Risk Assessment Using CSA Z432 - Machine Safeguarding

manufacturing Safety Alliance of BC

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Overview

1. Machine safeguarding fundamentals
2. Legal requirements and standards
3. Types of hazards
4. Risks assessment
5. Controlling hazards
6. Classification of safeguards
7. Machine safeguarding assessment
8. Resources (in BC)

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Module 1
Machine safeguarding fundamentals

Definitions

Safeguard *means the use of a guard, a safety device, a shield, an awareness barrier, warning signs, or other appropriate means, either single or in combination, to provide effective protection to workers from hazards.*

Safety device *means a type of safeguard consisting of an arrangement of operating controls, an active or passive physical restraint, an interlock, or a presence sensing device which ensures that a worker cannot access or be in a hazardous area while a machine is operating.*

Shield *means a type of safeguard consisting of a physical cover or barrier which restricts but does not prevent access to a hazardous moving part or a point of operation.*

[Occupational Health and Safety (OHS) Regulation 12.1 Definitions]

Why is this topic important?

- Every year workers encounter hazardous energy caused by hazardous power, point of operation and ejecting material.
- These encounters can lead to amputated fingers, injuries to hands and other body parts, and even fatalities.
- Most of these injuries can be prevented with safeguarding and lockout procedures.

Effective safeguard (AUTO)

Around

Under

Through

Over

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Module 2
Legal requirements and standards

Fundamental regulations (BC requirements)

Section 12.2 of the BC OHS Regulation

- The employer must ensure that machinery and equipment is fitted with adequate safeguards which:
- Protect a worker from contact with hazardous power transmission parts
- Ensure that a worker cannot access a hazardous point of operation
- Safely contain any material ejected by the work process which could be hazardous to a worker

Fundamental regulations (BC requirements)

Section 4.11 of the BC OHS Regulation

Before any equipment, machinery or work process is put into operation the persons responsible for doing so must ensure that

a) Safeguards and air contaminant controls required by this Regulation are in place and functioning, and

b) No person will be exposed to undue risk by putting the equipment, machinery or work process into operation.

Fundamental regulations (BC requirements)

Section 12.3 of the BC OHS Regulation

The application, design, construction, and use of safeguards, including an opening in a guard and the reach distance to a hazardous part, must meet the requirements of CSA Standard Z432-94, Safeguarding of Machinery.

[Enacted by B.C. Reg. 312/2003, effective October 29, 2003.]

** See also section 4.4 of the OHS Regulation.*

Fundamental regulations (BC requirements)

Conformity to Standards

- If the machine is manufactured after April 15th 1998, CSA Z432-94 must be met
- If the machine is manufactured before April 15th 1998; the machine must meet either CSA Z432-94, or the edition published at the time that the machine was manufactured, and
- Any other alternates must be approved by WorkSafeBC

CSA Z432 requirements

CSA Z432

1. Requirements for design, manufacture, installation, operation, maintenance and safeguarding of industrial equipment
2. Risk Analysis Process Model
3. Risk Reduction Process Model

CSA Z432 requirements

Main Purposes

1. Provides criteria to identify, select and apply guards and protective devices
2. Prevent injuries and deaths
3. Enhance the safety of personnel who operate, assemble and maintain machinery

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Module 3
Types of hazards

Mechanical versus non-mechanical

Mechanical

Entanglement

Friction and abrasion

Cutting or severing

Stabbing or puncturing

Non-Mechanical

Electrical

Thermal

Noise and vibration

Radiation

What are the 3 types of mechanical hazards?

Point of operation

Power transmission apparatus

Other moving parts

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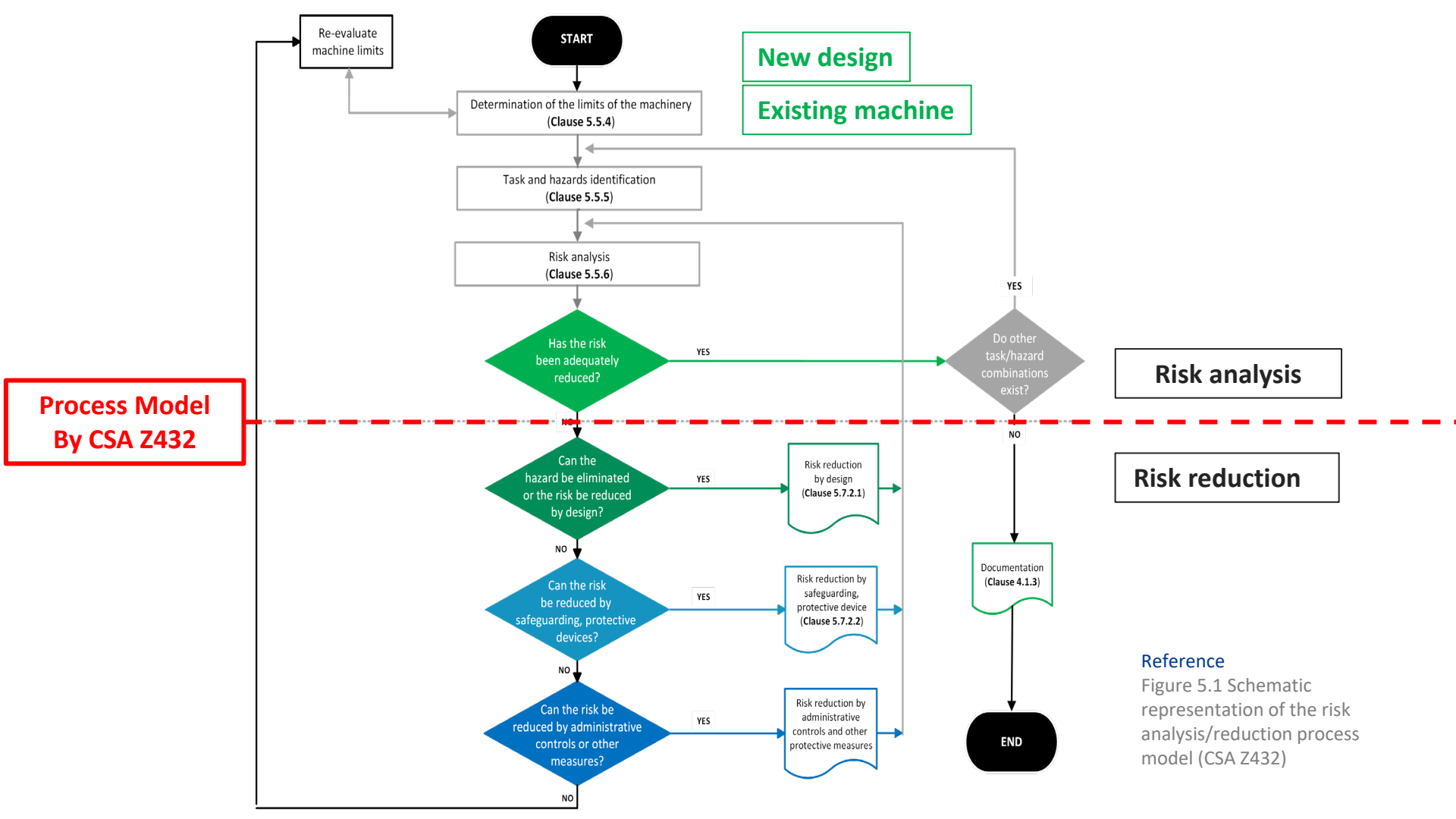
Module 4
Risk assessment

