

CAR 04 – Lockout, Tagout and Zero Energy (Vale North Atlantic)



Hello and welcome to the CAR 01 course - CRITICAL ACTIVITIES REQUIREMENTS: WORKING AT HEIGHTS.

The purpose of this awareness module is to provide an overview of the Vale Critical Activity Requirements that have been introduced to Vale's operations globally. These requirements are in the process of being fully implemented across our operations.

≡ Welcome

≡ Context

≡ Bowtie

≡ Lockout, Tagout and Zero Energy

≡ Removal of Locks and Tags Process

- ≡ Requirements in the Absence of Procedure, or when Procedure not Provided for Lockout
- ≡ Requirements to Prevent Failures in the Lockout Procedure
- ≡ Requirements for Zero Energy State
- ≡ Requirements to Prevent Failure of Lockout and Tagout
- ≡ Requirements to Prevent Failure in the Work Planning
- ≡ Requirements to Prevent Failure of Communication Among Working Groups
- ≡ Requirements to Prevent Failure or Lack of Lockout in a Potential Gravitational Energy Source
- ≡ Req. to Prevent Failure to Replace Protection Devices/or Guarantee in the Int. of Safety Conditions
- ≡ Requirements for training. Every person performing lock out tag out must be trained.
- ≡ Roles and Responsibilities
- ❓ Quiz
- ≡ Conclusion

Welcome



Watch the video in full to continue.

Context



CARs are part of Vale's safety culture. Their application is essential for the execution of critical activities.

PTP – 00813

Critical Activity Requirements are described in the document number 00813. In December 2019, CARs 01 to 05 were revised.

PNR-000069 Rev. 1 24/11/2020 has changed both in form and in content, with the aim of making requirements more robust, making critical activities SAFER and fulfilling our value life matters most.



**In this course, we will deal specifically with CAR 04 –
Lockout, tagout and zero energy.**



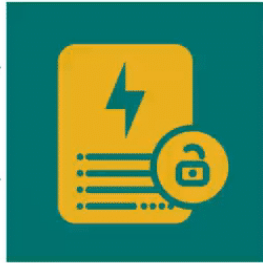
Complete the content above before moving on.



In the video below, you will see different tag colours. Please use the colour that is utilized in your location as per your local regulatory requirements and Vale Standards.



This video contains a definition for Zero Energy State. Please use the definition as defined by your regulatory requirements. Local definitions will be reviewed during the technical training at your location.



CAR 04

Lockout, Tagout and Zero Energy



Watch the video in full to continue.

Lockout and equipment settings

Explore the tabs below and review important concepts related to CAR 04.

Hazardous energy treatment:



It is the action by specific methods to prevent a hazardous energy from hurting people, when the isolation of the energy is not possible.

Hazardous energy isolation:

Is the act of removing, disconnecting and preventing inadvertent restoration of energy. It includes the removal and disconnection of energy sources, discharge of residual energy, blocking and / or locking, labeling and testing of the removal or disconnection of hazardous energy.

Lockout of hazardous energies:

The application of specific isolation requirements to prevent harm as a result of being exposed to an uncontrolled release of energy. This may occur with the unexpected activation of machinery and equipment or release of hazardous energy during maintenance or service activities.

Exclusive lockout:

Management of work on equipment or a process is transferred solely to one service team for exclusive control of the isolation, lockouts and work without any other party being allowed to access the process / equipment until it is released by the workgroup. (This is performed where there is increased risk caused by simultaneous activities.).

Lockout device:

A mechanical means of locking equipment or system energy source isolation devices that prevents machinery or equipment from becoming energized.

Isolation devices

A device capable of being locked out for isolation of an energy source, such as sectioning keys, valves, dampers, switches, circuit breakers, etc.

Maneuver or switching devices:

Devices that have the capacity of interrupting, deviating or not enabling the restoration of an energy source, such as disconnecting switches, valves, dampers, circuit breakers, etc.

Power settings

Explore the tabs below and review.

Hazardous energy:

Potential energy that if released can result in significant harm.

Electrical energy:

Energy from flow of electrical current as a result of a potential difference between two points in an electrical field.

Gravitational energy:

Energy of an object (at rest or in motion) exerted by the gravitational pull of the earth.

Hydraulic energy:

Is the energy stored within a pressurized liquid. When under pressure, the fluid can be used to move heavy objects, machinery, or equipment.

Mechanical energy:

Is the energy transferred by means of a force on an object through a distance, or an object in motion.

Pneumatic energy:

Energy produced from compressing air within an enclosed system.

Chemical energy:

Energy contained at a molecular level within a chemical substance. It is a measure of the substance's capacity to transform into another substance through a chemical reaction subsequently releasing, or absorbing, energy.

Radioactive (or nuclear) energy:

Energy produced as a result of a fission or fusion reaction during the molecular transformation of unstable atomic nuclei.

Residual energy:

Accumulated energy remaining when energy sources to a system are turned off. Left undissipated residual energy can result in significant harm and therefore must be tested, and where present, eliminated so that a zero energy state is obtained.

Thermal energy:

Energy generated by the kinetic energy of the atoms of a substance.

