CAR 03 - Mobile Equipment Operation (Vale North Atlantic)

Hello, welcome to the **CAR 03 – Mobile Equipment Operation course**.

Working at Heights course. 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**
- **Requirements for Facilities and Equipment**
- **General Requirements for Mobile Equipment**
- **Specific Requirements: Underground Mine Equipment**

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.

PNR-000069 Rev. 1 Nov. 24, 2020

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

PNR-000069 Rev. 1 Nov. 24, 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 cover CAR 03 – Mobile Equipment Operation.

Complete the content above before moving on.

CAR 03

Mobile Equipment Operation

VALE

Watch the video in full to continue.

The requirements of CAR 03 are divided into different types. They are the following:

1. Requirements for facilities and equipment;
2. General requirements for mobile equipment;
3. Specific requirements:

- Requirements for underground mine equipment;
- Requirements for detection, mitigation and prevention of fire on mobile equipment.

4 Requirements for procedures;

5 Requirements for training people.

Throughout this training, we will learn about each one of them. Stay alert and always focus on safety.

Before continuing with the requirements, check out in the next chapter what Bowties are and how they can help us to define the best requirements for each type of event that we want to prevent.

Complete the content above before moving on.

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.

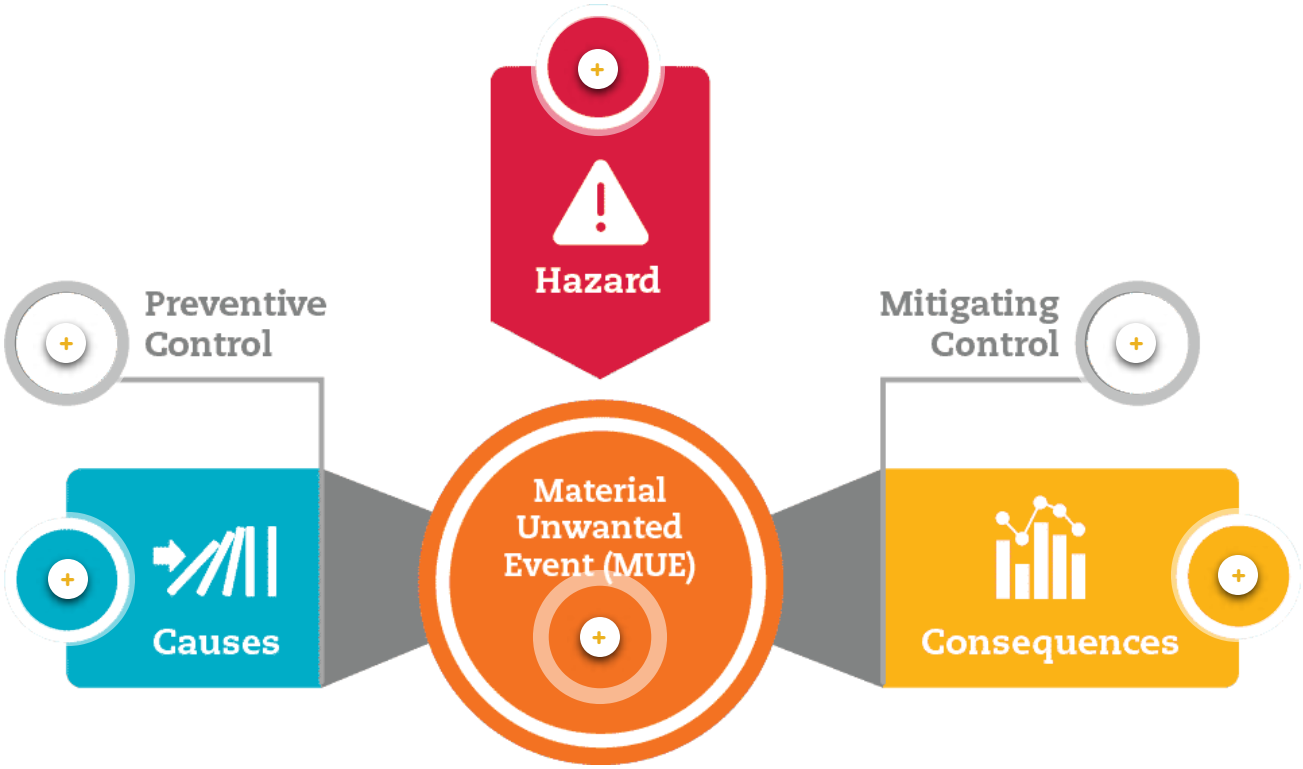
Watch the video below and understand bowties better!

Watch the video in full to continue.

Below, check the bowtie of CAR 03 related to the three main events that may occur in operations with mobile equipment.

Run over

Click on the indications below and learn more: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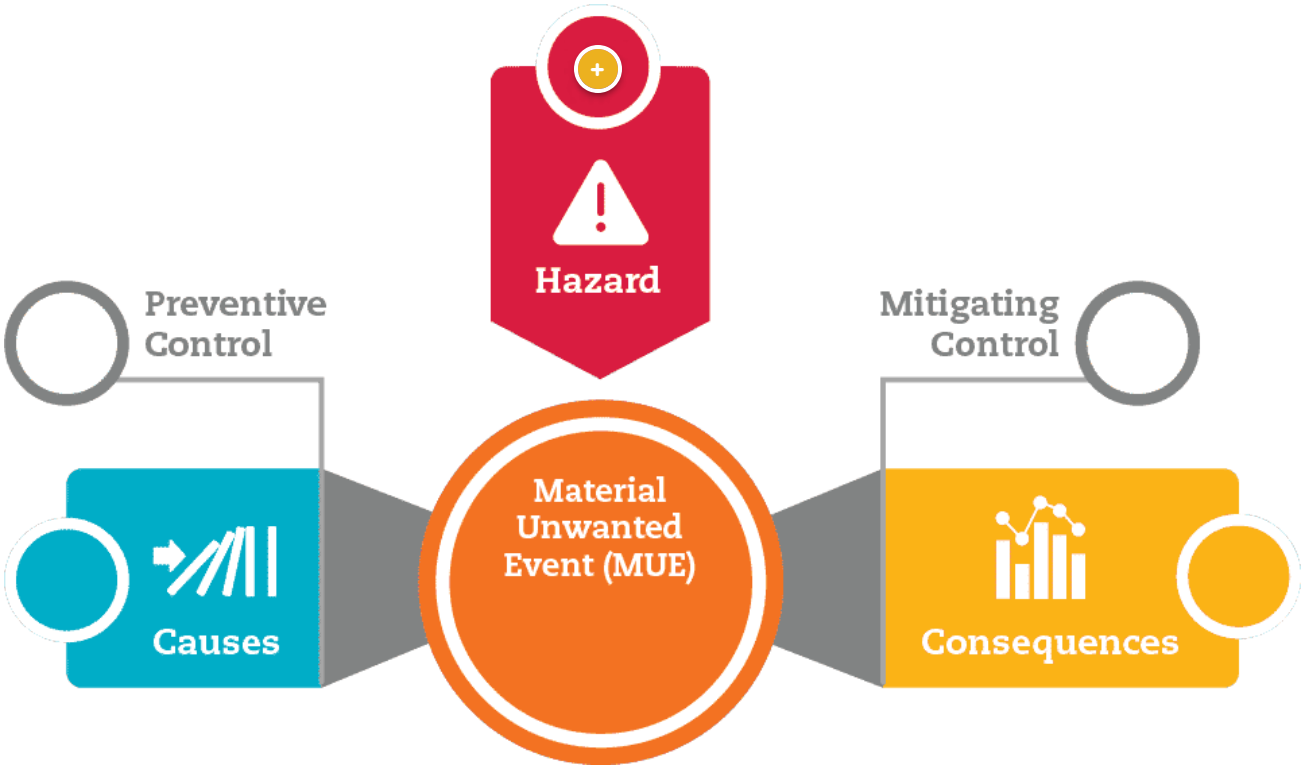
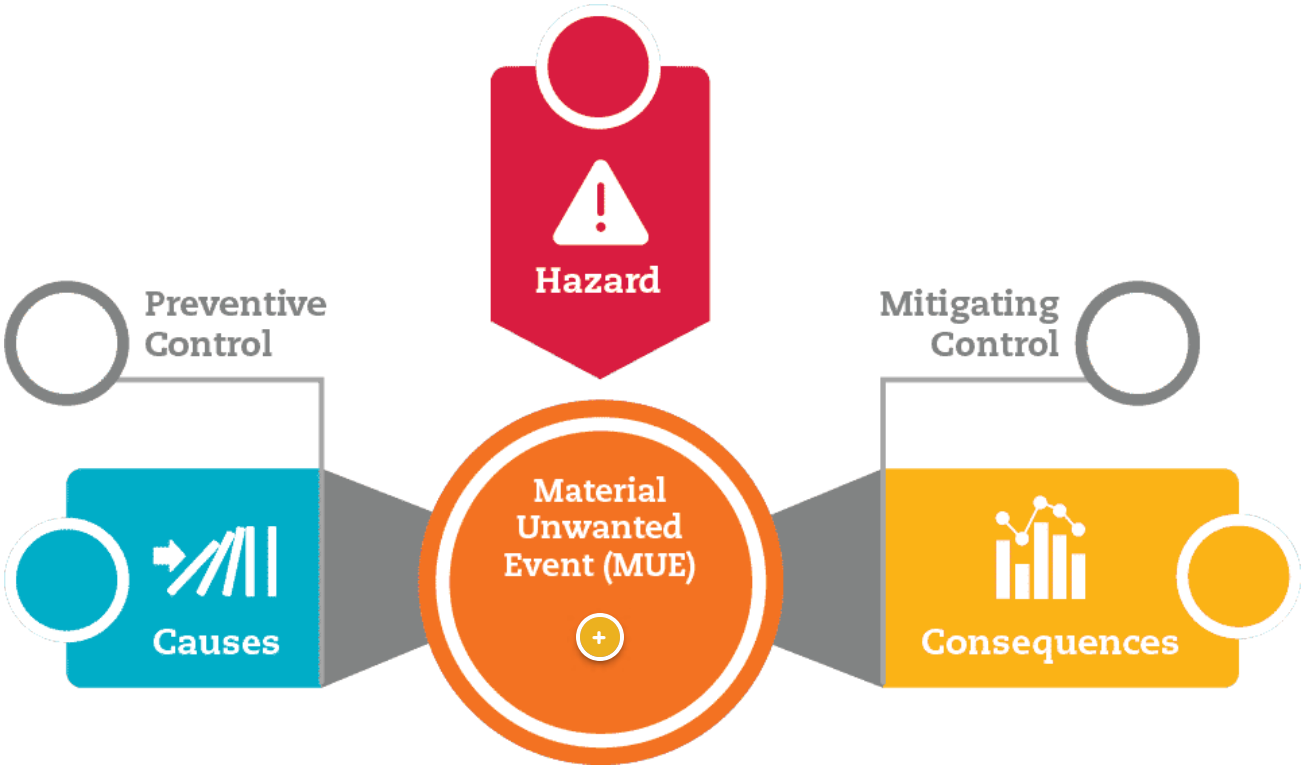
Mitigating Control
Causes
Material Unwanted Event (MUE)
Consequences



