.

The team should then identify which of these items require regular physical interventions (eg for maintain, set up, or repair).

It is necessary to consider all reasonably foreseeable interventions on equipment when defining this inventory.

The team should then define a plan to create ESPs for the identified equipment **PRIORITIZING THOSE ITEMS THAT PRESENT THE HIGHEST RISKS** of exposure to hazardous energy.



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# Creating An ESP (3/7)

For each piece of equipment the team needs to:

- Identify all sources of energy and their magnitude
- Identify all **ENERGY ISOLATING DEVICES**
- Verify that activating each isolating device completely and effectively disconnects that energy source from the equipment
- Verify that each **ENERGY ISOLATING DEVICE** can be locked out in the position where the energy is removed using a **LOCKOUT DEVICE**
- If the **ENERGY ISOLATING DEVICE** cannot be locked out the equipment should be modified to allow it.




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# Creating ESPs (4/7)

The team should then:

- Clearly and visually identify each **ENERGY ISOLATING DEVICE** to help in their identification and avoid errors.
  - It is recommended that a standard visual management system for the identification of **ENERGY ISOLATING DEVICES** is defined as part of the site's Control of Hazardous Energy system (see Additional Rules in Section 2 - System)
- It is recommended to take pictures of each **ENERGY ISOLATING DEVICE** and include them in the ESP




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# Creating ESPs (5/7)

For each **ENERGY ISOLATING DEVICE** the team should:

- Define the method for removing energy using the **ENERGY ISOLATING DEVICE**
- Define the correct **LOCKOUT DEVICE** that should be used and describe how they should be fitted.
- Define how to **VERIFY** the absence of energy after the **LOCKOUT DEVICE** has been fitted




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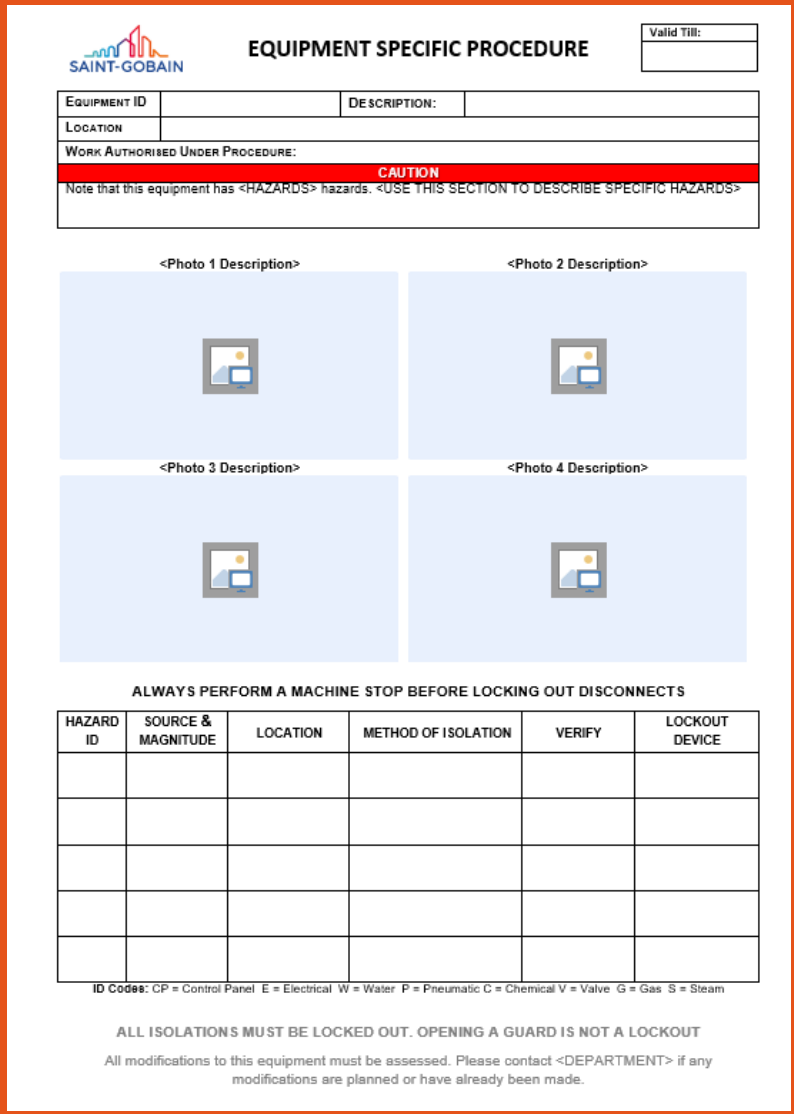
# Creating ESPs (6/7)

The team should then transfer the information they have collected into an **ESP TEMPLATE**. This template should be the same for all ESPs on site to ensure the information is communicated in a clear and consistent manner.