Energized:

Connected to an energy source or containing residual or stored energy.

Zero energy state:

An energy level that is so low that it cannot result in harm.

Energy source:

Any electrical, hydraulic, pneumatic, chemical, mechanical, nuclear, gravitational, residual, thermal.

Isolation of dangerous energies:

It is the act of removing, disconnecting and preventing unintentional energy restoration. It includes the removal and disconnection of energy sources, discharge of residual energy, blocking and/or locking, tagging and testing the removal or disconnection of dangerous energies.

Complementary definitions

Explore the tabs below and review.

Tag:

Individual warning card that fastens to the lock and includes name, date, time and reason for lockout.

Group

—

Group of people involved in performing a activity independent of the company or specialty.

Treatment of dangerous energies:

—

The action of preventing a dangerous energy from injuring people by specific methods, when isolation of energy is not possible.

Lockout matrix:

—

Document or computer worksheet that shows the identification of energy sources and lockout devices associated with the machine, equipment, system or facility.

Local standards:

—

Formal regional / industrial / legislated requirements applicable to the operational area that are to be reflected in local procedures.

Visitor:

—

A person that, although not being directly involved in activity related to the process lockout must also apply individual lockout device(s).



Complete the content above before moving on.



In the video below, you will see different tag colours. Please use the colour that is utilized in your location as per your local regulatory requirements and Vale Standards.

This video refers to the term Group Seal, which means "Group Lockouts".

For Locks and Lockout boxes, use the colours as per your local regulatory requirements and Vale standards.



Lockout Devices

CAR 04



Lock boxes are used for multi points lock out situations.



Watch the video in full to continue.

Bowtie

Do you know what a bowtie is?

It is a very efficient risk analysis tool that identifies the event, the barriers (controls) and the consequences.

For CARs, bowties assist in understanding the requirements. This training will show some bowties diagrams about the main events of the CARs.

It is important that you know this tool!



**Important: the diagrams were made for the main
CAR events and requirements.**

**Not all requirements in the document will be present
in the bowtie. Reading the document is essential.**

Watch the video below and understand bowties better!



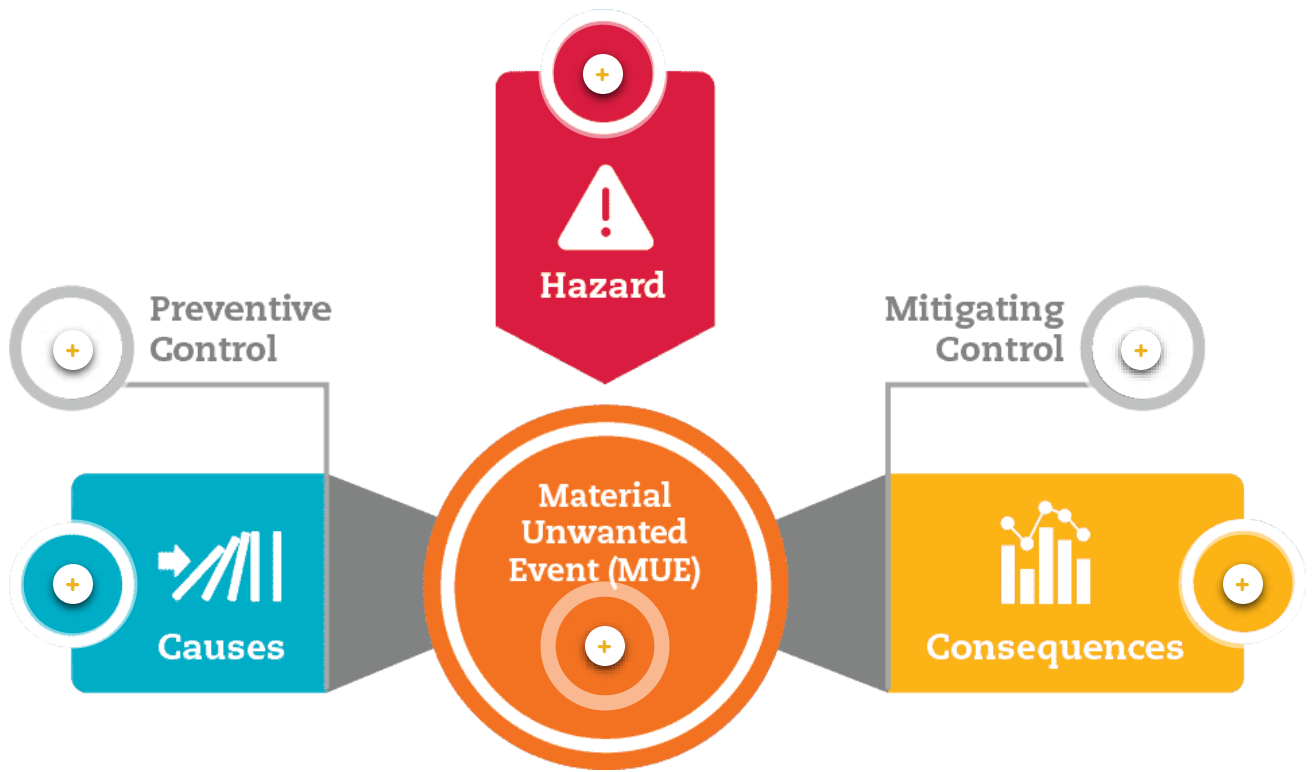
Watch the video in full to continue.