Interface between people and equipment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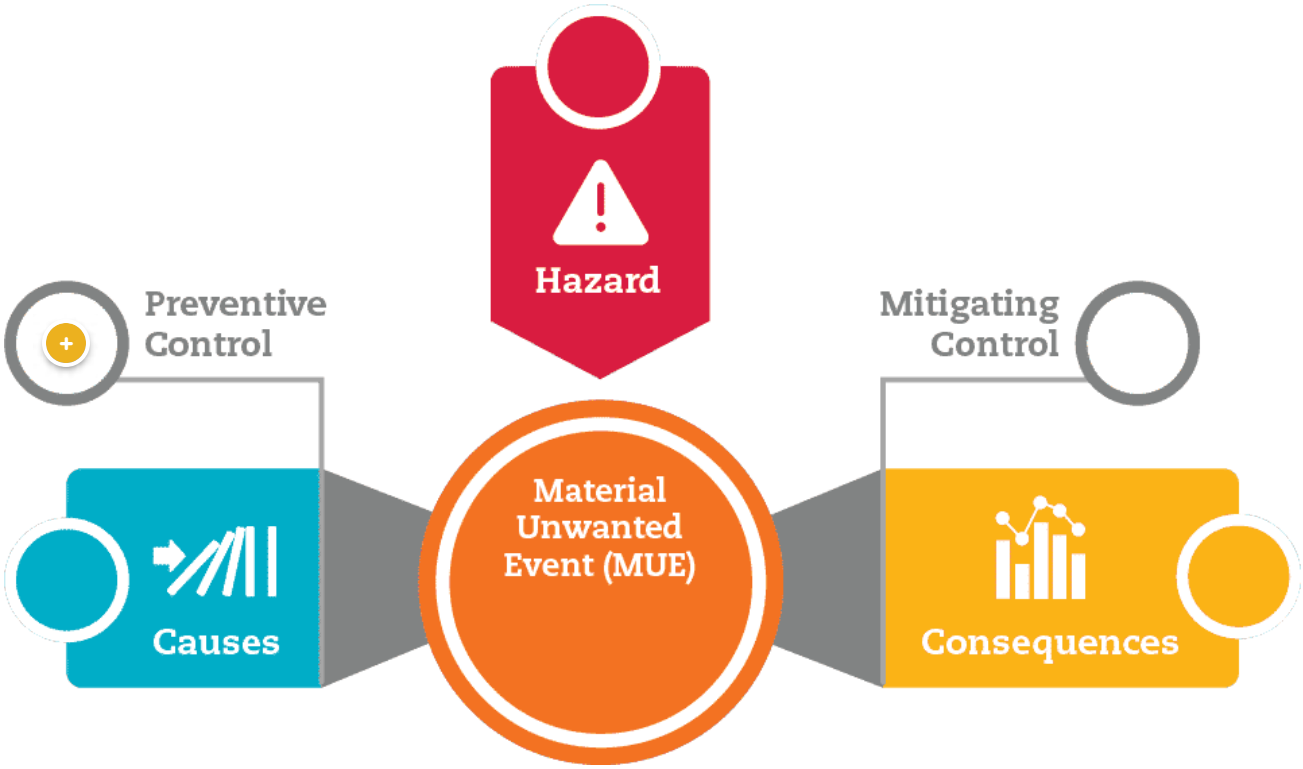


Preventive Control

Absense of barriers on roads / facilities:

- Protective berms;
- Limiters or height sensors.

Hight speed:

- Location and speed monitoring systems;
- Speed limiting device.

Poor visibility of equipment during reverse:

- Audible reverse alarm;
- Reverse warning light.

Lack of communication between operator and spotter:

- Two-way communication radios.

Untrained operator:

- Qualification and training.

Lack of visibility:

- Video cameras;
- Reflective clothing or waistcoats.

Operator drowsiness:

- Operator drowsiness detection system.

Low visibility of equipment:

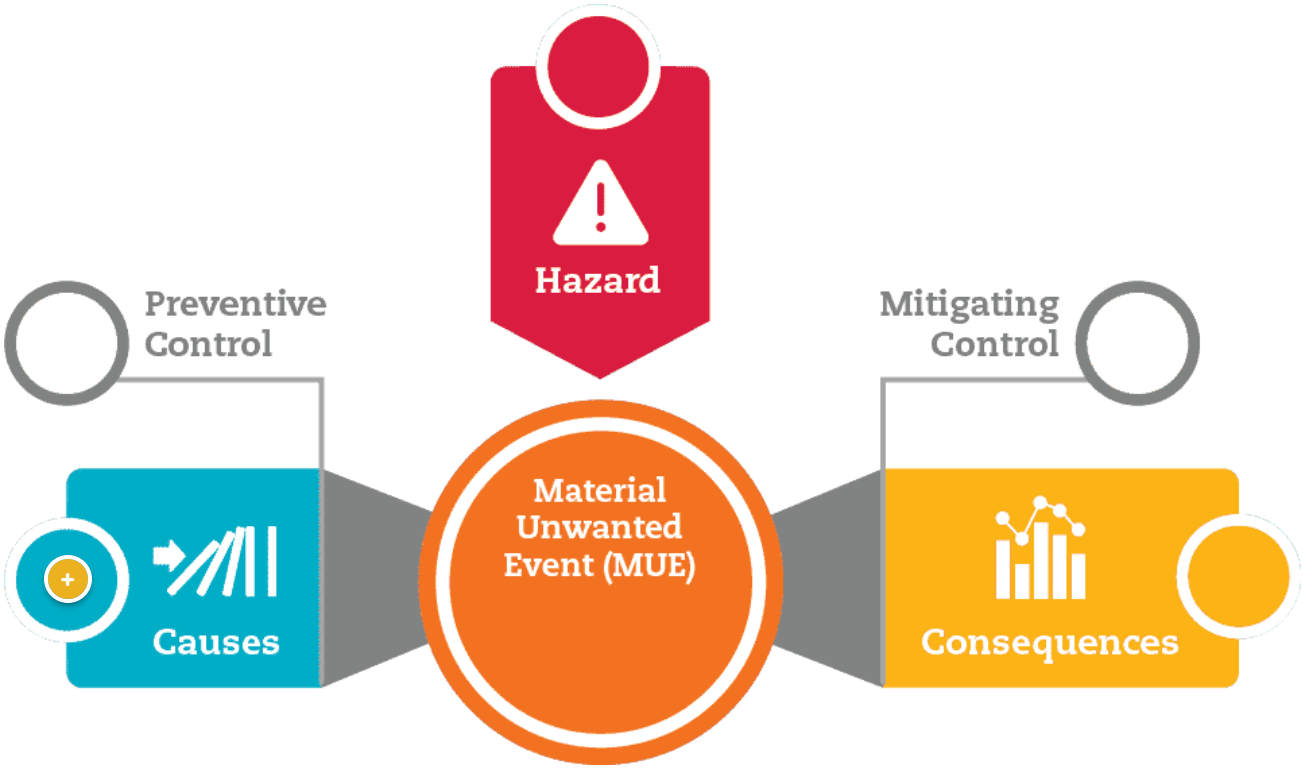
- External identification signs;
- Headlamps turned on.

Brake loss (equipment stopped):

- Utilization of chocks.

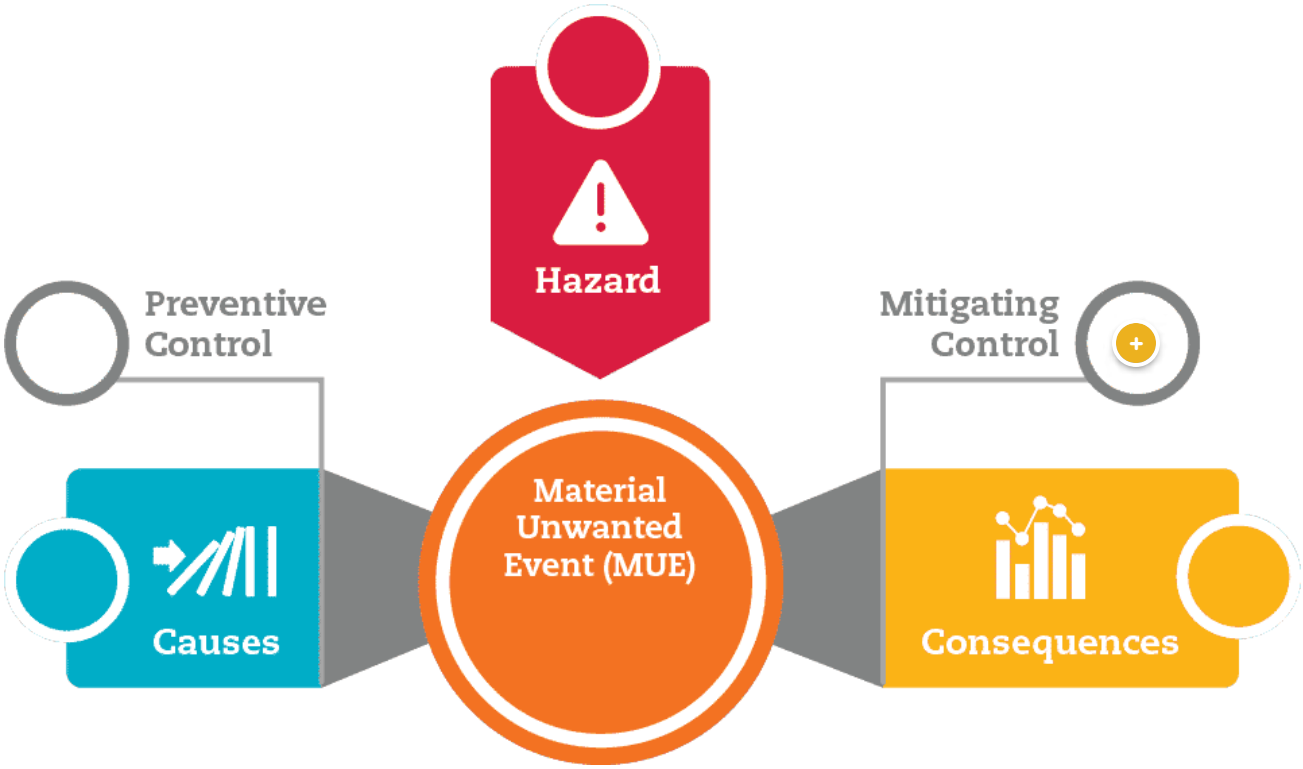
Operator distraction:

- Prohibition of use of TV / DVD.



Causes

- Absense of barriers on roads / facilities;
- Hight speed;
- Poor visibility of equipment during reverse;
- Lack of communication between operator and spotter;
- Untrained operator;
- Lack of visibility;
- Operator drowsiness;
- Low visibility of equipment;
- Brake loss (equipment stopped);
- Operator distraction.