Once all of the required information has been transferred to the template, the ESP should be validated by a competent person and made available on or near the concerned equipment.

All **AUTHORISED PERSONS** should be informed that the procedure is available. They may require training to ensure they fully understand the new procedure.



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**EQUIPMENT SPECIFIC PROCEDURE**

Valid Till:

| EQUIPMENT ID | | DESCRIPTION: | |
|---|---|---|---|
| LOCATION | | | |
| WORK AUTHORISED UNDER PROCEDURE: | | | |

**CAUTION**

Note that this equipment has <HAZARDS> hazards. <USE THIS SECTION TO DESCRIBE SPECIFIC HAZARDS>

<Photo 1 Description> <Photo 2 Description>

<Photo 3 Description> <Photo 4 Description>

**ALWAYS PERFORM A MACHINE STOP BEFORE LOCKING OUT DISCONNECTS**

| HAZARD ID | SOURCE & MAGNITUDE | LOCATION | METHOD OF ISOLATION | VERIFY | LOCKOUT DEVICE |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**ID Codes:** CP = Control Panel E = Electrical W = Water P = Pneumatic C = Chemical V = Valve G = Gas S = Steam

**ALL ISOLATIONS MUST BE LOCKED OUT. OPENING A GUARD IS NOT A LOCKOUT**

All modifications to this equipment must be assessed. Please contact <DEPARTMENT> if any modifications are planned or have already been made.

# Creating ESPs (7/7)

The site should ensure that all new machinery or equipment brought onto site are assessed and have an ESP developed (or ALTERNATIVE MEASURES defined) for them before they are entered into service.

This should become part of the standard commissioning and acceptance process for new machines and equipment.

# Keeping ESPs up to date

ESPs should be reviewed regularly to ensure they remain up to date.

Equipment and Machinery should also be checked regularly to ensure that:

- An ESP or Alternative Measures have been defined for them
- Each source of energy supplying them is equipped with an appropriate **ENERGY ISOLATING DEVICE**
- All **ENERGY ISOLATING DEVICES** operate properly and when used they completely separate the equipment from the energy source
- If any significant modification has been made to the equipment, that the ESP (or Alternative Measures) are reviewed and updated to take the changes into account.




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# When ESPs are Not Required

Some relatively simple pieces of equipment can be brought to a **ZERO ENERGY STATE** without the need to create and follow an ESP.

For equipment to be **EXEMPT** from the requirement to have an ESP developed, they must satisfy **ALL** of the conditions listed opposite.

However, they are **NOT EXEMPTED** from the requirement to establish **ALTERNATIVE MEASURES** to ensure any work on them can take place safely.

- There is NO potential for stored or residual energy
- It has only ONE energy source
- It is completely deactivated by the isolation of its single source
- It can be locked out during the work
- It requires only ONE lockout device to lock out and control it
- The person working on it must have exclusive control over it during the work
- The person will not create additional hazards that could harm other workers during their work
- There have been no prior incidents on the equipment due to uncontrolled energy


1 Hazardous Energy Control

2 System Procedures

3 LOTO

4 Alternative Measures

5 Competence & Audit

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# Alternative Measures of Hazardous Energy Control

**LOTO** is one of the most reliable method of preventing contact with hazardous energy during an intervention. It defines measures to take a system to a **ZERO-ENERGY STATE** and thus eliminating the risk.

However, there are some activities where full energy isolation is **NOT PRACTICABLE**. This is often encountered when one or more sources of energy are required to successfully complete a task.

In such situations, **ALTERNATIVE MEASURES** of hazardous energy control should be implemented.