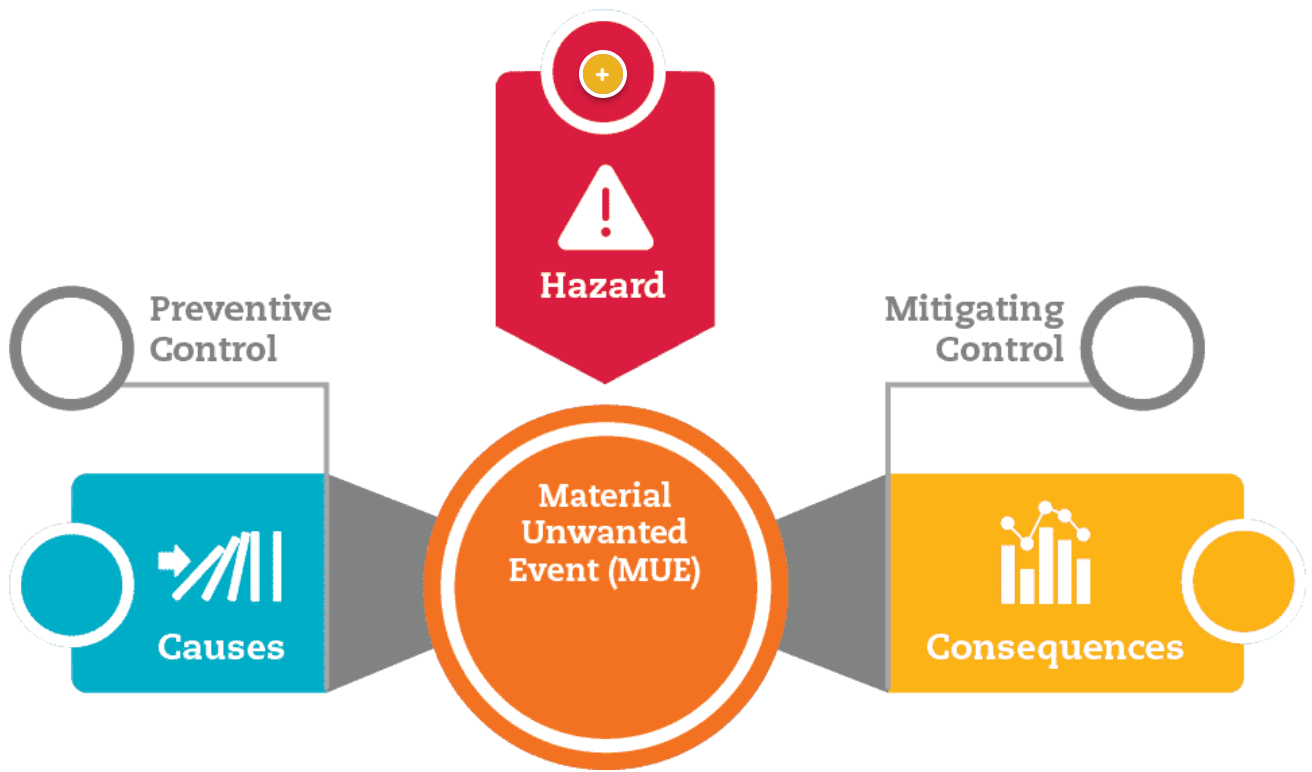
Check below the bowtie of CAR 04.