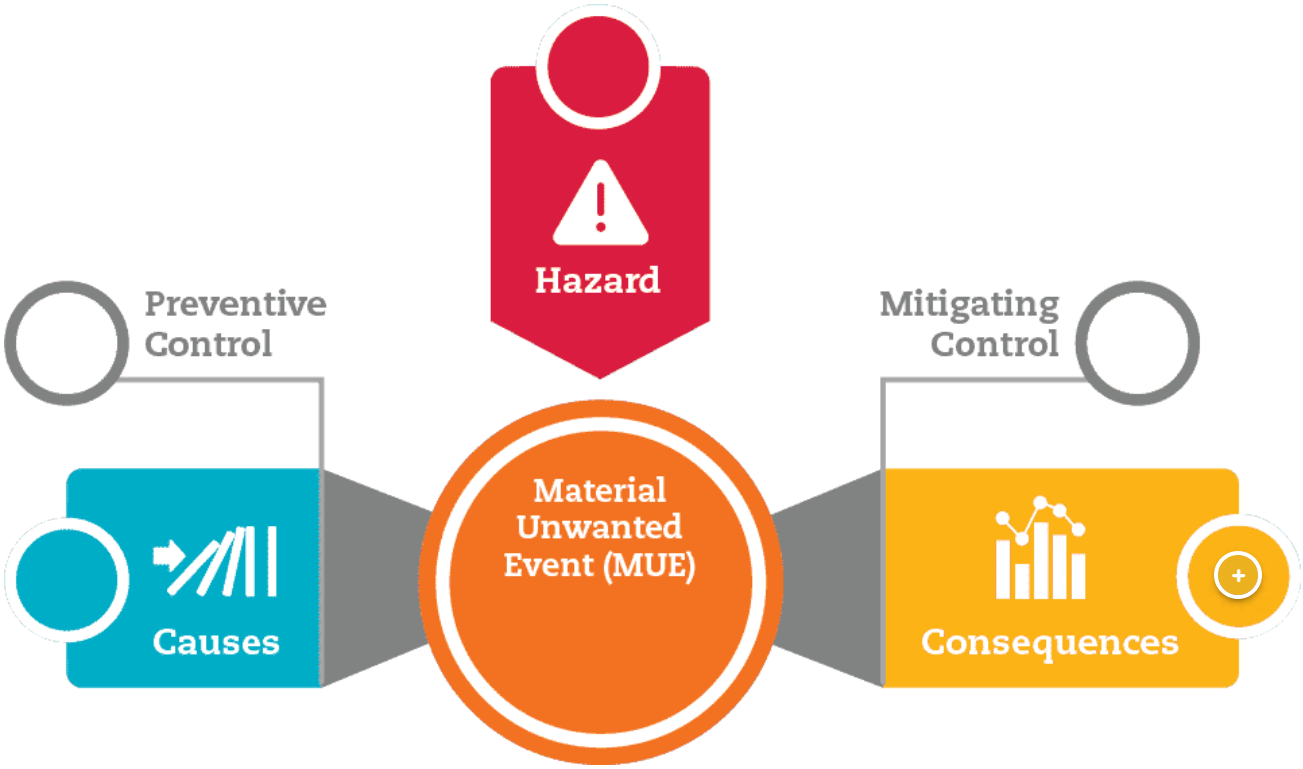
Mitigating Control

Fatality:

- Emergency Response Plan.

Serious Injury:

- Emergency Response Plan.



Consequences

- Fatality;
- Serious Injury.

Complete the content above before moving on.

Collision/Tip over

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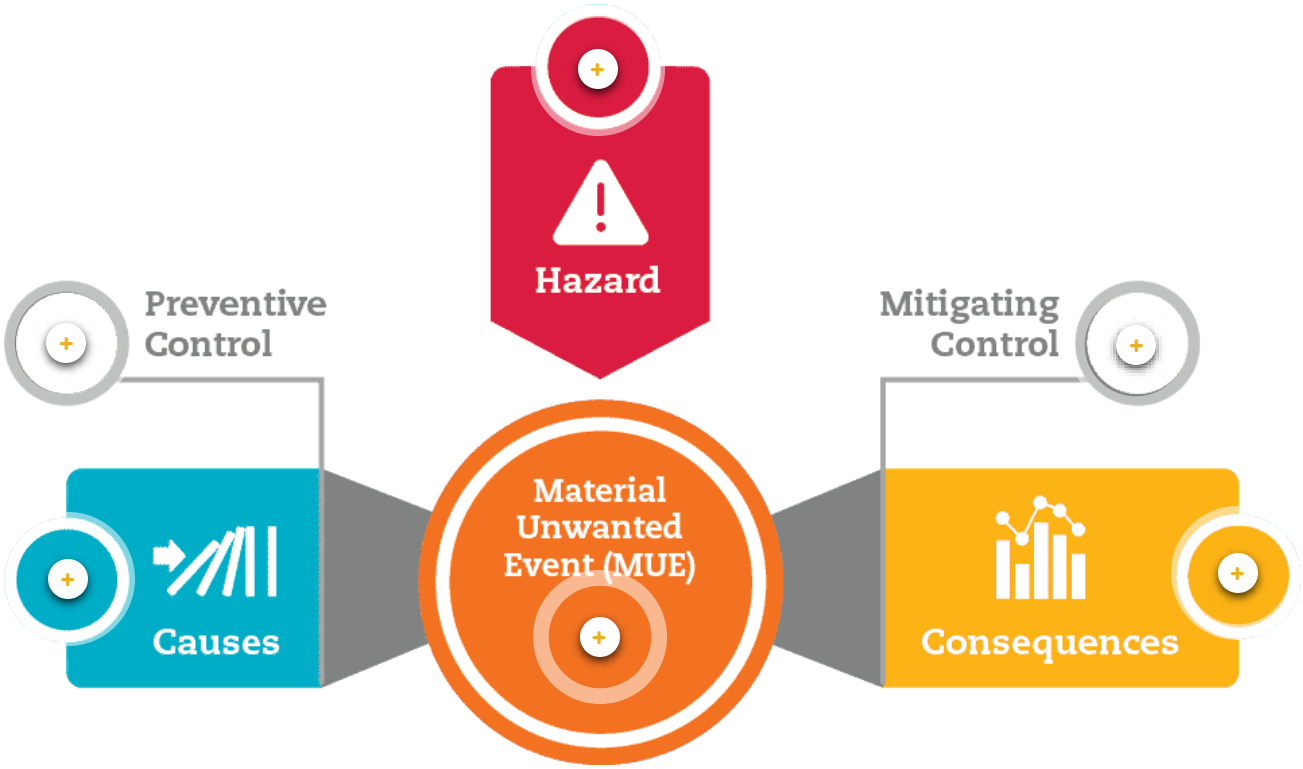
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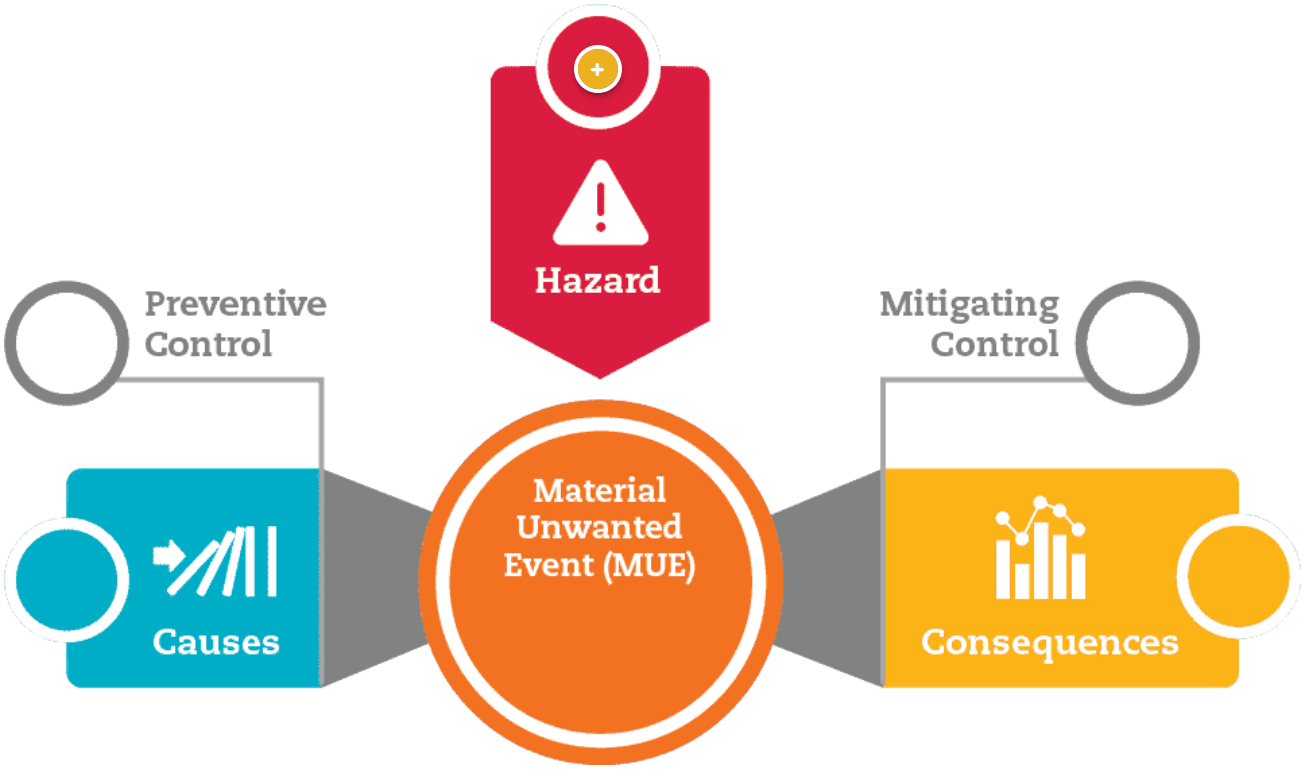
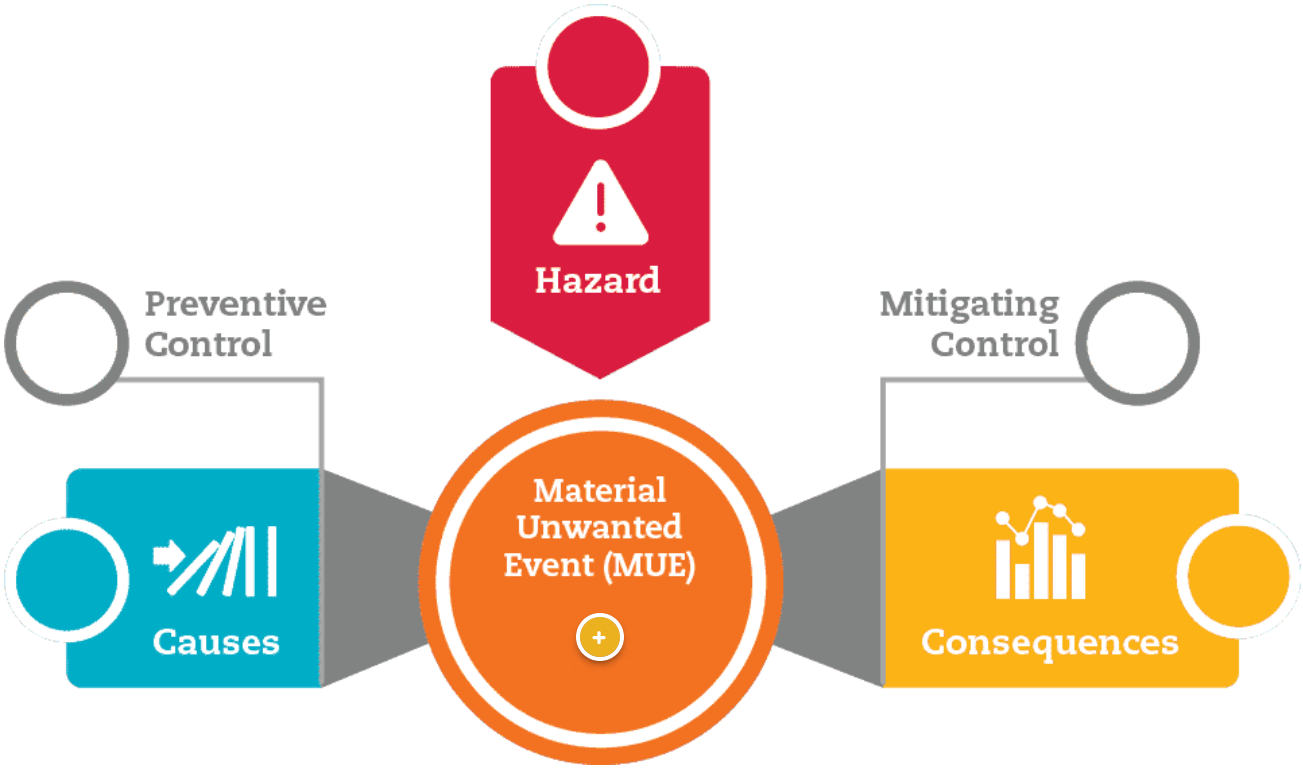
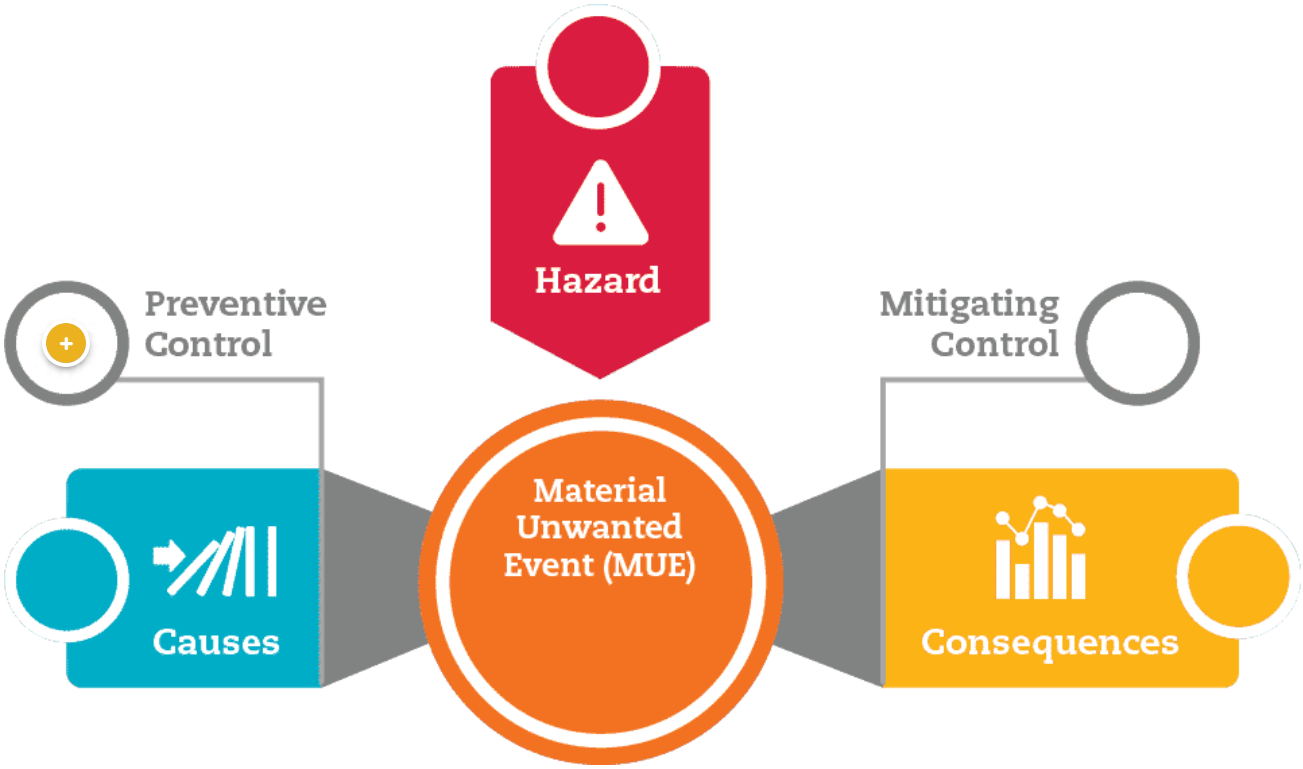