Risk assessment modeling

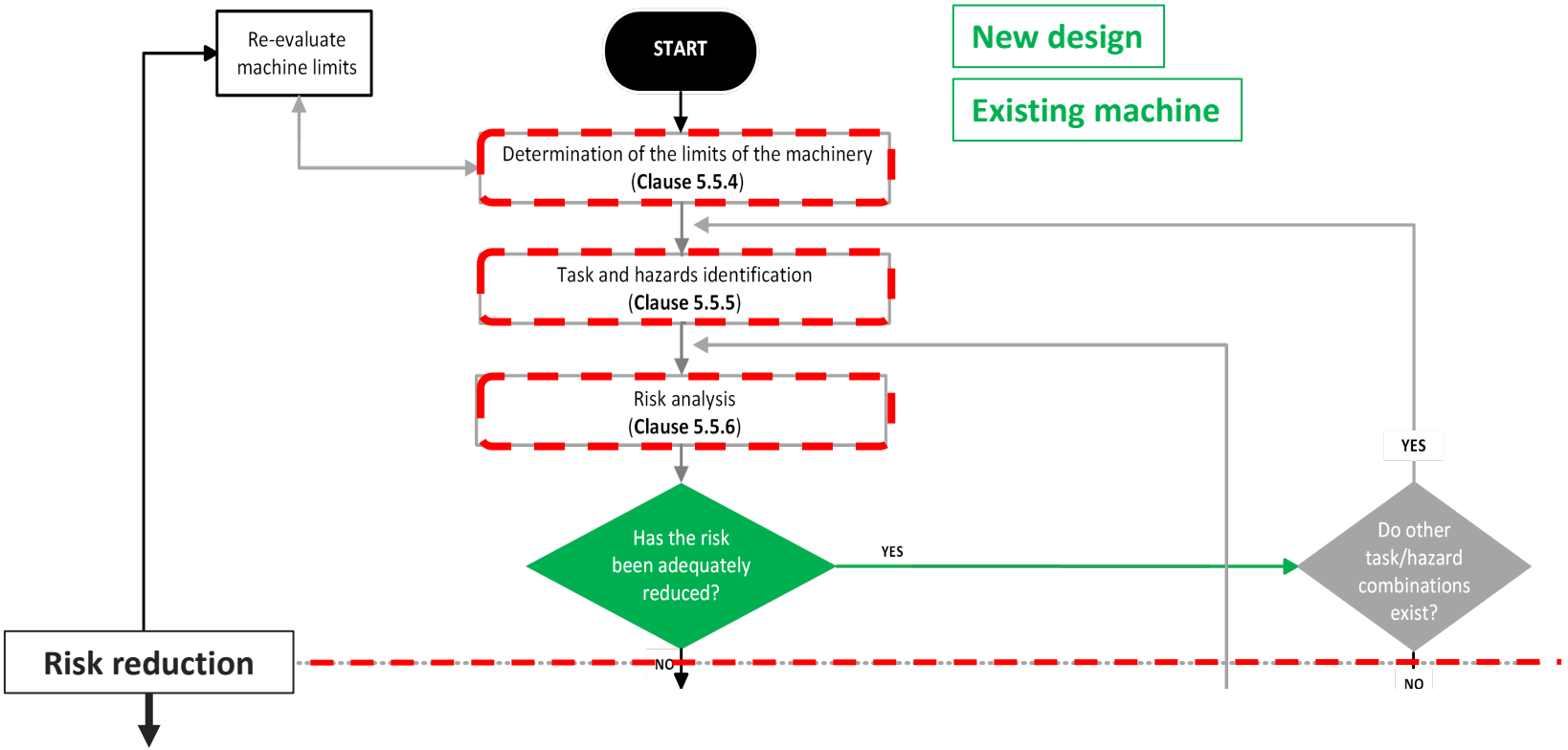
- Perform a risk assessment on all
- machinery and equipment
- Determine the hazards
- Assess the risk
- Implement the controls using the revised Hierarchy of Control
- Evaluate the risk after controls
- Monitor and review to ensure the controls are working



Reference

Figure 5.1 Schematic representation of the risk analysis/reduction process model (CSA Z432)