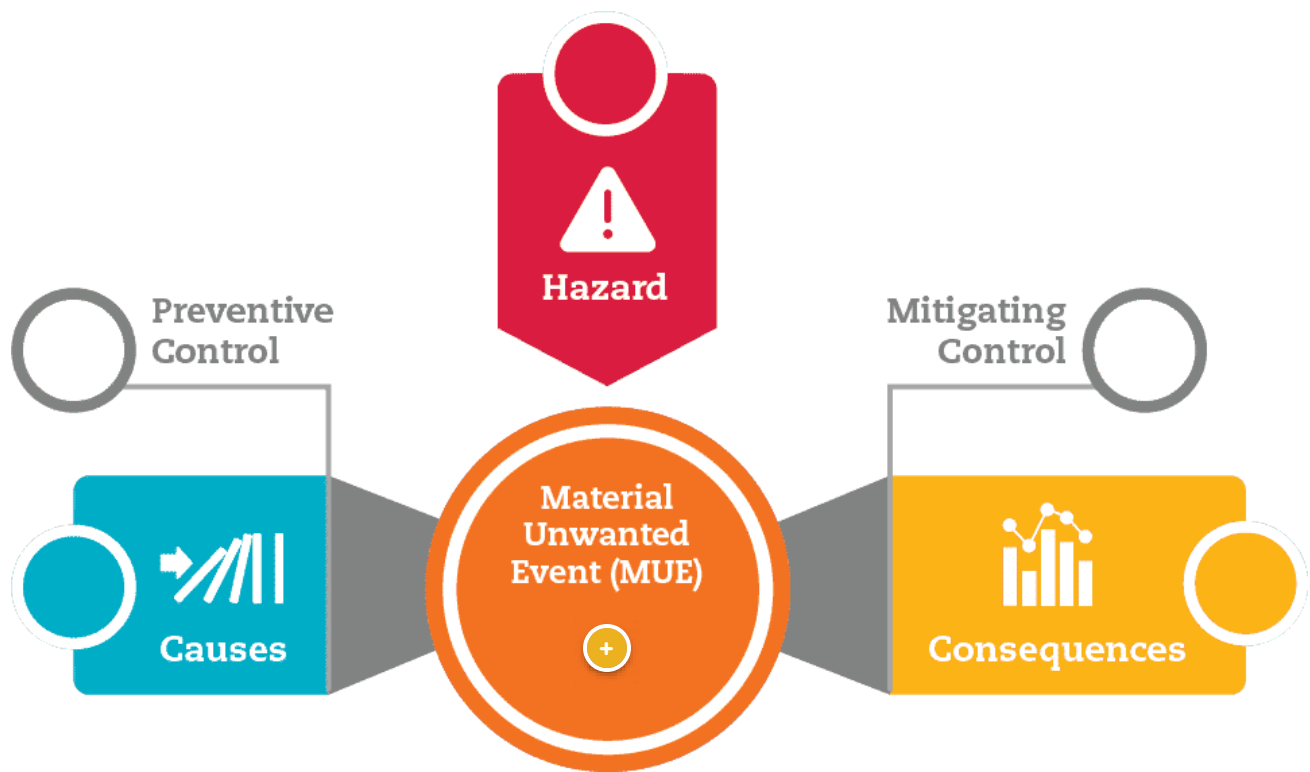
Exposure to injury

Click on the indications below and learn more:

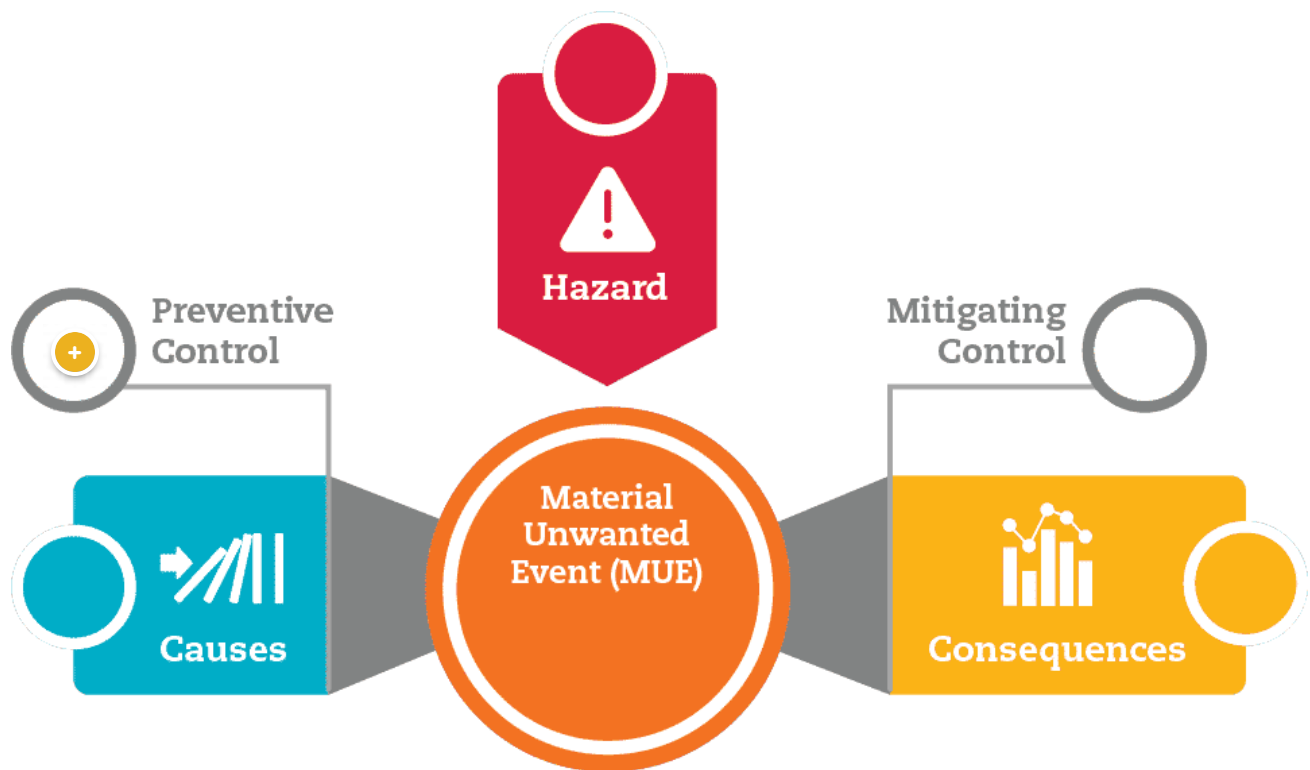




Energy



Exposure to energy



Preventive Control

Failure or lack of lockout and tag out:

- Isolation devices identified;
- Lockout devices;
- Lockout tags;
- Lockout and tag out procedures;
- Lockout matrix;
- System to manage the isolation and lockout of electrical energy stages.