Dump truck operation



Collision/Tip over



Preventive Control

Lack of barriers on roads or facilities:

- Protective berms;
- Limiters or height sensors.

Lack of control:

- Synchronized gearbox.

Poor visibility on top of the equipment:

- Headlamps turned on;
- External identification signs.

Improperly modified equipment:

- Manufacturer verification and approval.

Untrained operator:

- Qualification and training.

Overload:

- Maximum load and tare signaling;
- Load monitoring systems.

Damaged equipment:

- Preventive maintenance;
- Periodic inspection;
- Pre use inspection.

Proximity between equipment:

- Proximity alert system between equipment;
- Anti-collision system with automatic equipment braking.

Operator poor visibility:

- Video cameras.

High speed:

- Road speed limitation;
- Location and speed (telemetry) monitoring systems.

Tire explosion:

- Tire pressure and temperature monitoring systems;
- Diffuser valves for relieving internal tire pressure.

Operator drowsiness:

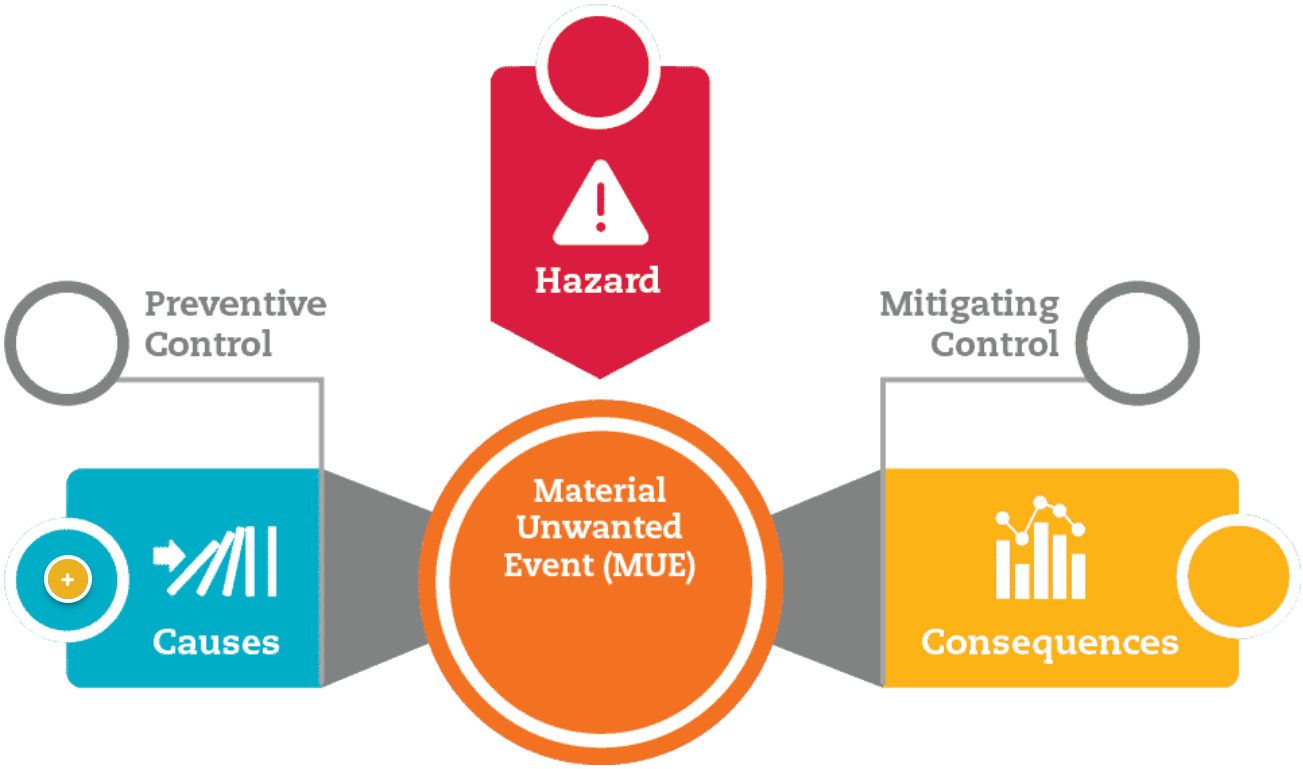
- Operator drowsiness detection system.

Brake loss (equipment stopped):

- Utilization Of chocks.

Operator distraction:

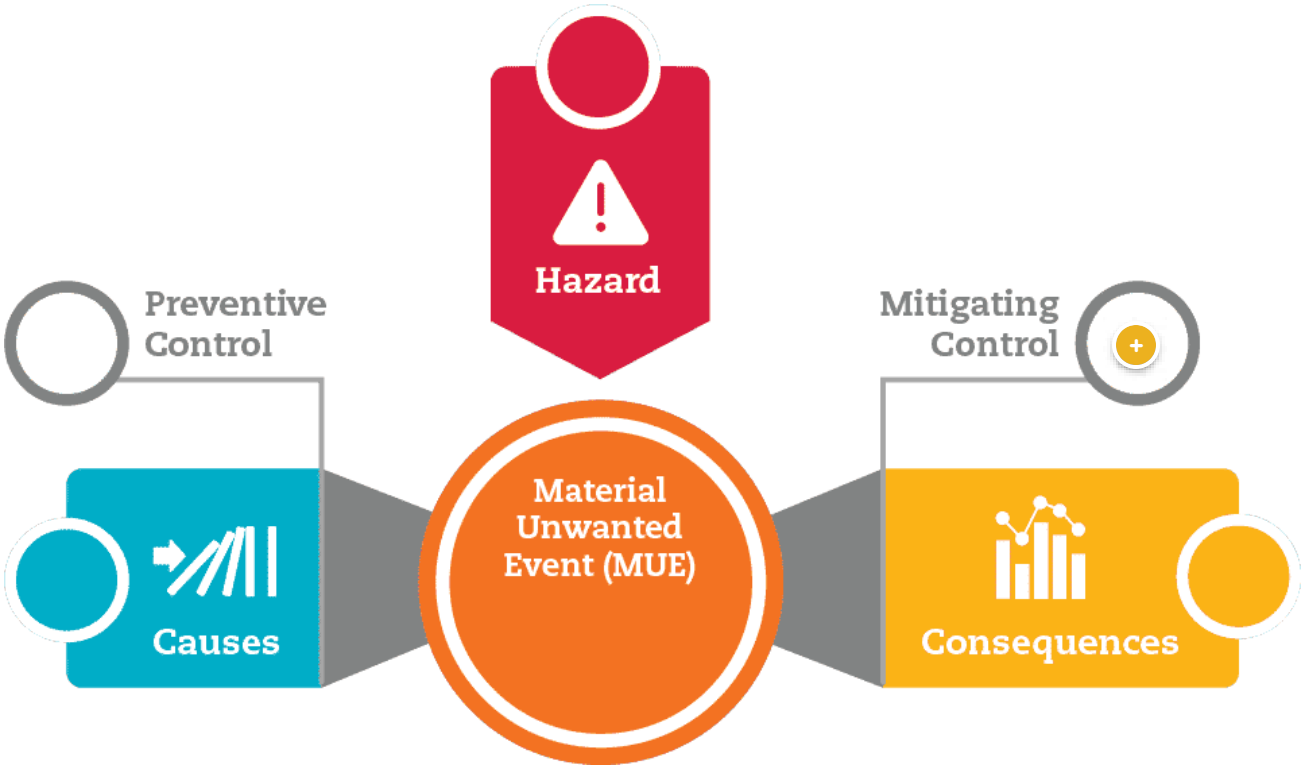
- Prohibition Of use of TV / DVD.