Risk analysis process model



Machine or system limitations

Design limitations

- Use limits
- Space limits
- Time limits
- Environmental limits
- Interface limits

Machine safeguarding risk assessment template

	Description	Hazards	Current Level of Guarding			Machine Identification Name:
			Severity	Exposure	Avoidance	Solution:

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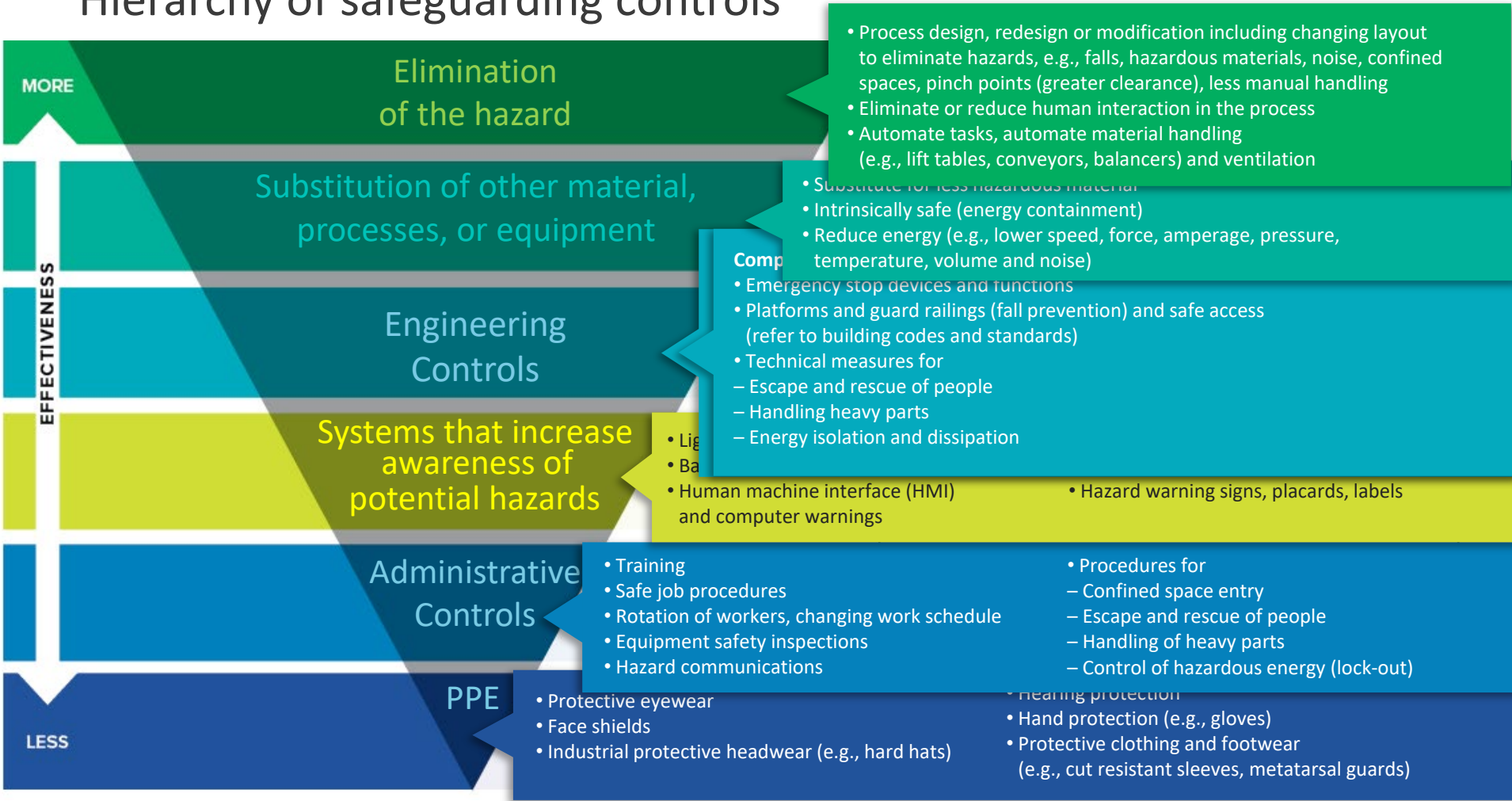
Module 5
Controlling Hazards

Hierarchy of safeguarding controls



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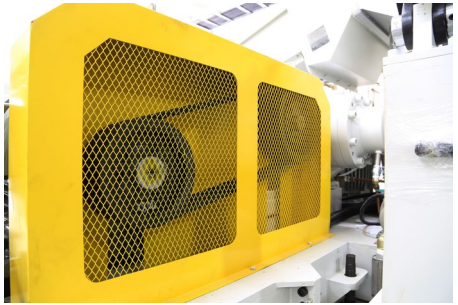
Module 6
Classification of safeguards

Classification of safeguards

- Barrier guards
- Safeguarding devices
- Location
- Administrative means
- Training and procedures
- PPE