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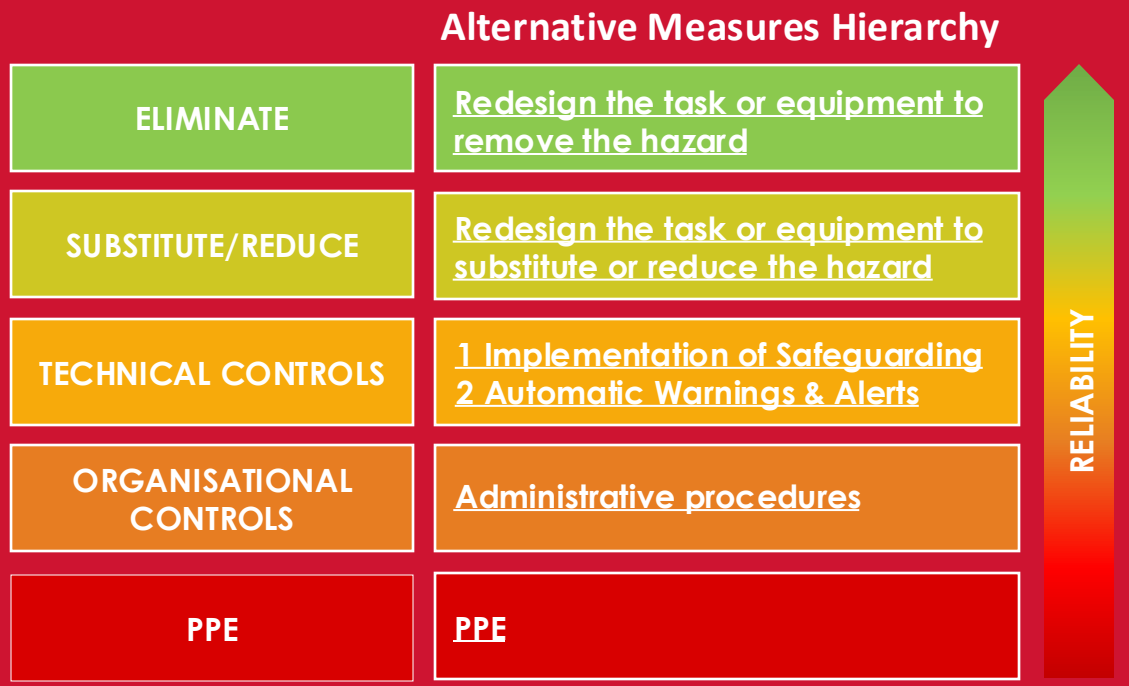
# Hierarchy of Control in Alternative Measures

When selecting **ALTERNATIVE MEASURES** sites should, as always, refer to the principle of the hierarchy of control:

(a) Eliminate the hazard through design,
(b) Reduce the hazard through design
(c) Use engineering safeguards,
(d) Use warning and alerting techniques,
(e) Use administrative controls,
(f) Use the personal protective equipment appropriate for the hazard.

- *The objective of this process is to select the highest possible level of control. Sometimes the application of a single control methodology will not provide an effective level of protection. In those cases a combination of lower level controls should also be applied.*



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# Hierarchy of Control
# Eliminate or Reduce Risk by Design

The most effective actions that can be taken are at the equipment's design stage.

Some elements can be fitted to existing equipment but generally this is more technically challenging.

So a key requirement of any Hazardous Energy Control system is to ensure equipment that is purchased and brought to the site is designed in a way to minimize the risks of exposure to hazardous energy.




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# Hierarchy of Control
# Eliminate or Reduce Risk by Design

International norms have been developed that try to ensure machinery and equipment is safe (eg ISO 13849-1, IEC 62061).

Ensuring equipment entering a site conforms to these norms can help avoid unforeseen and potentially hazardous machine or equipment behavior such as:

- Unexpected start-up,
- Unexpected speed change,
- Failure to stop moving parts,
- Dropping or ejection of machine parts or workpiece(s),
- Machine action that disables safety function(s) or protective devices.

# Hierarch of Control
# Engineering Safeguards (1/4)

Engineering safeguards should provide an equivalent level of protection to applying LOTO to prevent contact with hazardous energy during work on the equipment.



