Machine Guarding Compliance Game Plan

Working on or near an industrial machine can get a worker killed or maimed. Hazards include:

- **Rotating** machine parts;
- **Reciprocating motions**, that is, sliding parts or up/down motion;
- **Transverse motions** where materials move in a continuous line;
- **Pinch points and shear points**, or areas where a part of the body can get caught between a moving part and a stationary object;
- **Flying materials** that fall from or are ejected by the machine; and
- **Energized parts** that create electrical, fire, or explosion hazards.

For these reasons, failure to properly safeguard workers from machine hazards is a leading cause of OHS penalties. Examples:

- De-barking machine unexpectedly starts up and kills electrician making repairs resulting in **$500,000 fine** against Ontario employer [*Resolute FP Canada Inc*.];
- Saskatchewan oilfield services company fined **$182,000** for not preventing a worker who got trapped in machinery from making contact with a moving machine part [*Shawcor Ltd*.]; and
- BC food manufacturer fined **$138,638** for allowing worker

to bypass the door interlock safeguard of a slicing machine [*Neptune Fresh Produce Inc*.].

Here's a 12-step Game Plan for preventing machine injuries and keeping your company compliant with OHS machine guarding requirements.

Defining Our Terms

This Game Plan focuses on a key aspect of machine safety, namely, the use of devices that physically protect a worker from machine hazards, which the OHS laws call "guards," "safeguards" and "protectors." (We'll refer to these devices collectively as "guards.") The Game Plan also addresses general machine guarding requirements. It doesn't cover specialized guarding requirements for certain types of machines, such as conveyors, grinding wheels, and saws.

Step 1. Establish a Machine Hazard Assessment Routine

The first step is to perform a hazard assessment to identify the hazards posed by particular machines and the guards necessary to control them. Hazard assessments should be performed on each machine in your workplace, not only when it's first installed but also:

- When the machine is moved from one place to another;
- At intervals recommended by the manufacturer or if there are no such recommendations, at least monthly;
- After incidents resulting in injury or property damage and near misses that didn't actually but had the potential to cause such injury or damage;
- When the machine malfunctions; and
- After preventive maintenance or repair and before you place the machine back into service.

Step 2. Look for Machine Hazards in All 3 Zones of Danger

Focus on hazards in the 3 principal zones of danger that may require use of machine guards under OHS regulations:

- The point of operation, or part of the machine where the cutting, shaping, boring, forming, or other operation is done on the material;
- Moving parts in the apparatus that transmit power to the part of the machine doing the work, including flywheels, pulleys, belts, couplings, chains, cranks, connecting rods, and gears; and
- Other moving parts of the machine, such as feed mechanisms and auxiliary parts.

Step 3. Look for Hazardous Machine Motions & Actions

What makes machinery so dangerous to workers are the mechanical motions and actions, like the movement of rotating parts, that can create in-running nip points. It’s crucial to factor the different types of mechanical motions and actions into your hazard assessment, including:

- Motions like rotating, reciprocating, and transversing parts; and
- Actions like cutting, punching, shearing, bending, and stabbing.

Step 4. Assess the Machine Hazards You Identify

The next phase of the assessment is to evaluate and decide what to do to control the machine hazards you identify.

Consider the type of machinery, the manufacturer, where and when it was purchased, the location of the machinery, and preventive maintenance requirements. Also look at how many workers operate the machinery and the current training program for new workers, as well as any machine guards you currently use. Questions to ask:

- What are the hazards associated with the machine?
- What are the guards and how do they work?
- How do you use the guards?
- How and under what circumstances and by whom may guards be removed?
- What should you do if a safeguard is missing, damaged, or ineffective?

Step 5. Select Appropriate Machine Guards

At this point, the strategy shifts from hazard assessment to hazard control. The starting point and first-choice method is use of engineering controls that manage machine hazards physically or mechanically. And that's what machine guards do by blocking workers' access to the danger zone(s). There are 4 basic kinds of machine guards:

- Fixed guards that are a permanent part of the machine;
- Adjustable guards that allow for flexibility in accommodating different sizes of stock;
- Interlocked guards that automatically shut off or stop the machine when the tripping mechanism is activated until the guard is put back in place; and
- Self-adjusting guards in which the size of the opening in the barrier adjusts to accommodate the stock, e.g., enlarges to allow larger stock to enter.

The OHS regulations generally don't specify which guard to use, except in the provisions dealing with specific types of

machinery (for example, sheet metal or screen guards must be installed under or alongside an elevated conveyor that's not entirely enclosed to prevent material from falling onto workers below). However, in 5 jurisdictions (BC, MB, NL, QC, YK), machine guards must comply with some version of CSA Standard Z432, *Safeguarding of Machinery*; in Quebec, machine guards must also meet ISO 12100. The general standards for machine guards:

- They must prevent the worker's body or clothing from coming into contact with hazardous moving parts;
- They must be firmly secured to the machine and not easily removed;
- They must ensure that no objects can fall into moving parts;
- They may not create any new hazards such as shear points, jagged edges, or unfinished surfaces;
- They may not create any interference or prevent workers from performing the job quickly and comfortably;
- They must allow for safe lubrication of the machine without removing the safeguards, if possible; and
- They should allow for maintenance and other operations to be performed without having to remove the guard.