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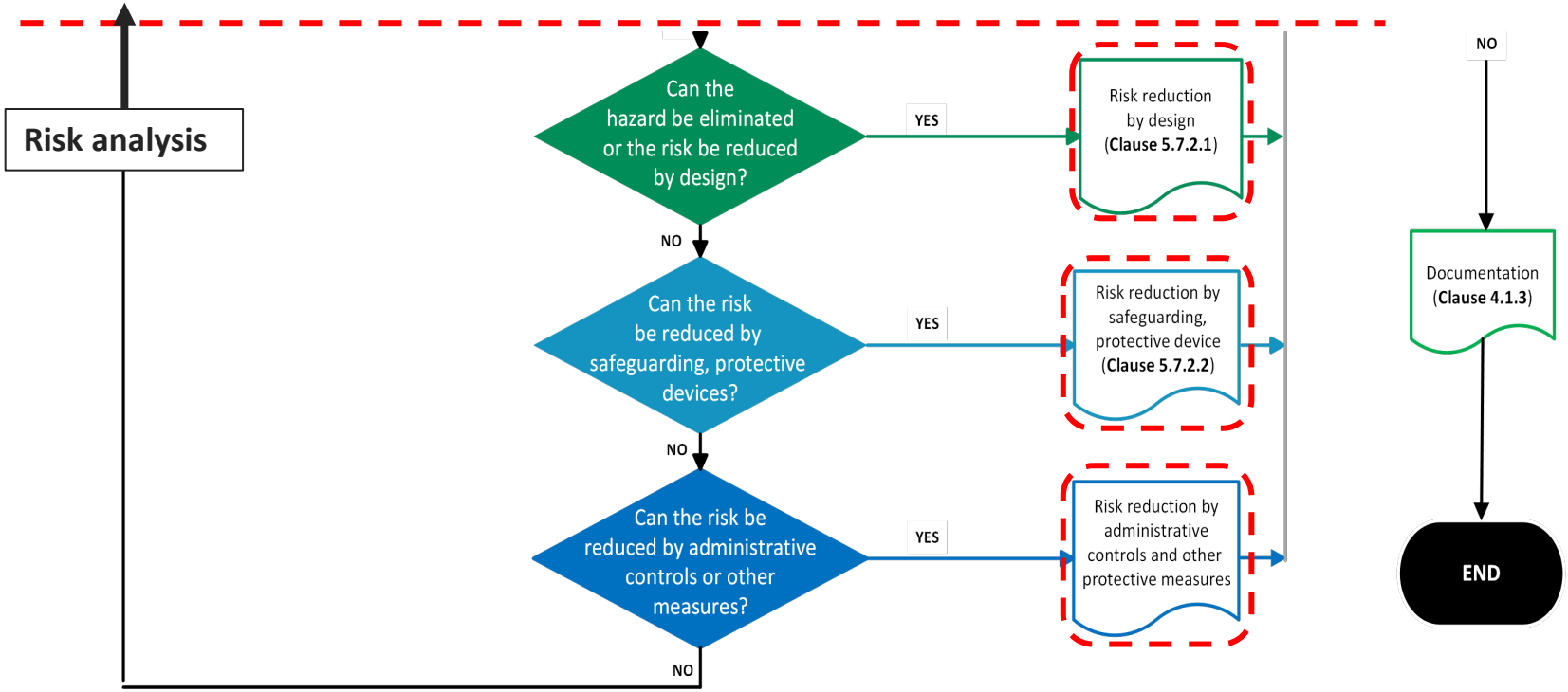
Module 7
Machine safeguarding assessment

Risk reduction process model



Complying with the requirements

Risk reduction process model

1. Risk reduction by Design
2. Risk reduction by Safeguarding
3. Risk reduction by Administrative Controls and Other Protective Measures

Inherently safe design measures

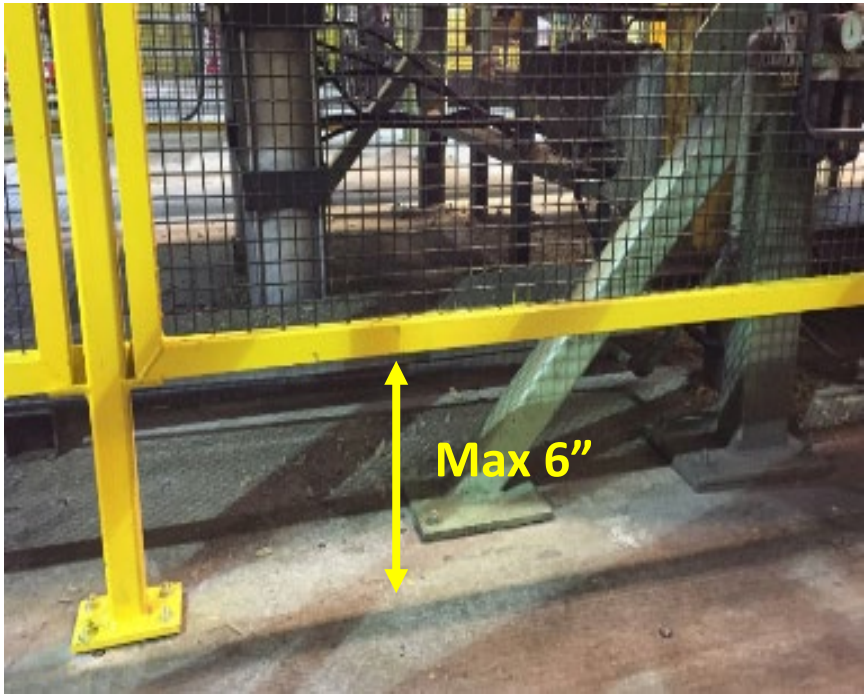
1. **Eliminating the hazard**

- Process design, redesign or modification
- Eliminate or reduce human interaction in the process
- Automate tasks or material handling
- Reduce energy