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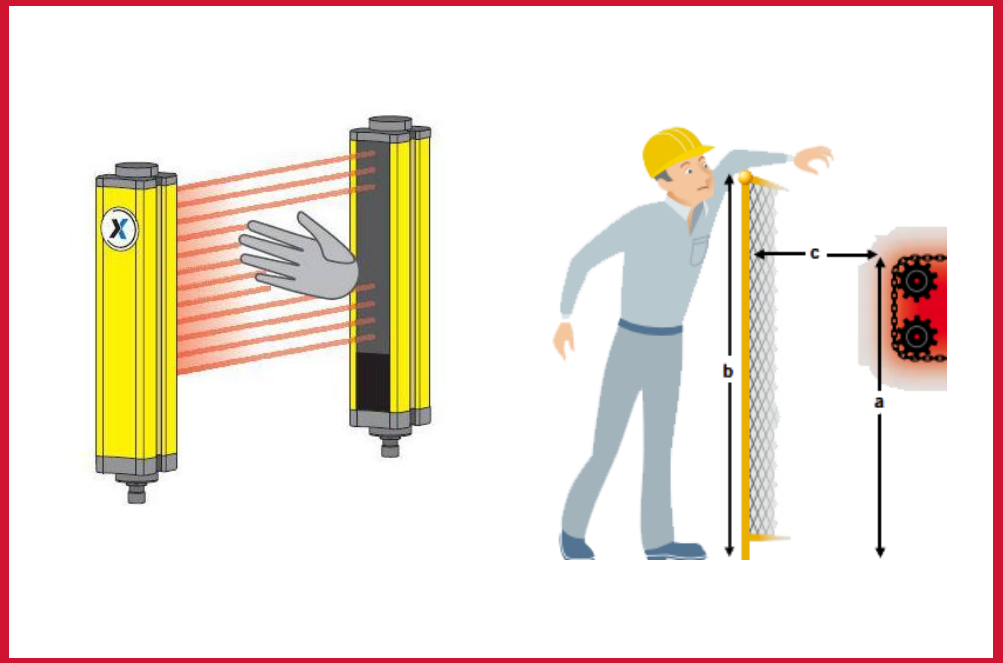
# Hierarch of Control
# Engineering Safeguards (2/4)

Engineering safeguards such as light curtains, pressure mats or physical barriers can be installed on equipment. These are designed to prevent contact with hazardous energy using a variety of strategies.

However, if they are to be used as an **ALTERNATIVE MEASURE** to control exposure to hazardous energy they must:

- Be constructed using quality components
- Incorporate control reliability
- "Fail to safe".

In addition, residual risk and the possibility that the safeguard might be defeated or bypassed should be assessed.



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# Hierarch of Control
# Engineering Safeguards (3/4)

## Principle of Individual Control

When designing **ALTERNATIVE MEASURES** the **AUTHORISED PERSON** that will perform or lead the work on the equipment should have an individual control that prevents any unexpected release of or contact with hazardous energy.

Examples include locks, pendants, and locking guards.




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# Hierarch of Control
# Engineering Safeguards (4/4)

Other appropriate Engineering Safeguards can include:

(a) Area scanners – detecting person(s) entering the sensing field,
(b) Fixed and movable guards,
(c) Hold-to-run devices that require application of direct pressure to one or more buttons
WARNING: these devices only protect the individual operating the device!
(d) Light curtains and single opto-electronic beams – these devices activate a safety stop when the beam or a sensing plane is interrupted by a person or part of a body.
(e) Pressure mats detect a person walking on its surface.
(f) Safety-rated switches must be tamper resistant and mechanically actuated. Coded & monitored contactless (magnetic or RFID) switches may also be used.
(g) Stop devices include buttons, cables, edge sensors that are capable of activating stop functions.
WARNING: depressing/releasing these devices must not automatically restart machines.
(h) Trapped key devices are mechanically attached to power circuits, switches & valves and access doors. They enable access through predetermined sequence of actions.

# Hierarchy of Control
# Warning and Alerting Techniques

Warning or alerting techniques should be implemented when a risk assessment indicates that their use would be beneficial or where engineered safeguards alone do not provide an adequate protection.

These techniques include:

(a) Barricades to prevent access to a hazardous area - in conjunction with other warning systems
(b) Automated Warning Systems - audible and/or visual systems that warn if a hazardous condition is detected
(c) Warning signs & placards
(d) Safety Attendant - a person who is added to complement other control methods, to monitor the effectiveness of those controls and to alert personnel when problems are detected. Adequate reaction time should be considered.