Lockout method / procedure failure:

- Lockout and tag out procedures;
- Lockout matrix;
- System to manage the isolation and lockout of electrical energy stages.

Lack of procedure or procedure did not provide for lockout:

- Lockout and tagout procedures;
- Lockout matrix.

Lack or Failure in the lockout efficiency test (zero energy):

- Procedure for testing the efficiency of the lockout (zero energy);
- System to manage the isolation and lockout of energy stages.

Failure in communication between working groups:

- Only one authorized professional designated to confirm the lockout;
- Exclusive lockout.

Failure of work planning:

- Only one authorized professional designated to confirm the lockout.

Lack or failure to lockout potential gravitational energy source:

- Tagout and lockout of gravitational energy.

Failure to make a temporary change to the zero energy:

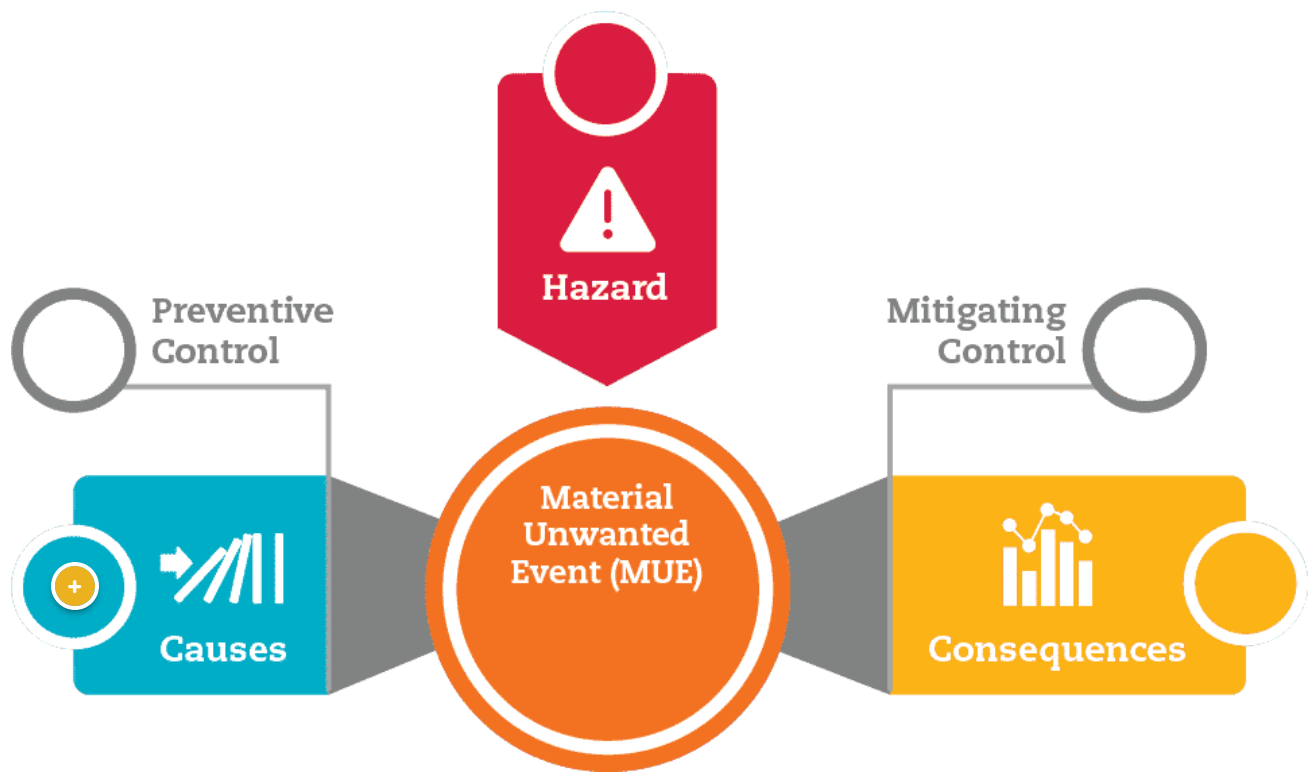
- Procedure for change of energy state.

Failure to reset protection devices / integrity of safety conditions:

- Procedures for the removal of locks and tags.