2. **Substituting other material, processes, or equipment**

- Substitute for less hazardous material
- Fundamentally safe

Common safeguarding mistakes

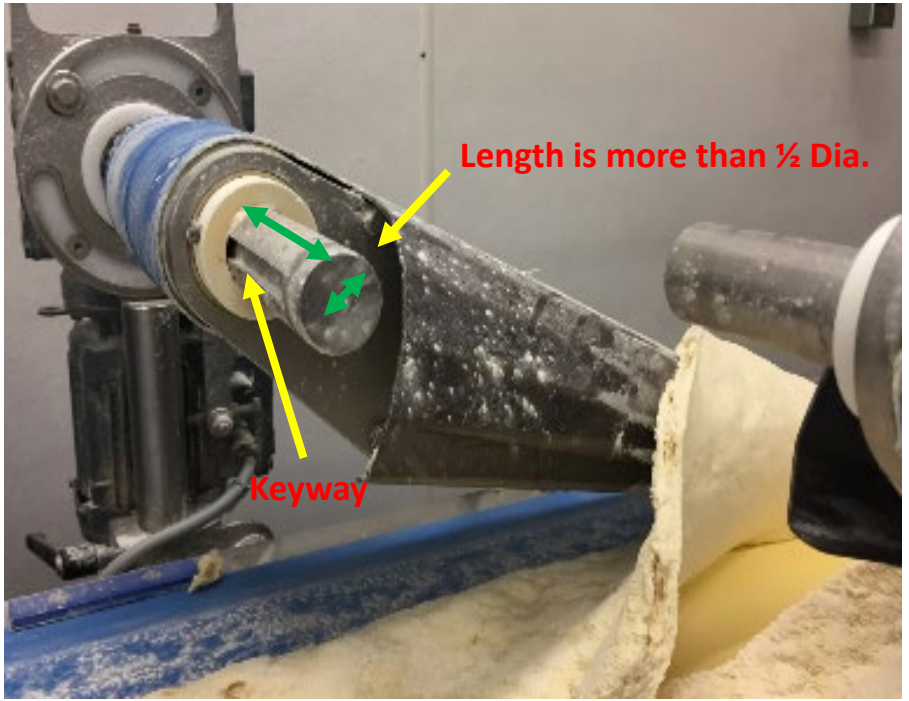


Perimeter guard shall have no greater than 6” opening with adjacent walking surface and the bottom of the perimeter guard. (Clause 10.2.5 (b))

Common safeguarding mistakes

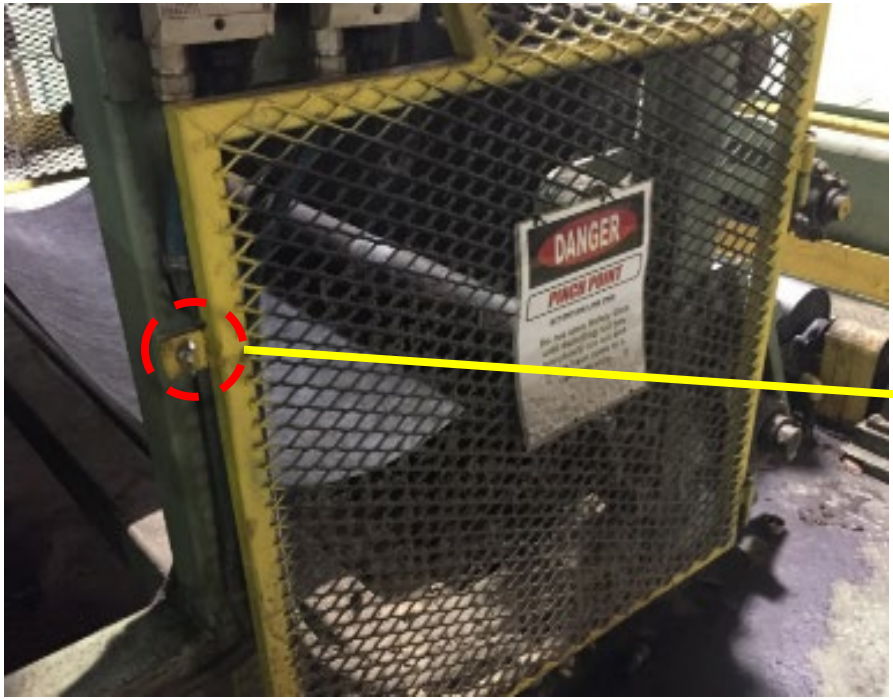
Fixed guards shall be securely held in place either permanently (welding) or by means of fasteners (screws, nuts). (Clause 6.3.3.2.2 and Clause 9.2)

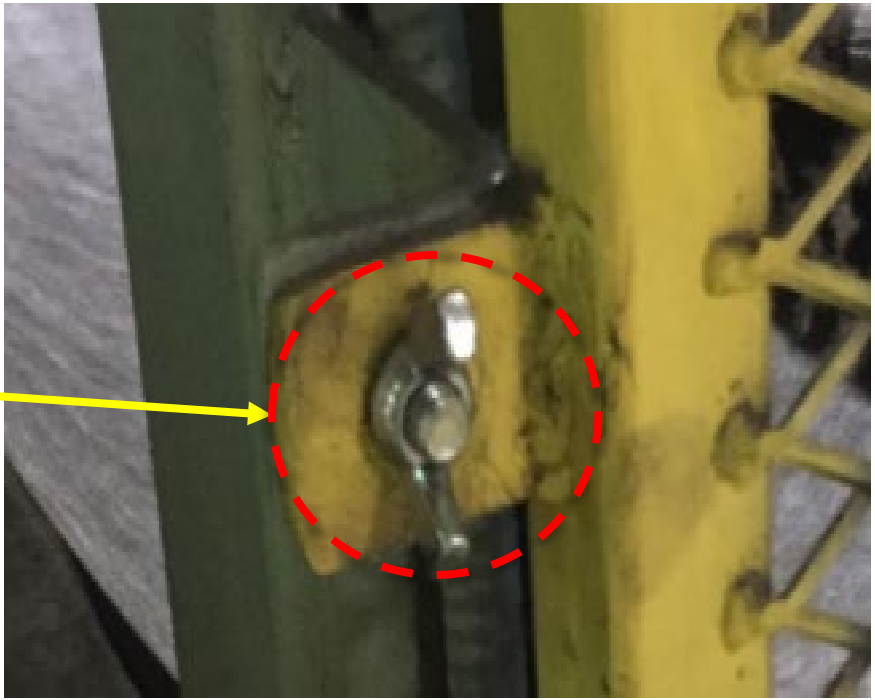
Common safeguarding mistakes



If the shaft sticks out less than half of its diameter and no set screws or keyways at that point no shaft cap is required.
(BC Regulations, Part 12, Section 12.16 Rotating Hazards)