Step 6. Ensure Machine Guards Are Properly Installed

The selection of the appropriate guard can be completely undermined if that guard isn't properly installed. An improperly installed machine guard may actually create an additional hazard. First choice: Affix the guard to the machine. If that's not possible, the guard should be physically secured to the floor or another location near the machine.

Step 7. Ensure All Danger Zones & Machine Parts Are Effectively Guarded

Machine guards must not simply be in place but effective in blocking worker access to the hazard. Point of operation guards must meet any applicable OHS standard for the particular kind of machine and hazard(s) involved. Such guards may be supplemented with, but not replaced by, special hand tools that allow operators to place and remove materials from the machine without sticking their hands in the danger zone. Revolving drums, barrels, and containers should be guarded by an enclosure that’s interlocked with the drive mechanism, so that the barrel, drum, or container can’t revolve unless the guard enclosure is in place. There should also be guards preventing access to:

- Prime movers, including steam, gas, oil, and air engines, motors, steam, hydraulic turbines, and other equipment used as a source of power for the machine;
- Shafting, with each continuous line of shafting secured in position;
- Pulleys, especially when they’re low (7 feet/2.13 meters or less) from the floor;
- Belts, ropes, and chain drives;
- Gears and sprocket wheels.

Step 8. Ensure Machines Have Appropriate Stopping Devices

Another engineering control that can be used to manage machine hazards is a device that automatically stops the machine when or before a worker comes into contact with any moving parts. While stopping devices can be used in addition to guards, in 7 jurisdictions (AB, NB, NS, NT, NU, PEI, and SK) you can use

stopping devices instead of guards. Thus, for example, a conveyor isn't required to have a guard if it's equipped with a sensor that stops the machine if a light beam is broken. There are 3 basic types of stopping devices:

- Presence sensing devices that stop the machine's operating cycle when a light field is broken, such as when a worker sticks a hand or arm in the danger zone;
- Pullback devices that use a series of cables attached to the operator's hands, wrists, and/or arms; and
- Safety controls like tripwire cable, and two-hand control.

It's up to the employer to ensure that workers can't tamper with or easily bypass a machine's stopping device.

Step 9. Implement Alternative Safety Measures If Guards Aren't 'Reasonably Practicable'

Some jurisdictions allow employers to implement alternative safety measures when the option of using machine guards isn't "reasonably practicable:"

- **Manitoba:** Employer must ensure that an alternative mechanism, system, or change in work procedure offering at least equal protection is used if it's not reasonably practicable to provide a safeguard on a machine;
- **Nova Scotia:** Employer must ensure that a push block, push stick, or other protective device is used, and establish a written procedure to ensure the safety of the machine operator if it's not reasonably practicable to use a safeguard on a cutting or shaping machine;
- **Prince Edward Island:** Employer must ensure that an alternative mechanism, system, or change in work procedure, approved by a govt. OHS officer, is used to protect workers if an effective safeguard can't be

provided; and

- **Quebec:** Steps must be taken to manage "residual risks" when it's foreseeable that the effect of installing a means of protection on a machine will render the function for which it was designed "reasonably impractical."

Step 10. Implement Safe Work Procedures for Working on or Near Machines

The alternative safety measures allowed instead of machine guards that aren't reasonably practicable can and should also be used to supplement machine guards that are put in place. Such measures include implementing and training workers on your company's machine guarding policy and safe work procedures for using and working near the machine. At a minimum, such policies and procedures should:

- Describe the hazards posed by the particular machine and/or operation;
- Ban tampering or removing a guard or safety device without proper authorization;
- Ban wearing of loose clothing, long hair, rings, bracelets, necklaces, or other jewelry that can get entangled in the moving parts of a machine;
- Ban workers from riding on a conveyor, unless the conveyor is specifically designed and used to transport people; and
- Specify the PPE and protective equipment that workers must use when operating or working near the machine.

Step 11. Ensure Machine Guards Are

Properly Inspected & Maintained

Inspect machine guards regularly and immediately after incidents or operational changes that may harm their effectiveness. Remove defective guards from service and replace them immediately so that the machine doesn't remain unguarded for longer than necessary.

Step 12. Implement Safety Protocols for Temporary Removal of Machine Guards

If possible, select machine guards that are designed so that you don't have to remove them to perform cleaning, maintenance, and other necessary operations on the machine they're guarding. However, you'll need safety protocols when and if removal is necessary. As a general rule, nobody should perform any servicing work on a machine unless and until it's properly de-energized in accordance with your company's lockout procedures. Unfortunately, lockout may not always be feasible. That makes it imperative to have special procedures for performing work on energized machinery that can't be locked out specifying, amongst other things, who's qualified to perform the work and the authorization and supervision required.