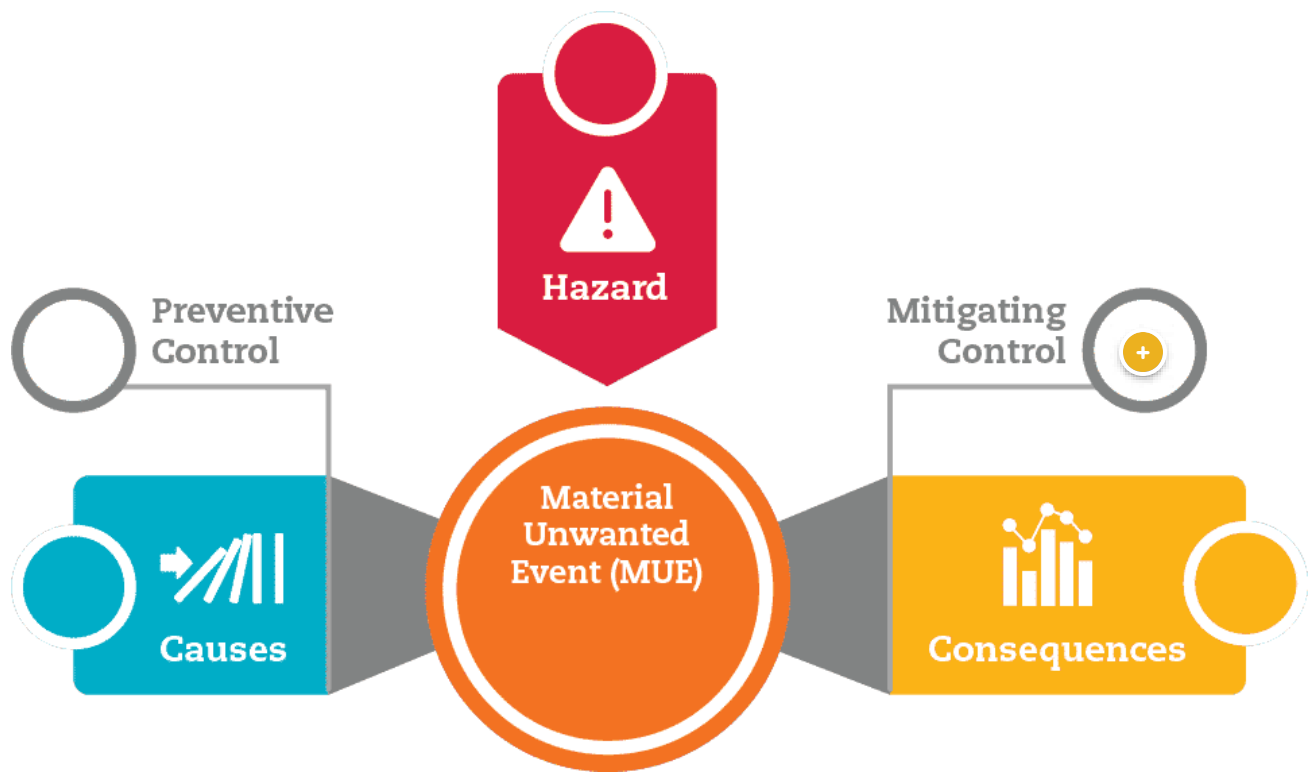
Lack of training:

- Training in prevention of Risks in Lockout, Tagout and Zero Energy.



Causes

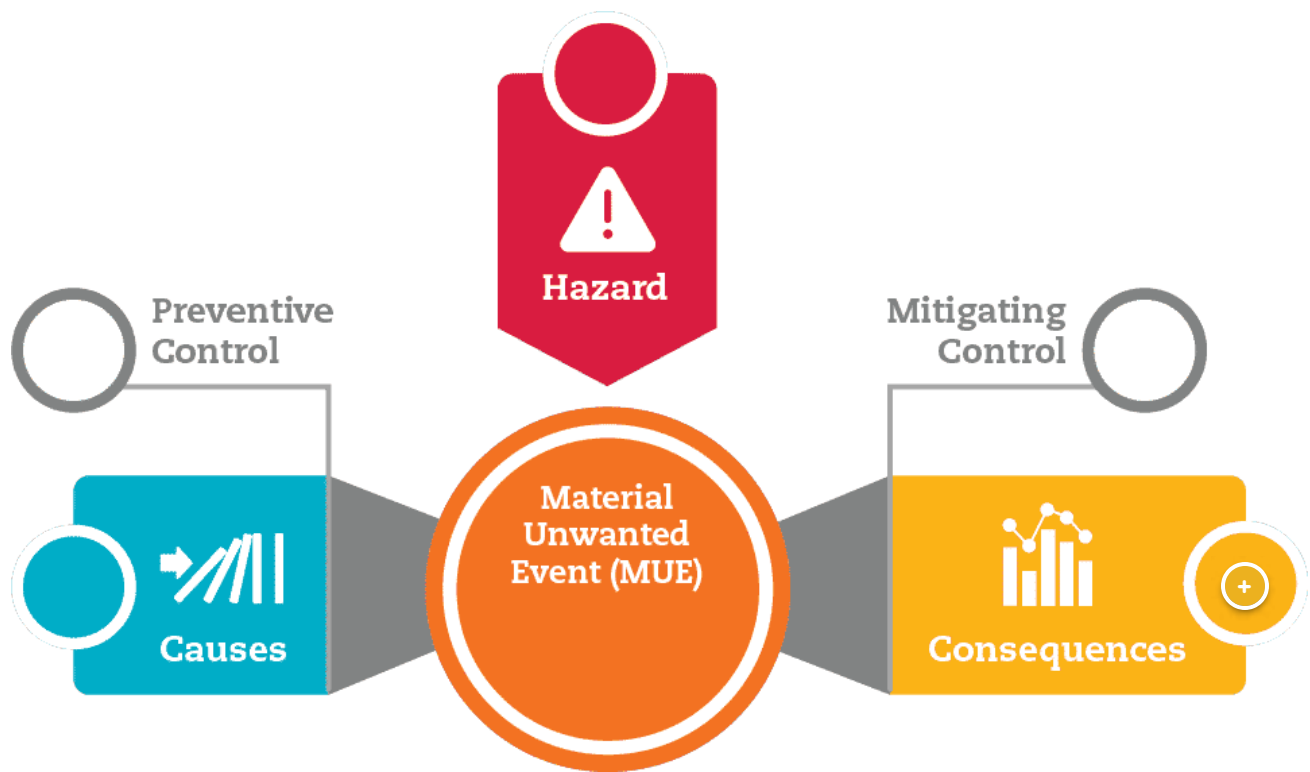
- Failure or lack of lockout and tag out;
- Lockout method / procedure failure;
- Lack of procedure or procedure did not provide for lockout;
- Lack or Failure in the lockout efficiency test (zero energy);
- Failure in communication between working groups;
- Failure of work planning;
- Lack or failure to lockout potential gravitational energy source;
- Failure to make a temporary change to the zero energy;
- Failure to reset protection devices / integrity of safety conditions;
- Lack of training.