Common safeguarding mistakes



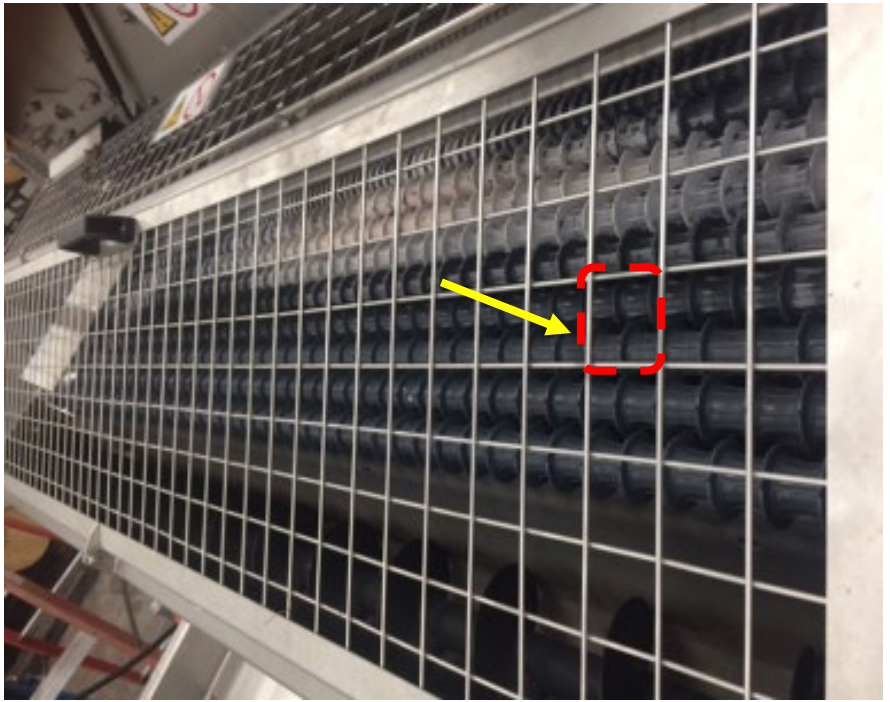


The fixed guards shall only be removable by the use of a tool. (Clause 6.3.3.2.2 and Clause 9.2)

Common safeguarding mistakes

The latches that hold down the guards are not in compliance with CSA Z432.
A fixed guard must be attached that would require a tool to remove the guard.
(Clause 6.3.3.2.2 and Clause 9.2)

Common safeguarding mistakes

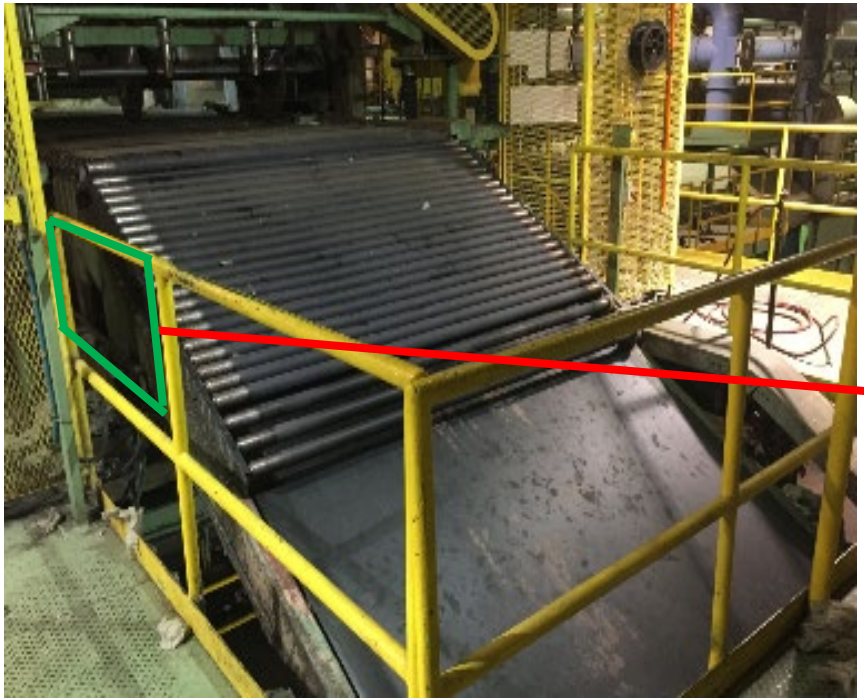


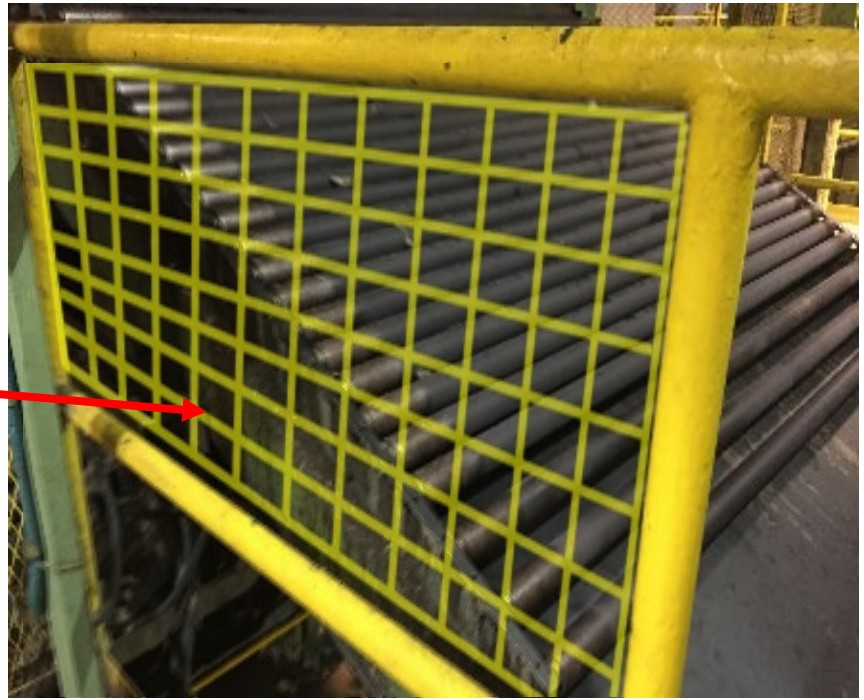
Reduce the clearance between the grating or increase the distance the grating is from the hazard.
Review CSA Z432-16 Sec. 10.13, to find out the min distance from hazard as a function of barrier opening size.
(Table 10.2 and 10.3)