Causes

- Lack of barriers on roads or facilities;
- Lack of control;
- Poor visibility on top of the equipment;
- Improperly modified equipment;
- Untrained operator;
- Overload;
- Damaged equipment;
- Proximity between equipment;
- Operator poor visibility;
- Hight speed;
- Tire explosion;
- Operator drowsiness;
- Brake failure;

- Operator distraction.



Mitigating Control

Fume inhalation:

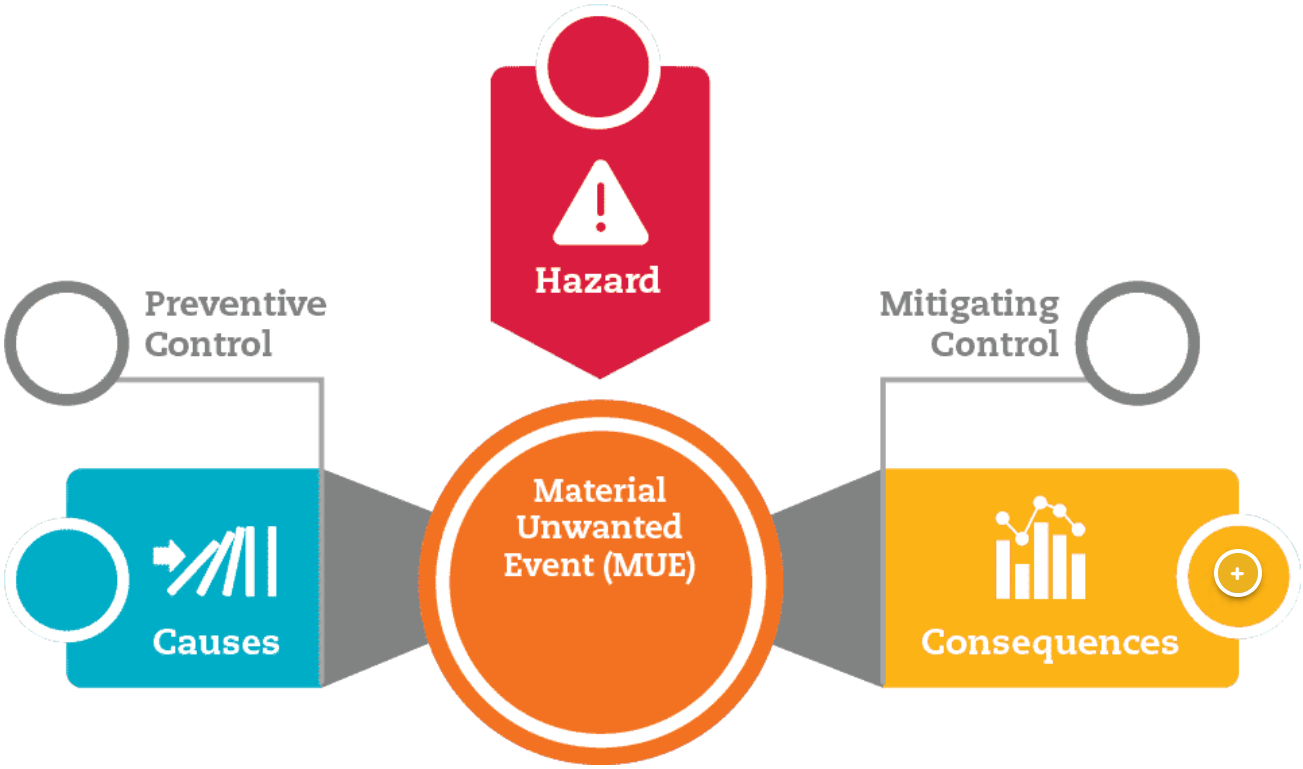
- Escape and landing alternatives in emergency situations;
- Emergency response plan.

Operator ejection:

- Safety belt 03 points;
- Emergency response plan.

Crushing:

- Cabin protection;
- Emergency response plan.



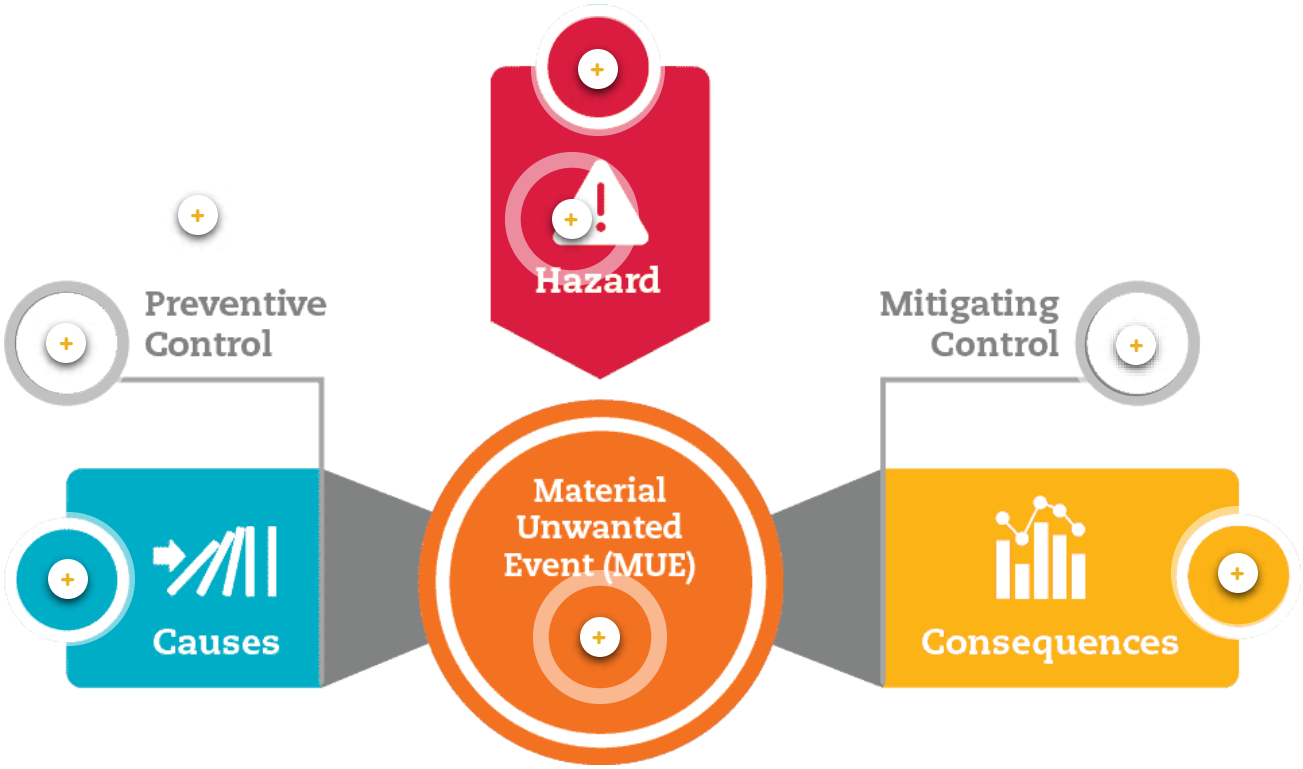
Consequences

- Fume inhalation;
- Operator ejection;
- Crushing.

Complete the content above before moving on.