Mitigating Control

Injury:

- Personal protective equipment;
- Emergency response plan.



Consequences

- Injury;
- Fatality.



Complete the content above before moving on.

Lockout, Tagout and Zero Energy



To perform the Lockout, Tagout and Zero Energy process safely, it is **important execute the steps in the correct order.**

Watch the following video and learn about the step-by-step.



**Specific Steps for
Lockout, Tagout and
Zero Energy**
CAR 04



Watch the video in full to continue.



Relate the columns according to the process step order.

≡ Step 1

Identify the equipment to be locked out.

≡ Step 2

Check that all energy sources are identified.

≡ Step 3

Disconnect or interrupt the power source.

≡ Step 4

Release residual energy, including additional steps that avoid reaccumulation of energy.

≡ Step 5

Apply lockout and tagout devices of each energy source.

≡ Step 6

Verify that the "zero energy" state has been achieved.

SUBMIT



Complete the content above before moving on.

Removal of Locks and Tags Process

The removal of the locks and tags process can only be performed **after all maintenance activities have been completed.**

Watch the video below to learn the precautions when removing the locks and tags.





Watch the video in full to continue.



Relate the columns according to the step order for the removal of locks and tags.

≡ 1

Everyone involved in maintenance has completed their activities and is outside the area.

≡ 2

All tools and parts have also been removed from the risk area.

≡ 3

Mechanical/electrical/individual/collective protections were returned to origin condition.

SUBMIT



Complete the content above before moving on.

Requirements in the Absence of Procedure, or when Procedure not Provided for Lockout

In the absence of Procedure or when it does not provide for lockout, **some specific requirements for these cases must be followed.**

Watch the video below and check it out.



Lock out must not be performed if procedures are not available.



Requirements in the Absence of PRO, or when PRO not Provided for Lockout CAR 04



Watch the video in full to continue.



**The Electrical Drawing and the Lockout Matrix must
always be updated.**

Attention: All employees must be properly trained in the
procedures and in the lockout matrix.





Complete the content above before moving on.

Requirements to Prevent Failures in the Lockout Procedure

Failures in the lockout method or procedure are **provided for in specific requirements.**

Check out what they are.



**Requirements to
Prevent Failures in
the Lockout Procedure**
CAR 04

Always follow the procedure.



Watch the video in full to continue.

Requirements for Zero Energy State

Failures can occur, but our goal is to avoid them at all costs.

The zero energy state test can identify some failures and is of great importance. The lack of this test can lead to incidents.

Watch the following video and check out the requirements to prevent these cases.



**Requirements to Prevent
Failure or Lack of
Zero Energy State Test**
CAR 04





Never fail to perform the zero energy state test.

This procedure saves lives.



Complete the content above before moving on.

Requirements to Prevent Failure of Lockout and Tagout

Failure or lack of lockout and tagout are unsafe **situations that should not happen.**

CAR 4 has provisions to prevent failure or lack of lockout and tagout as presented in the following requirements:

- Identification of energy source lockout devices;
- Lockout and tagout;
- Lockout procedure;
- Lockout matrix;
- System for managing the stages of the electrical lockout process.



Complete the content above before moving on.

Requirements to Prevent Failure in the Work Planning



Failure or lack of lockout and tagout, are unsafe situations that should not happen.

Check out the requirements identified for these cases in the video below:



Each crew working in a system must verify zero energy of the system.



Requirements to Prevent Failure in the Work Planning

CAR 04



Watch the video in full to continue.

Requirements to Prevent Failure of Communication Among Working Groups

The lack, or failure, of communication could lead to an incident .