Common safeguarding mistakes

Existing fixed guarding shall be extended and enclosed the machine from all sides.
Review CSA Z432-16 Sec. 10.13, to find out the min distance from hazard as a function of barrier opening size.
(Table 10.2 and 10.3)

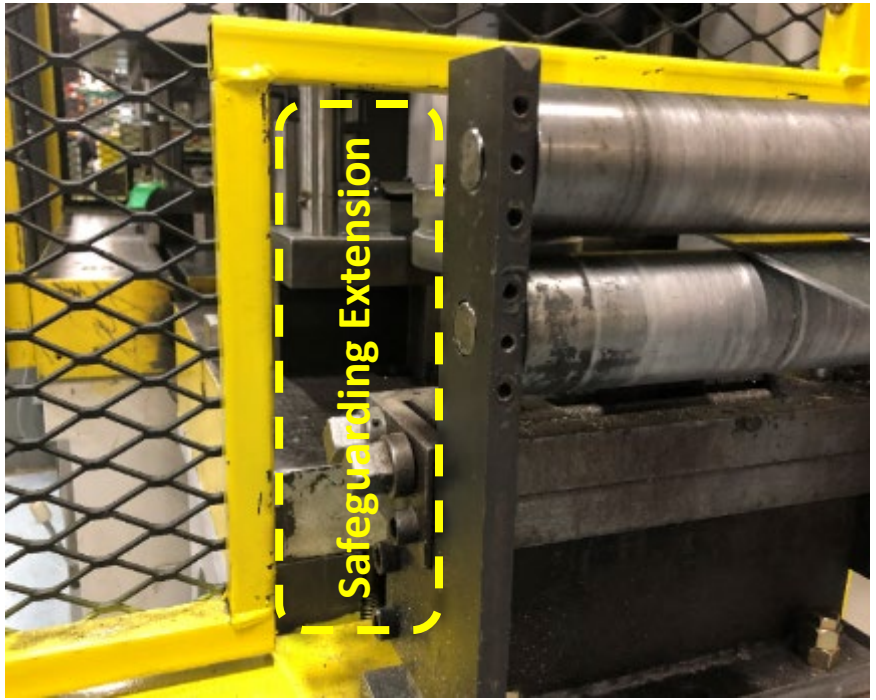
Common safeguarding mistakes





Fixed barrier guarding is required to enclose the open area to prevent contact with rollers.
Review CSA Z432-16 Sec. 10.13, to find out the min distance from hazard as a function of barrier opening size.
(Table 10.2 and 10.3)

Common safeguarding mistakes



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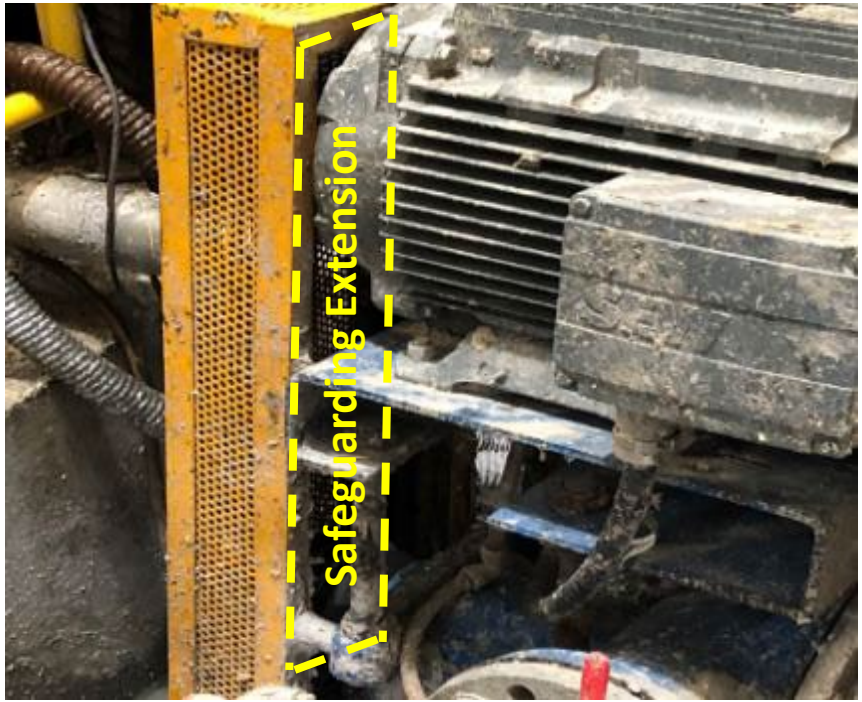

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Module 8

Resources (in BC)

