Safeguarding – Working around Machinery Fact Sheet

WHAT IS CONSIDERED TO BE MACHINERY?

The CSA Standard Z432-16 Safeguarding of machinery provides detailed guidance for the design, installation, use and maintenance of machinery. The use of machinery in a workplace exposes workers using it, and people near it, to various hazards. CSA standard Z432-16 defines machinery as:

“an assembly of linked parts or components, at least one of which moves, with the appropriate machine actuators, control and energy circuits, etc. joined together for a specific application, in particular for the processing, treatment, moving, or packaging of material.”

What are the hazards of working around machinery?

Hazards associated with working near or on machinery vary depending on the exact machine used but can include exposure to:

- moving parts (e.g., risk of injuries from entanglement, friction, abrasion, cutting, severing, shearing, stabbing, puncturing, impact, crushing, drawing-in or trapping, etc.)
- energy (e.g., electrical, electromagnetic, magnetic, etc.)
- heat or cold
- noise
- vibration
- radiation
- gas or liquid under pressure (e.g., injuries from injection or ejection by hydraulic systems, pneumatic systems, compressed air, paint sprayers, etc.)
- psychosocial hazards (e.g., stress, job content, work organization, cognitive factors, etc.)

Because there are many different types of machines and processes, a risk assessment should be conducted for each machine or situation, and in some cases, before each use. It may be necessary to involve individuals with specialized or technical expertise (i.e., engineer, safety professional, manufacturer, etc).

How do I work safely with machinery?

Each piece of powered equipment should be assessed using the following process:

1. Understand how the machine is designed.

2. Understand how to use the machine safely.

3. Identify all tasks performed by and associated with the machine:

- What hazards may occur from use and misuse of the machine?
- What moving parts and corresponding safeguards are currently in place?

4. Identify who will be using the machine, and how often the machine will be used.

5. Determine what materials are used with the machine (e.g., sheet metal, wood, metalworking fluid, oil, etc.).

6. Estimate the risk of each hazard by considering the:

- Severity of possible injuries and or incidents, and
- Probability or likelihood of occurrence.

7. Eliminate the hazard(s) where possible.

8. Use protective measures to control the risk of each hazard including considering:

- the design,
- safeguarding and protective devices,
- administrative controls, or
- other measures.

9. Re-assess to estimate the new risk level.

10. Repeat the process if the risk level has not been eliminated or effectively controlled.

What should be considered when assessing the severity and probability of a risk?

Severity of the injury can be determined by asking two main questions:

- What type of mechanical or other hazard is involved?
- What type(s) of injury could happen?

The probability of the injury should be determined by reviewing information about the machine’s operation such as:

- exposure to a machine that could cause the injury while working with or around the machine (e.g., entanglement, contact with blade, etc.)
- potential human behaviour while performing these tasks
- reports of machine breakdowns, etc.

These three factors can be combined to determine the probability of injury from a particular task.

Determine a risk rating for each type of injury by assuming no protective measures have been installed on the machine. This evaluation will help when determine if sufficient action has been taken to prevent injury. The CSA Standard Z432 provides additional details on the assessment process.

What are some hazards that are associated with machinery and powered equipment?

The following checklist will help identify hazards in your workplace. It is important

to tailor the information to your workplace and add any additional items as necessary.

Possible Hazard	Check One		Notes
	OK	Needs Investigation	
Machine			
Identify the use and limits of the machine by considering: • production rates and cycle times • intended use of the machine • types of materials being used • forces generated • range of motion of moving parts			
Identify how much space the machine needs to safely operate for all tasks being performed by and on the machine, including access for maintenance and repairs.			
Identify the life expectancy of parts and fluids as a result of wear and tear			
Identify the environmental limits of the machine (e.g., operating temperatures, humidity, noise, etc…)			
Consider how the machine interfaces with other machines, equipment, and energy sources			
Consider all tasks the machine performs, and is performed on the machine during its use • trial runs • regular operation • tool changes • scheduled maintenance • un-jamming and recovery from crashes • unscheduled maintenance			
Consider tasks associated with different phases of the machine’s life • start-up and programming • loading, packing, transporting, unpacking • decommissioning and disposal			
Mechanical Components			
At the point of operation, identify the following: • what parts move • the range of motion of moving parts • the type of motion (e.g., rotation, shearing, bending, cutting, punching) Note – the point of operation refers to the area of the machine where useful work is performed. Typically this point is where an operator has contact with the machine.			
Identify how power is transmitted to the machine • hydraulic • pneumatic • mechanical			

If present, identify if the machine has a brake or clutch, and how it operates			
Identify all the “in-running nip points” on the machine			
Identify all the pinch points on the machine			
Identify entanglement hazards of the machine as a result of contact with: • rotating and moving parts • materials in motion • projections or gaps			
Identify where a worker could come in contact with parts moving at a high velocity (e.g., abrasion or friction hazards)			
Identify cutting or severing hazards where a worker could come in contact with cutting tools, saws, routers, knives, or sharp materials			
Identify shearing hazards where a worker could be severely cut by being between two machine parts or between a machine part and a workpiece or stationary object			
Identify crush hazards where a worker could be caught between parts of a machine moving against one another			
Identify if it is possible to be struck or punctured by flying objects			
Review the machine’s operation to determine if a worker could come into contact with pressurized liquids or gases			
Identify any sharp edges and angular parts that protrude (stick out) from the machine			
Identify situations where harm may occur if there was a fault or break in the machine or material (breakage point)			
Identify situations where harm may occur if the machine’s operating software (if applicable) fails.			
Worker specific considerations			
Identify all work that a worker must perform while operating the machine, including: • how stock is fed into the machine • how final products are removed from the machine • removal of scrap • periodic cleaning of the point of entry and other parts of the machine • pre-shift safety checks			
Identify all work that must be done when performing maintenance			
Identify all work that must be done to change a tool or die			

Identify any potential slip or fall hazards in and around the machine as a result of the floor surface, or due to material spills (e.g., lubricating oils, grease, water, saw dust, plastic pellets)			
Identify other possible hazards, for example vibration or noise			
Identify potential ergonomic issues in the operation of the machine. Make sure that the: **• worker does not have to reach excessively** **• worker does not have to use excessive force** **• worker does not have to perform high frequency movements** **• machine cycle is based upon worker capacity, not visa versa** **• worker can perform work in several positions that promote a neutral body position** **• work surface is adjustable** **• worker has sufficient room to move without striking anything**			