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# Hierarchy of Control
# Administrative Controls

**SAFE OPERATING PROCEDURES** can be developed. They are particularly useful when the sequence of steps is critical to ensure the safety of the **AUTHORISED PERSON** or their team who are performing work protected by **ALTERNATIVE MEASURES.**

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EQUIPMENT SPECIFIC PROCEDURE

| | | | | |
|---|---|---|---|---|
| EQUIPMENT ID | BR-1 | | | Valid Till: |
| LOCATION | UTILITIES BUILDING 2 – NORTH CORNER | DESCRIPTION: | Hot Water Boiler | |

WORK AUTHORISED UNDER PROCEDURE: ANY WORK ON BOILER WHERE NO ENERGY IS REQUIRED

CAUTION

Allow at least 3 hours for the vessel to cool after carrying out this procedure before commencing work.

NORTH WALL

SOUTH SIDE

WEST SIDE

ALWAYS PERFORM A MACHINE STOP BEFORE LOCKING OUT DISCONNECTS

| HAZARD ID | SOURCE & MAGNITUDE | LOCATION | METHOD OF ISOLATION | VERIFY | LOCKOUT DEVICE |
|---|---|---|---|---|---|
| E-1 | Electrical 480V | MCC on north wall | Move E-1 disconnect to OFF position & lockout | Attempt restart at CP-1 | Lockout hasp & lock |
| W-1 | Hot Water Supply | Above boiler on west side | Turn W-1 valve to OFF & lockout | Verify pressure has bled off | Cable lockout |
| W-2 | Hot Water Return | Above boiler on west side | Turn W-2 valve to OFF & lockout | Verify pressure has bled off | Cable lockout |
| G2 | Gas Natural Gas | West side of boiler | Turn G-1 valve to OFF & lockout | Verify pressure has bled off | Universal ball valve lockout |
| | | | | | |
| | | | | | |

ID Codes: CP = Control Panel E = Electrical W = Water P = Pneumatic C = Chemical V = Valve G = Gas S = Steam



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# Hierarchy of Control
# Administrative Controls

A **PERMIT TO WORK** should always be required to help control **HIGH RISK** work such as **COMPLEX INTERVENTIONS** or work on "live" equipment.

A **PTW** should also be used whenever there is no standard operating procedure or ESP existing for a task or a particular piece of equipment.

**LOTO** #:548

THIS PERMIT MUST BE USED IN CONJUNCTION WITH GENERAL PERMIT:

LINK TO OTHER RELIVANT PERMITS

| Permit Type | Permit # | Issuer | Valid until |
|---|---|---|---|
| LOTO | 548 | Jack G. | May 27 |

| Permit Type | Permit # | Issuer | Valid Until |
|---|---|---|---|
| | | | |

1. THE ACTIVITY: Motor replacement
Location of Planned Work: Line 2
Description of activities to take place:
De-energize the equipment and lock out
Remove side panels
Disconnect and remove defective motor
Install the replacement motor and reconnect all wiring
Replace guarding panels and re-energize

2. Plant & Equipment to be ISOLATED under LOTO:
Line 2 conveyor drive system

TREAT ALL OTHER EQUIPMENT AS LIVE

3. REQUIRED ISOLATIONS

| Number | Location | Method |
|---|---|---|
| E1 | Main electrical panel | Switch off and lock out, verify by attempting to restart |
| P1 | South side of the line | Turn off the valve, apply cover and lock out |
| P2 | North side of the line | Turn off the valve and apply lock to built-in hasp |

Additional Comments

WARNING NOTICES MUST BE AFFIXED TO ALL ISOLATION POIMTS DESCRIBED ABOVE

4. EXPERT APPROVAL — Signed: Bob Thebuilder Date & Time: 5/27

5. ACCEPTANCE — Signed: Frank Letank Date ^ Time: 05/27

5. ISSUED:
From: 09:00 Until: 15:00 Signature: Jack G Date: 05/27
ADDITIONAL AUTHORISATION: Signature: Date:

6. APPROVAL TO DEISOLATE
The planned work has been completed / suspended. The isolations can now be removed excluding the exceptions detailed below:
EXCEPTIONS:
Signature: Date & Time:

7. DEISOLATION
All isolations detailed in **Section 3** have been removed and the equipment detailed in **Section 1** is now available to commence pre-start checks
Signature: Date & Time:



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# Hierarchy of Control
# Administrative Controls


Defining mandatory levels of training can be a key control.