Equipment Fire

Click on the indications below and learn more: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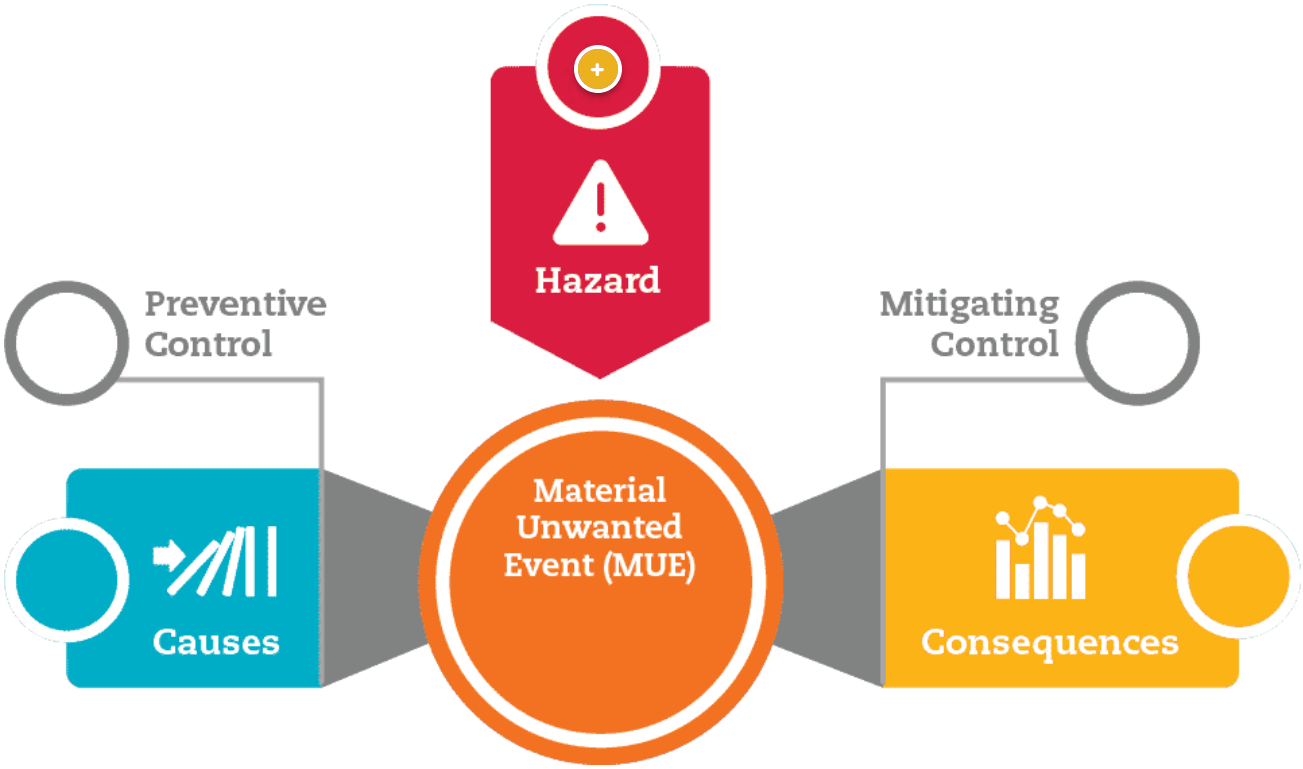
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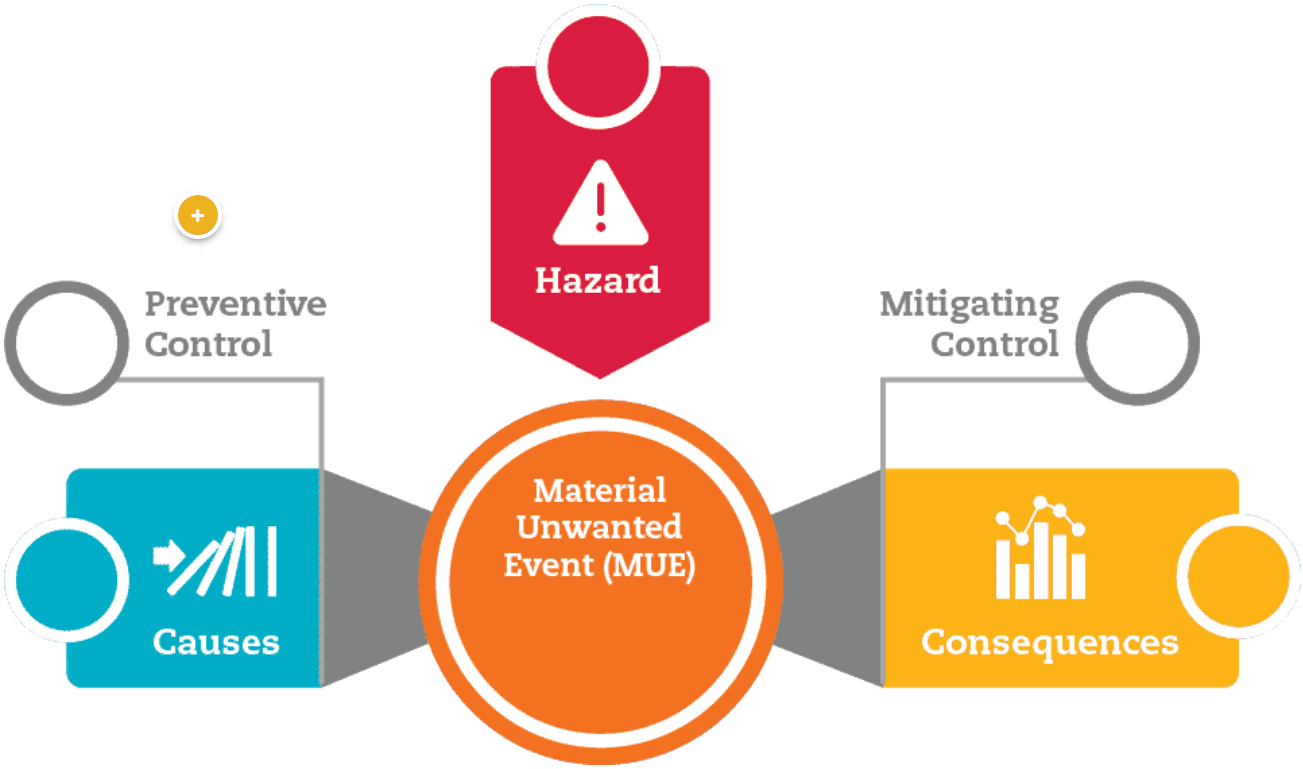
Fire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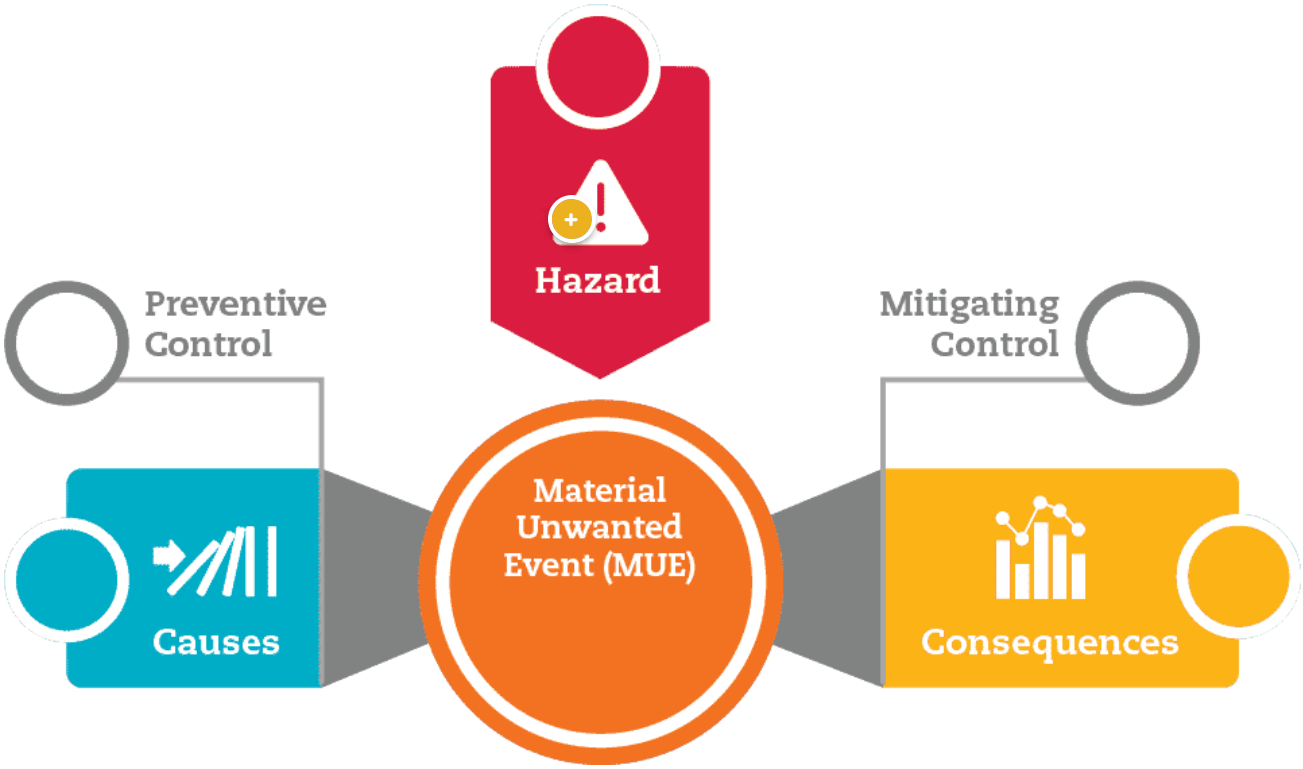
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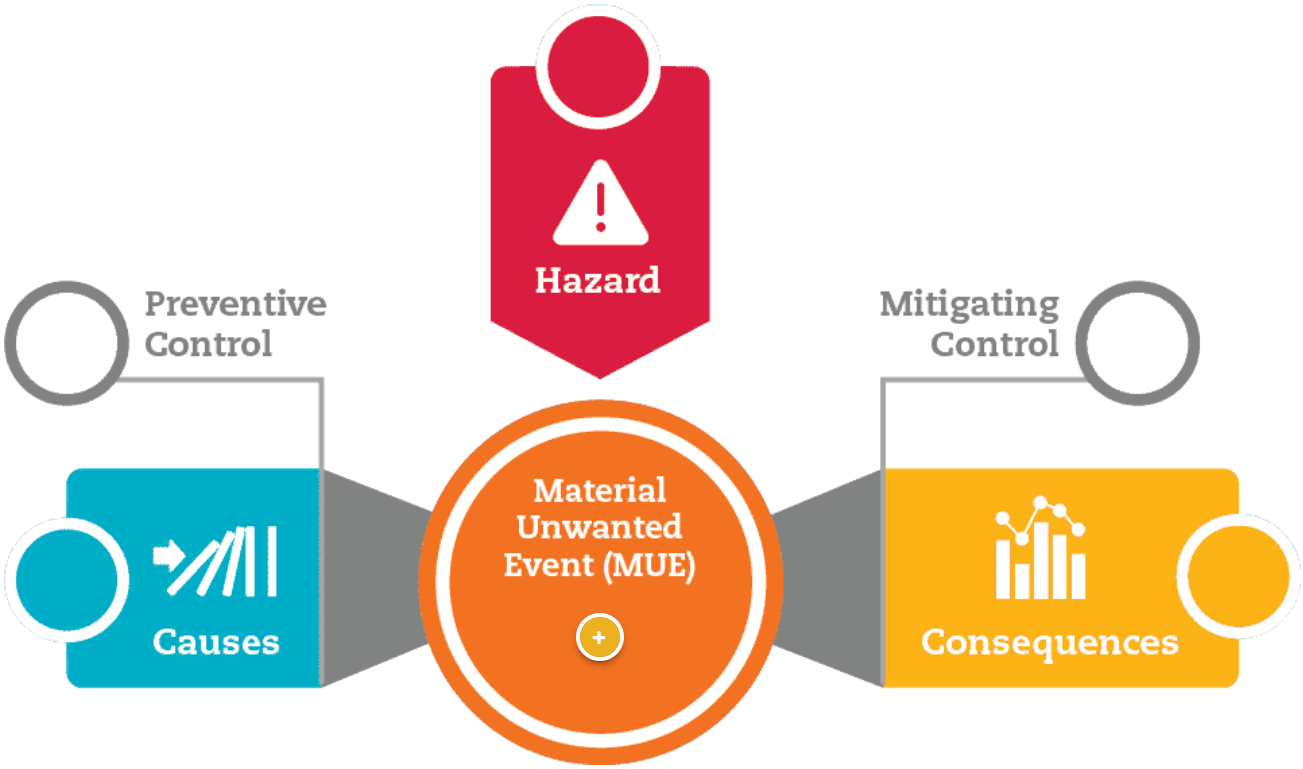
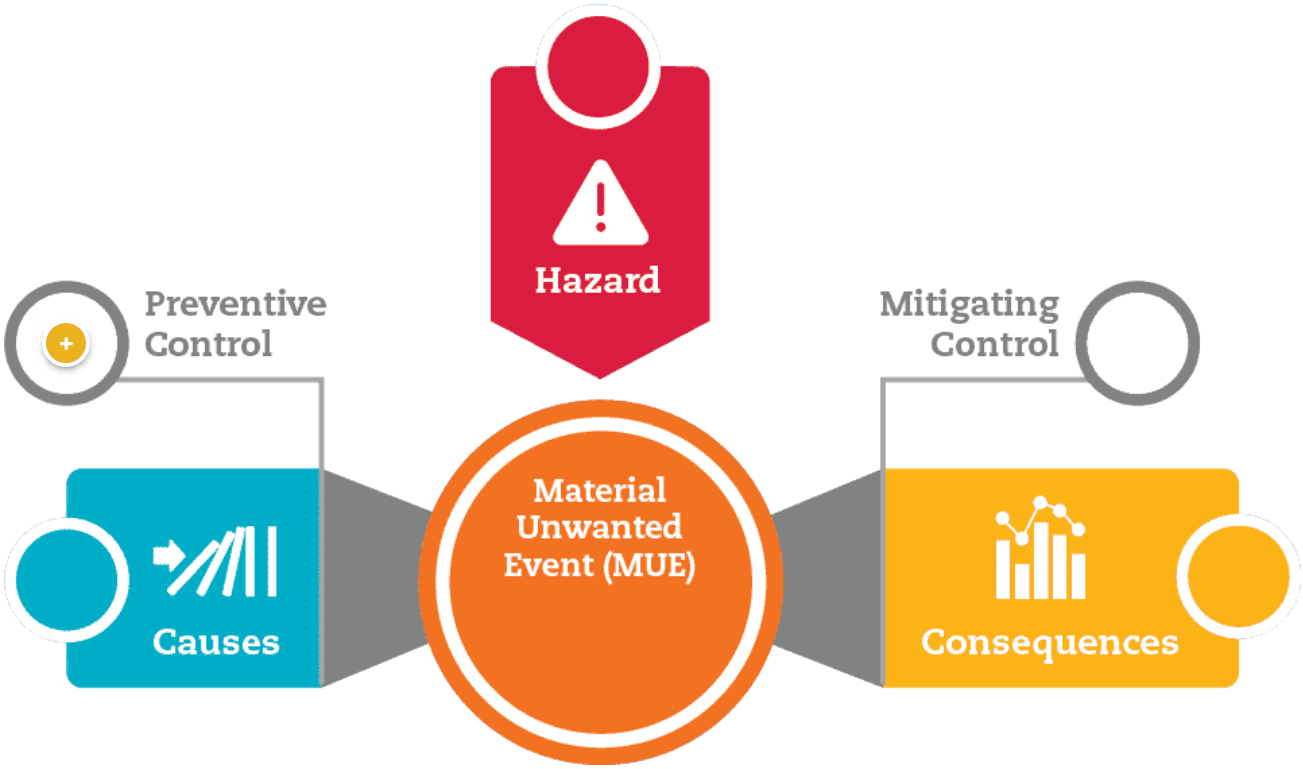