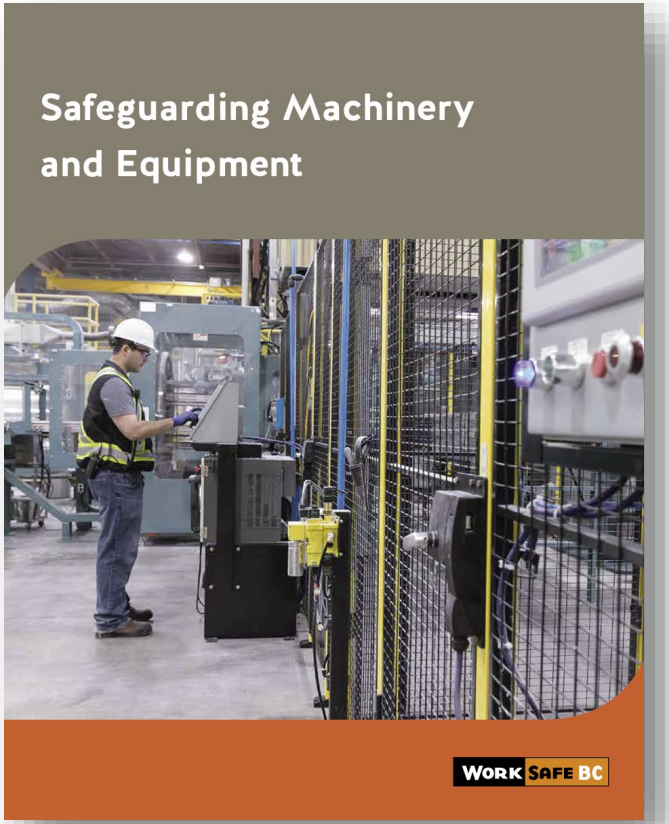
Safeguarding Machinery and Equipment

(WorkSafeBC)

- Three main parts,

1. Identifying different kinds of hazards,
2. Assessing the risks, and
3. Controlling hazards.

- Also includes a safeguarding checklist, applicable standards in the OHS Regulation, and safeguarding risk assessment tables.



Safeguarding Checklist

(WorkSafeBC)

- Safeguarding Requirements
- Mechanical Hazards
- Education and Training
- Protective Equipment and Proper Clothing
- Machinery Maintenance and Repair

Safety in Manufacturing

Safeguarding Checklist

Photocopy this machine guarding checklist. Use it to analyze all of the moving machinery in your workplace.

Guarding Requirements	Yes	No
1 Do the guards prevent workers' hands, arms, and other body parts from making contact with dangerousmoving parts?	☐	☐
2 Are the guards firmly secured and not easily removable?	☐	☐
3 Do the guards ensure that no objects will fall into the moving parts or explode out?	☐	☐
4 Do the guards permit safe, comfortable, and relatively easy operation of the machine?	☐	☐
5 Can the machine be oiled or greased without removing the guard?	☐	☐
6 Does the machine automatically shut down when the guard is removed?	☐	☐
7 Can the existing guards be improved?	☐	☐
Mechanical Hazards		
The point-of-operation:		
1 Is there a point-of-operation guard provided for the machine?	☐	☐
2 Does it keep the operator's hands, fingers, body out of the danger area?	☐	☐
3 Is there evidence that the guards have been tampered with or removed?	☐	☐
4 Could you suggest a more practical, effective guard?	☐	☐
5 Could changes be made on the machine to eliminate the point-of-operation hazard entirely?	☐	☐
Power transmission apparatus:		
1 Are there any unguarded gears, sprockets, pulleys or flywheels on the apparatus?	☐	☐
2 Are there any exposed belts or chain drives?	☐	☐
3 Are there any exposed set screws, key ways, collars, etc.?	☐	☐
4 Are starting and stopping controls within easy reach of the operator?	☐	☐
5 If there is more than one operator, are separate controls provided?	☐	☐

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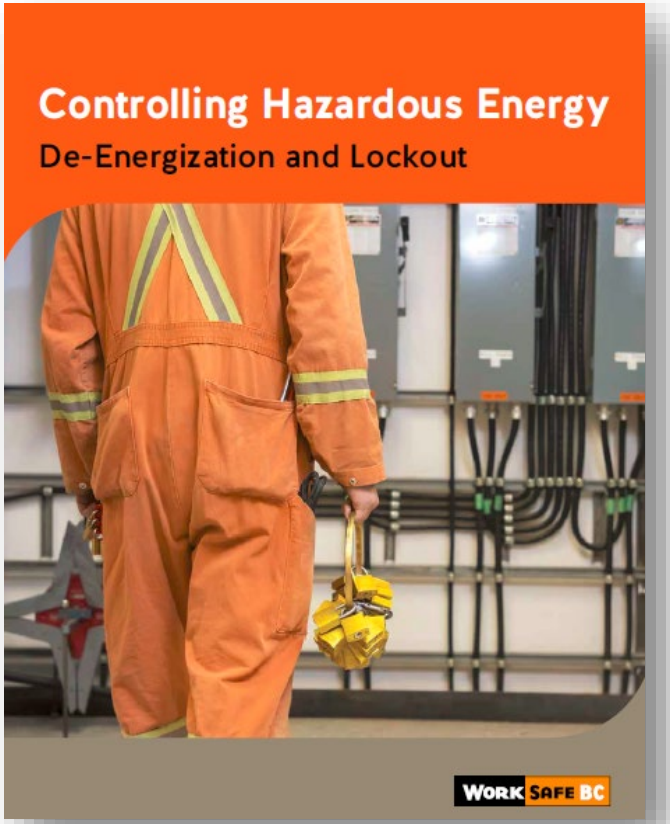
Controlling Hazardous Energy

De-Energization and Lockout

(WorkSafeBC)

- Introduction to Hazardous Energy
- Responsibilities
- Policy, Program and Procedures
- Alternative Methods
- Automation Technology



Q&A

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About the Manufacturing Safety Alliance of BC

The Manufacturing Safety Alliance of BC is the nonprofit health and safety association for BC manufacturers and food processors. More than 3,000 employers use our Alliance online and classroom training and confidential advisory services to build workplace health and safety programs and protect workers.

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for the Occupational Safety
Standard of Excellence
COR for BC Manufacturers

Thank you!!!

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