Risk can be reduced by restricting certain tasks to only those with the required training competence and experience.

Any method requiring adherence to a Permit to Work or procedure should require additional specific training.

Anyone with a role in the Hazardous Energy Control system should receive some level of training (see Section 5).



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# EXAMPLE Alternative Measures for Production Interventions

**SCENARIO:** An operator needs to gain access to a robot cell to remove product from the area.

**ALTERNATIVE MEASURE:**

**Safe Design:**
Interlocked safety gate & robot remote pendant

**Administrative Measures:**
System of personal locks for operators
Production intervention procedure (eg simplified ESP)
Visual identification of lockout point

**Operator Training**
Production intervention procedure
How to apply and remove locks



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# EXAMPLE Alternative Measures for Complex Interventions

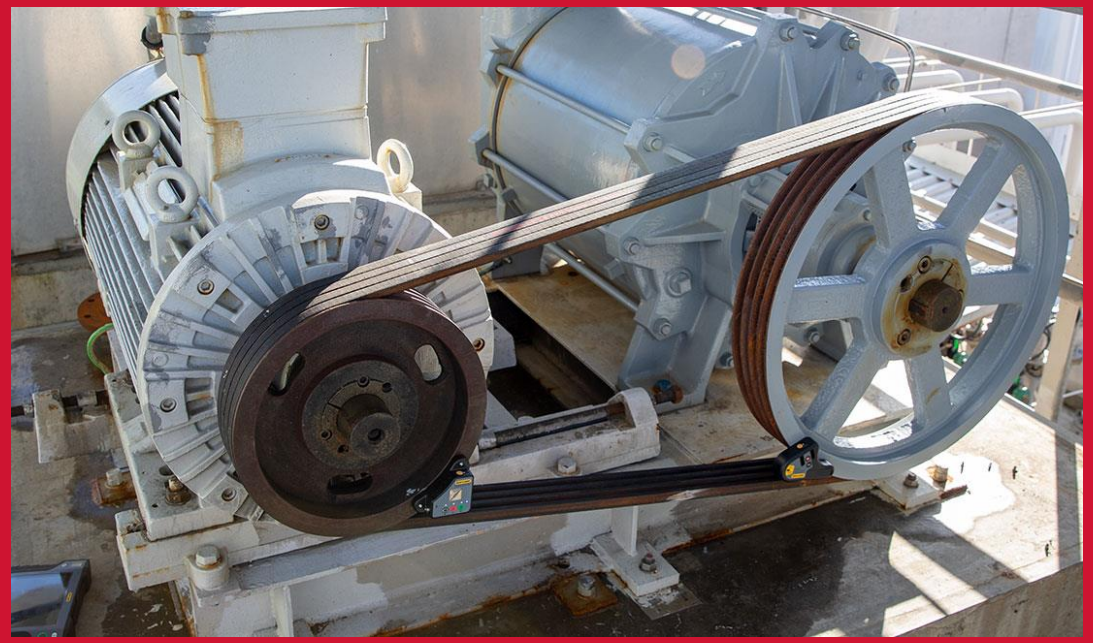
**SCENARIO:** An Engineer wants to replace a motor then test the new one and align its belt.

**ALTERNATIVE MEASURE:**

**Safe Design:**
Current and new motors are CE marked and have isolating devices

**Administrative Measures:**
Permit to Work requires the engineer to follow an ESP to reach zero energy state and defines the measures required to allow energy to be restored for testing and for working on unguarded energized equipment

**Operator Training**
**AUTHORISED PERSON**, Permit to Work training, live working training





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1 Hazardous Energy Control

2 System Procedures

3 LOTO

4 Alternative Measures

5 Competence & Audit

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# COMPETENCE

All people involved in the control of hazardous energies should be competent.

This means something different for each main role in the system. The next section describes what competence should look like for:

- The System Guarantor
- AUTHORISED PERSONs
- Affected Persons
- Trained Operators for specific tasks.

All training should be documented.