Check out the requirements identified to avoid this failure in the video below:



Effective and complete communication among working groups **demonstrates care and concern for each other.**



Watch the video in full to continue.

Requirements to Prevent Failure or Lack of Lockout in a Potential Gravitational Energy Source

Check out the **requirements identified for these cases** in the video below:



**Requirements to Prevent Failure
or Lack of Lockout in a Potential
Gravitational Energy Source**
CAR 04



“Machines or equipment under maintenance or service and which have moving or rotating parts supported by cables or hydraulic cylinders such as counterweights, pelletizing discs, truck cabins, etc. that can move through the action of potential gravitational energy must have this risk situation identified in the lockout matrix and properly controlled according to the local procedure in order to prevent unwanted movement.”

-CAR 04 - Lockout, Tagout and Zero Energy



Complete the content above before moving on.

Req. to Prevent Failure to Replace Protection Devices/or Guarantee in the Int. of Safety Conditions

Check out the requirements identified for these cases in the video below:



"Procedures for the removal of locks and tags for re-energizing



the isolated system must include, at a minimum:

- I. Confirmation that all involved parties concluded their activities and are permanently out of the risk area;
- II. Confirmation that all tools and parts were removed from the risk area;
- III. Confirmation that all mechanical or electric protection mechanisms, individual or collective ones, were returned to their original condition.”

-CAR 04 - Lockout, Tagout and Zero Energy.



Complete the content above before moving on.

Requirements for training. Every person performing lock out tag out must be trained.

Check out the **requirements identified for these cases** in the video below:

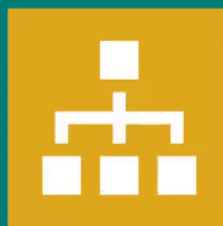


Watch the video in full to continue.

[

Roles and Responsibilities

Check out in the video below what are the roles and responsibilities of each of those involved in the procedures related to **lockout and tagout of hazardous energies**:



Roles and Responsibilities

CAR 04



Watch the video in full to continue.

Lesson 16 of 17

Quiz

You will now take a quiz.

Question

01/07

The following documents must be updated and available to guarantee the process of lockout hazardous energies according to the equipment to be locked:

- ☐ Lockout Matrix.
- ☐ Process flow and electrical drawings.
- ☐ Lockout procedure.
- ☐ All of the above.

Question

02/07

Indicate the correct sequence of specific steps to perform the lockout of hazardous energies:

1. Application of lockout and tagout devices in each energy source.
2. Isolation of energy source and release of residual energy.
3. Verification process to evaluate that zero energy has been achieved.
4. Identification of equipment to be locked out and check that all energy sources are identified.

☐ 4, 1, 2, 3.

☐ 2, 3, 4, 1.

☐ 3, 2, 4, 1.

☐ 4, 2, 1, 3.

Question

03/07

In which document the identification of hazardous energy sources and the isolation devices associated with the equipment must be consulted:

- ☐ Job Safety Analysis - JSA.
- ☐ Electrical drawing.
- ☐ Lockout Matrix.
- ☐ Safe Work Permit - SWP.

Question

04/07

Which stage of the lockout process aims to confirm the absence of energy:

- ☐ Disconnection or interruption of the energy source.
- ☐ Verification process of zero energy.
- ☐ Release of residual energy.
- ☐ Application of lockout and tagout devices for each energy source.

Question

05/07

What is the type of hazardous energy present in moving or rotating parts supported by cables or hydraulic cylinders such as counterweights, pelletizing discs or truck cabins?

- ☐ Electrical energy.
- ☐ Chemical energy.
- ☐ Gravitational energy.
- ☐ Thermal energy.

Question

06/07

These are steps in the process of temporary change of zero energy state, except:

- ☐ Communication of the change to all people working at the equipment under the lockout.
- ☐ Confirmation by the authorized professional that all required control measures have been correctly applied.
- ☐ Update of process flows and electrical drawings of the equipment.
- ☐ Exclusive lockout of the machine, equipment or installation.

The process for the removal of locks and tags must include, at a minimum, confirmation that:

- ☐ The mechanical or electrical protection mechanisms, individual or collective ones, were returned to their original condition; the tools and parts were removed from the risk area; the verification process of zero energy was performed.
- ☐ The tools and parts were removed from the risk area; mechanical or electrical protection mechanisms, individual or collective ones, were returned to their original condition; the application of lockout and tagout devices for each energy source was carried out.
- ☐ The mechanical or electrical protections mechanisms, individual or collective ones, were returned to their original condition; the isolation of the energy sources was carried out; all involved parties concluded their activities and are out of the risk area.
- ☐ The tools and parts were removed from the risk area; mechanical or electrical protections mechanisms, individual or collective ones, have been returned to their original condition; all involved parties have concluded their activities and are out of the risk area.

Conclusion



Remember, the purpose of this awareness module is to provide an overview of the Vale Critical Activity Requirements that have been introduced to Vale's operations globally. These requirements are in the process of being fully implemented across our operations.



00:14

Click on the button beside to exit.

SAVE AND EXIT