Equipment Fire



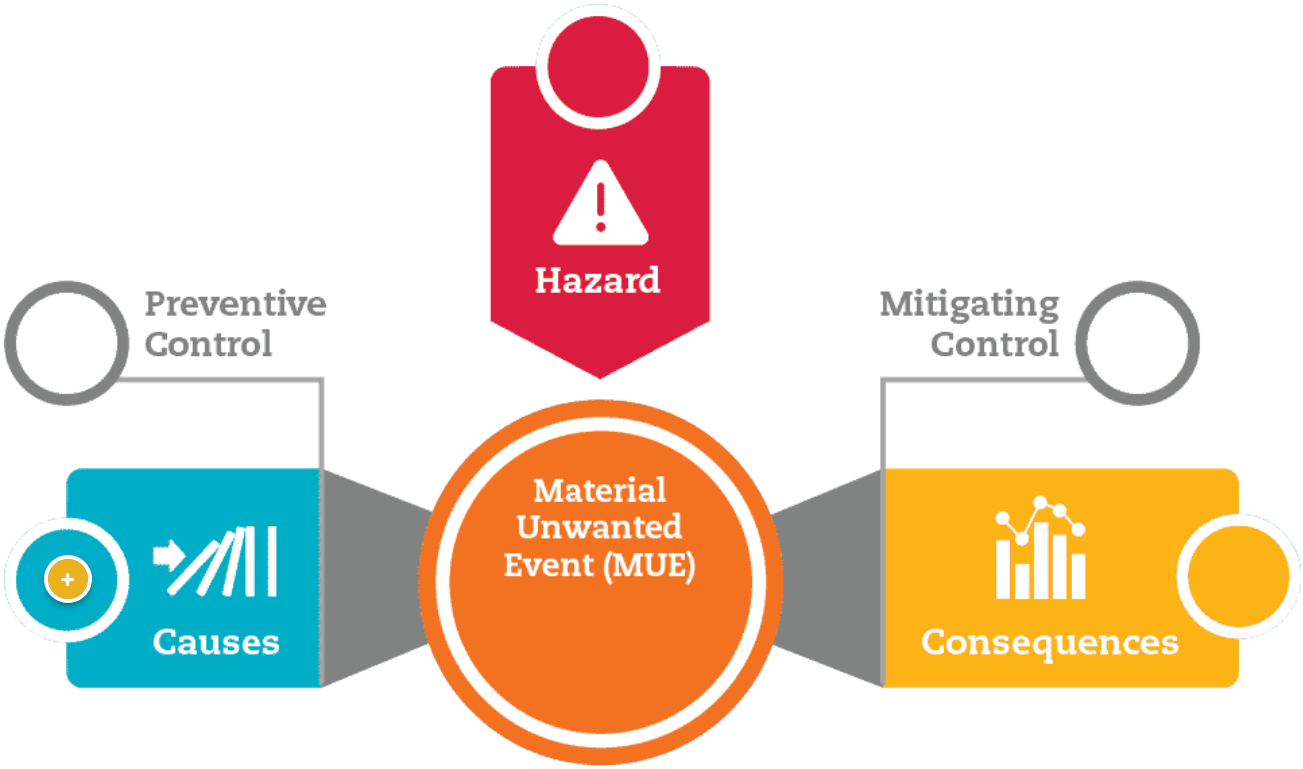
Preventive Control

Conbustion in exhaust ducts:

- Thermal blanket in the exhaust ducts.

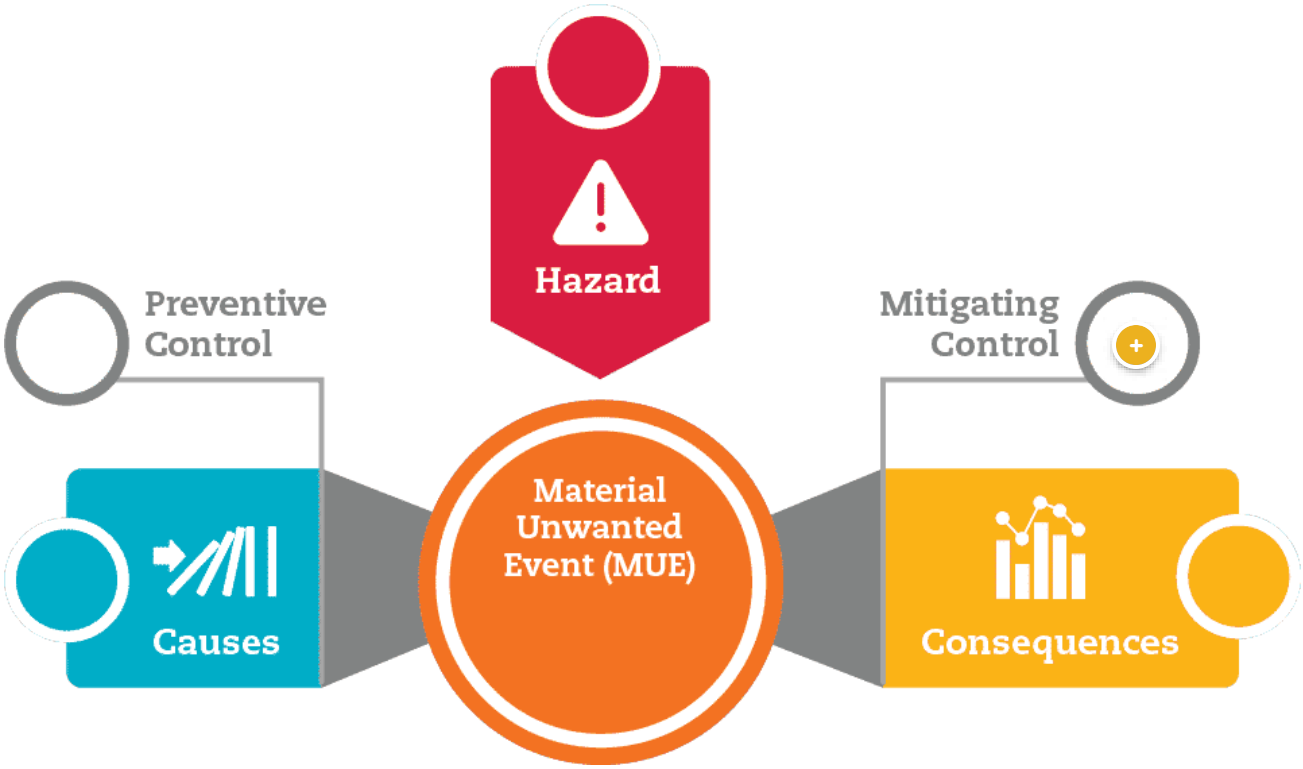
High temperature in tire:

- Tire pressure and temperature monitoring systems.



Causes

- Conbustion in exhaust ducts;
- High temperature in tire.



Mitigating Control

Injury or fatality from burn or fume inhalation:

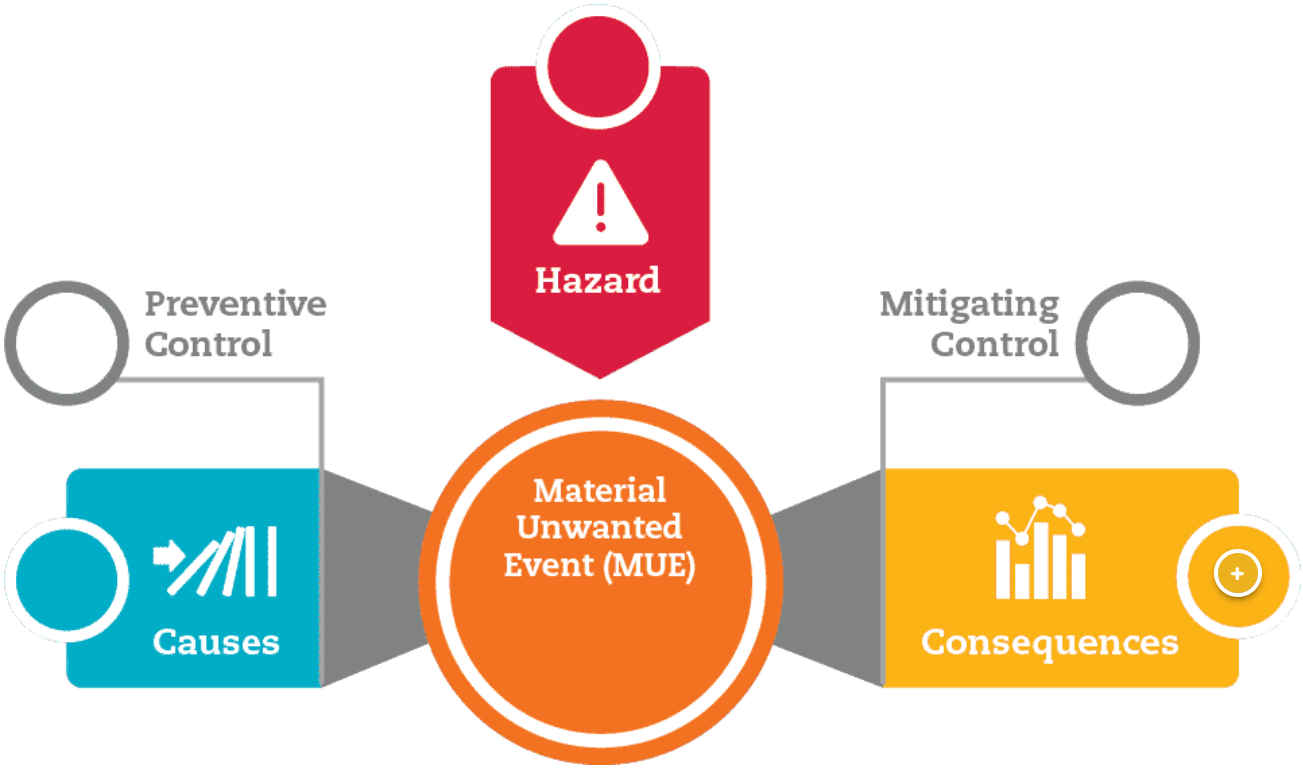
- Automatic fire detection and suppression systems;
- Automatic and emergency engine shutdown logic;
- Portable fire extinguishers;
- Water trucks.