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# COMPETENCE: System Guarantor

The System Guarantor should:

- Ideally be an engineer with experience working with different types of energies
- Have sufficient authority and resources to discharge their responsibilities
- Fully understand the requirements of local regulations and the Saint-Gobain Standard for Control of Hazardous Energy
- Be an expert in the site's Control of Hazardous Energy System
- Have completed the site's **AUTHORISED PERSON** training



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# COMPETENCE: AUTHORISED PERSON (1/4)

The **AUTHORISED PERSON** should:

- Be formally recognized by the System Guarantor as being capable to perform their duties
- Clearly understand the limits of their authorization (for example, only authorised to perform LOTO, limits placed on the magnitude or types of energy sources they are authorised to work on etc)
- Understand the requirement to communicate with **AFFECTED PERSONS**




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# COMPETENCE: AUTHORISED PERSON (2/4)

The AUTHORISED PERSON's training content should be adapted to:

- The types of equipment they will be authorised to work on
- The types and magnitudes of energies they will encounter within their authority
- The acceptable methods (eg ESP or alternative) and other control measures for these energy types.




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# COMPETENCE: AUTHORISED PERSON (3/4)

The AUTHORISED PERSON's training content should include:

- A detailed examination of the site Hazardous Energy Control System and associated procedures
- Practical exercises where they can follow existing **EQUIPMENT SPECIFIC PROCEDURES** to enable them to fully understand how to apply them
- An explanation of how to create new **EQUIPMENT SPECIFIC PROCEDURES.**



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# COMPETENCE: AUTHORISED PERSON (4/4)

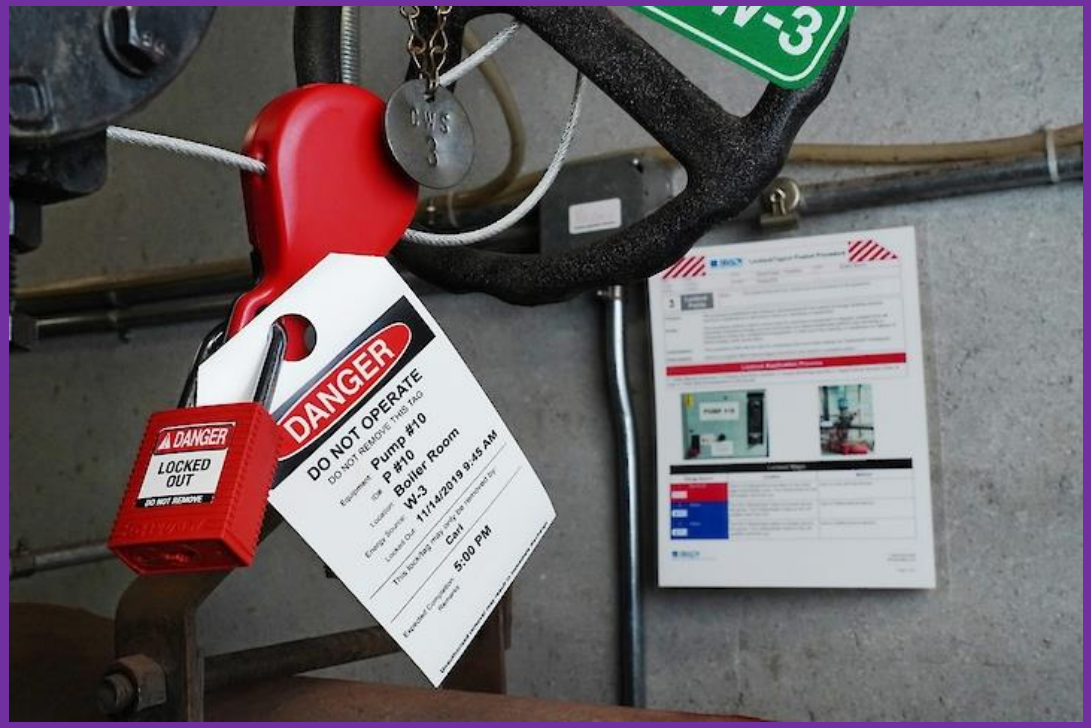
If the **AUTHORISED PERSON's** role requires them to apply **ALTERNATIVE MEASURES**, additional training should be given on:

- Following existing Maintenance procedures that include the use of **ALTERNATIVE MEASURES**
- Understanding what are acceptable **ALTERNATIVE MEASURES**
- Understanding how and when an intervention becomes **COMPLEX**
- The site Permit to Work system (They may have to be trained as a "**HOLDER**" – which should be an additional training course)

# COMPETENCE: AUTHORISED PERSON Training

Sites can develop modular training for **AUTHORISED PERSONS** where they only train in the topics necessary to fulfil their expected duties. For example:

- LOTO Intervention
- Production Interventions
- Standard Interventions
- Complex Interventions
- Interventions by Contractors
- High Pressure Systems
- High Voltage Electrical Systems
- etc



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# COMPETENCE: Affected Persons

Affected Persons training should include:

- Understand their role under the Control of Hazardous Energy System of the site
- Understand & follow the instructions of **AUTHORISED PERSONS** regarding the status of equipment
- Recognize **ENERGY ISOLATIONS** and understand their function and limits
- Ensure they never interfere with energy Isolations.



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# COMPETENCE:
# Trained Production Operator

Operators who are required to perform **PRODUCTION INTERVENTIONS** should receive specific **AUTHORISED PERSON** training. The contents of this training should include:

- The relevant work procedures that cover the production interventions they may need to perform and details of the **ALTERNATIVE MEASURES** they should employ
- The procedure to follow when applying or removing their lock




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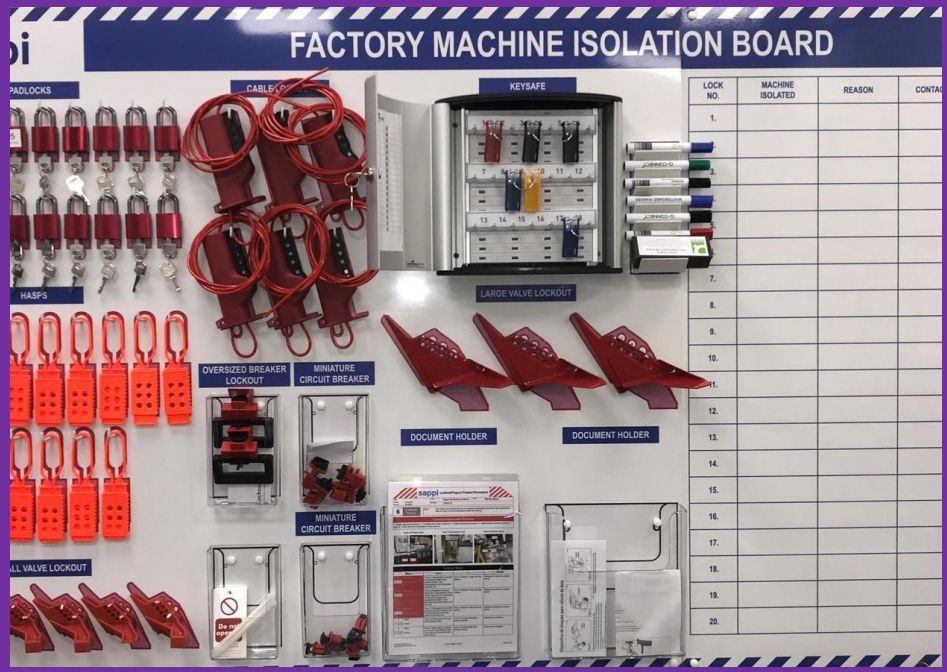
# Audit of Hazardous Energy Control System (1/2)

An audit system should be established to regularly check the effectiveness of the system. The audit should check that:

- The system meets the minimum requirements of the Saint-Gobain Control of Hazardous Energy Standard
- Procedures are regularly reviewed to ensure that they are accurate, up to date and respected, especially when new equipment is installed or modifications are made to existing equipment.
- The training and competence of **AUTHORISED PERSONS** and others with roles in the program is evaluated.
- The equipment has the necessary Isolation Devices installed and the site has sufficient appropriate Lockout Devices available to implement the program.



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# Audit of the Hazardous Energy Control System (2/2)

The Audit system should:

- Be documented
- Have a clear schedule
- Examine the operation of the system, its documentation and how individual tasks are actually managed on the shop floor.
- Deliver clear recommendations for improvement when gaps or deficiencies are discovered
- Follow up previous recommendations to ensure their completion.




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