Tire explosion:

- Diffuser valves for relieving internal tire pressure.

Injury or fatality due to or fume inhalation:

- Evacuation system.



Consequences

- Injury or fatality from burn or fume inhalation;
- Tire explosion;
- Injury or fatality due to burn or fume inhalation.

During this training, these bowties will be used to exemplifying the requirements of CAR 03. Carefully analyze the bowties and learn more about CAR requirements!

Complete the content above before moving on.

Requirements for Facilities and Equipment

In this chapter, we will learn about the main requirements of CAR 03 for **FACILITIES AND EQUIPMENT** and how they can contribute to the prevention and mitigation of incidents related to CAR 03.

Watch the video in full to continue.

The following is an example of an accident at Vale. Identify which requirement could have prevented or mitigated this event:

Overturning

When performing a reverse maneuver to discharge ore, an off-road truck exceeded the tipping limit and ended up overturning to the lower bank.

After investigations, several causes for this occurrence were identified. One of them was related to the height of the RIDGE, which had inadequate dimensions.

What controls provided for in CAR 3 could have prevented or mitigated this event?

Among other controls, certainly a Berm built with dimensions appropriate to the size of the types of mobile equipment used at the site could have contributed to prevent or mitigate the event.

Complete the content above before moving on.

Which of the following unwanted events does CAR 03 mitigate?

- ◯ Collision/overturning, Running over/fire.
- ◯ Crane fall during the lifting activity.
- ◯ Load fall from overhead crane.

SUBMIT

Complete the content above before moving on.

Which equipment below are included in CAR 03?

- [ ] Backhoe.
- [ ] Yard reclaimers and stackers.
- [ ] Off-road truck.

SUBMIT

Complete the content above before moving on.

The protective berms act as a physical barrier preventing the equipment from falling to a lower level. **What are the dimensions established in CAR 03 for building berms?**

- ( ) There are no criteria for the size of the berms to be built in the surface mining areas.

- Protective berms shall be constructed with a minimum height equal to half the diameter of the largest tire among equipment that travel on the surface mining areas.
- Protective berms shall be constructed with a minimum height equal to half the diameter of the smallest tire among equipment that travel on the surface mining areas.

SUBMIT

Complete the content above before moving on.

General Requirements for Mobile Equipment

In this chapter, we will learn about the general requirements of CAR 03 for **MOBILE EQUIPMENT**.

Watch the video in full to continue.

Check below the main requirements applicable to dump truck.

3 Points safety belt

Proximity alert system between equipment

Reverse gear sound alarm

Video camera

Air-conditioned cabin

Load monitoring systems

Operator drowsiness detection system

Location and speed (telemetry) monitoring systems

Requirements against collision between mobile equipment

Escape and landing alternatives in emergency situations

ROPS/FOPS

ROPS - Rollover protection system

FOBS - Falling object protection

Tire pressure and temperature monitoring systems

Complete the content above before moving on.

Activity

Which of the controls below is not related to general requirements for mobile equipment?

- ◯ Trucks must have a synchronized gearbox.
- ◯ Pivot points must have clear and visible signaling of this risk.
- ◯ Hooks with safety locks on the lifting equipment.

SUBMIT

Complete the content above before moving on.

See now more examples of accidents at Vale and identify which requirement could have prevented this event:

Collision

An operator was driving an dump truck when another truck appeared on the right on a collision course. The operator braked the equipment and performed an evasive maneuver to the left. However, a side collision occurred near the operator's cabin.

Complete the content above before moving on.

Question

What controls provided for in car 3 could have prevented or mitigated this event?

- ◯ Equipment proximity alert systems.
- ◯ Video camera.
- ◯ Speed monitoring systems.
- ◯ All alternatives.

SUBMIT

Complete the content above before moving on.

Specific Requirements: Underground Mine Equipment

In this chapter, we will learn about the specific requirements of car 03 for **underground mine equipment**.

Watch the video in full to continue.

Specific underground mine requirements:

Specific Requirements	Graders	Wheel Loaders	Low Profile Loaders	Excavators	Underground Drills	Scalers	Telescopic Handlers	Rigs	Articulated Trucks (Off-Road)	Scissors lift trucks	Other trucks
a) Windshield Protection Grid (FOG).				X							
b) Front video cameras.			X								
c) Rear video cameras.		X	X						X		
d) Air-conditioned cabin.	X	X	X	X		X	X		X	X	X
e) Location and speed monitoring systems (telemetry).									X	X	X
f) Reflective stickers on sides and rear.	X			X	X	X	X	X	X	X	X
g) Speed limiting device.									X		
h) Fixed load table next to commands.		X	X	X							
i) Primary (motor brake) and secondary (electric or hydraulic) speed retarding system.									X[(a)]		X[(a)]
j) Head rest.	X					X			X	X	X
k) Signaling devices (reflective triangles, cones, plastic drums or stanchions).											X
l) Operator drowsiness detection system.									X	X	X

(a) The secondary type speed retarding system is mandatory for equipment with a total gross weight equal or above 30 tons and its use on long and steep slopes.

Complete the content above before moving on.

Specific Requirements: Detection, Mitigation and Prevention of Fire on Mobile Equipment

In this chapter, we will learn about the specific requirements of car 03 for **detection, mitigation and prevention of fire in mobile equipment**.

Based on the recurrence of fires in mobile equipment at vale, the new document presents an exclusive chapter on the subject, always focusing on the safety of the operator and firefighting professionals.

Watch the video in full to continue.

Specific requirements for fire detection and mitigation:

1. Automatic fire detection and suppression systems.
2. Thermal blankets in exhaust ducts for turbine and silencer.
3. Diffusion valves for relieving tire internal pressure.

4 Evacuation system.

5 Automatic shutdown.

All the requirements below are fundamental for the prevention of fire in equipment, except:

- ◯ Thermal blankets.
- ◯ Diffusion valves.
- ◯ Seat belt.
- ◯ Automatic fire detection and suppression systems.

SUBMIT

Complete the content above before moving on.

See now an incident at vale involving fire in a mobile device and learn about the requirement that could prevent this event:

Equipment fire

As an off road truck was in operation, there was a fire outbreak in the equipment, that quickly spread to the cabin forcing the operator to stop and abandon the equipment. When she got off the equipment, she jumped half way down the stairs to the ground suffering body burns.

Complete the content above before moving on.

What controls provided for in car 3 could have prevented or mitigated this event?

- Putting thermal blankets in the exhaust ducts.
- Automatic fire detection and suppression systems.
- Diffusion valves for relieving tire internal pressure.
- Implementation of the engine automatic and emergency shutdown logic.
- All alternatives.

SUBMIT

Complete the content above before moving on.

Requirements for Procedures

In this chapter, we will learn about the requirements of car 03 for **procedures** which must be followed in operations with mobile equipment.

Watch the video in full to continue.

In the case of maneuvering with excavator power cables, if the cable is submerged by water or mud, one must:

- Make the move normally.
- Perform in zero energy condition.
- They must only be performed in daylight, in good visibility.

SUBMIT

Complete the content above before moving on.

Drag the cards to the corresponding category:
True or False:

True

Before operating equipment, a pre-use/periodic inspection must be carried out.

People in operating areas must wear reflective clothing or vests.

Chock is not necessary when equipment is stabilized or with implement lowered.

False

The headlights of mobile equipment must be kept only at night.

The use of seat belts in mobile equipment is optional.

Complete the content above before moving on.

Requirements for Training

In this chapter, we will learn about the requirements of car 03 for **training** which must be followed in operations with mobile equipment.

Watch the video in full to continue.

The operation of heavy equipment can only be carried out following some training criteria. Review the alternatives below and check the correct option.

- ◯ Valid driver's license for the type of mobile equipment they will operate, when required by local law.
- ◯ Certification for the operation of the specific equipment type.
- ◯ Mobile equipment risk prevention training.
- ◯ Training in the operation of the automatic fire detection and suppression systems, evacuation techniques and activation of the site emergency plan, if operating mobile equipment with such systems.
- ◯ All are correct.

SUBMIT

Complete the content above before moving on.

Quiz

You will now take an evaluative test regarding the content of the training.

The test has 7 questions about CAR.

You will be considered approved if you answer 70% of the questions correctly.

Good luck.

Question

01/07

The requirements of CAR 03 aim to prevent or mitigate events that may occur during operation with mobile equipment.

Check the correct alternative (s) regarding the events that the requirements of CAR 03 aim to prevent or mitigate:

- [ ] Collision and Tipping.
- [ ] Falling object from Overhead Crane.
- [ ] Running over.
- [ ] Fire and Explosion.

Question

02/07

Protective berms are physical barriers that prevent equipment from falling to a lower level in the event of an operational failure. Check the correct alternative for building "berms" in surface mining areas.

- There are no criteria for the size of the berms that will be built in the surface mining areas.
- Protective berms shall be constructed with a minimum height equal to half the diameter of the largest tire among equipment that travel on the surface mining areas.
- The building of berms in surface mining areas is not mandatory.
- Protective berms shall be constructed with a minimum height equal to half the diameter of the smallest tire among equipment that travel on the surface mining áreas.

Question

03/07

Chocks with dimensions compatible with the tires of mobile equipment and their implements must be used in some situations. Analyze the alternatives below and check the correct option.

- In parking lots and in maintenance performed in workshops or maintenance stalls.
- In activities where the equipment must remain switched on and the operator must stay outside the cab, except in shift changes, which must take place at appropriate and safe locations for this activity.
- In case of mobile equipment that is damaged or needs to be temporarily parked on roads, access roads or sloped roads, with the operator outside the cab.
- All alternatives are correct.

Question

04/07

Mobile equipment must have fire detection, mitigation and prevention systems. Analyze the alternatives below and check the one that is not included in the fire prevention requirements required in CAR 03.

- ◯ Automatic fire detection and suppression systems.
- ◯ Thermal blankets in the exhaust ducts (turbine and silencer).
- ◯ Evacuation system that enables the operator to safely evacuate the equipment.
- ◯ FOPS and ROPS protection structure.

Question

05/07

In the case of general requirements for mobile equipment, all the sentences below are correct, except:

- As long as the equipment is not parked in a safe place, the use of TV/DVD devices, headphones/earphones, and mobile phones, including headset or speakerphone features, is prohibited.
- Modifications to mobile equipment can be performed without formal approval from the manufacturer.
- Mobile equipment must have audible reverse alarm.
- Mobile equipment with pivot points where there is a risk of crushing or pinching shall have that hazard clearly and visibly signaled.

Question

06/07

Manual positioning of excavator power cables present significant risks and can only be performed following controls provided for in CAR 03. Analyze the sentences below and check the incorrect option.

- Can be performed without the supervision of an Electrician (Instructed Professional).
- They shall only be performed if the Operator of the excavator maintains eye contact with all persons performing the activity.
- They shall only be performed in daylight, in good visibility conditions and they must be interrupted during thunderstorms or risk of lightning.
- They must be performed under the condition of zero energy in case the cable is submerged by water and/or mud.

Question

07/07

The operation of heavy equipment can only be carried out following some training criteria.

Analyze the alternatives below and check the correct option.

- Valid driver's license for the type of mobile equipment they will operate, when required by local law.
- Certification for the operation of the specific equipment type and mobile equipment risk prevention training.
- Training in the operation of the automatic fire detection and suppression systems, evacuation techniques and activation of the site emergency plan, if operating mobile equipment with such systems.
- All alternatives are correct.

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