

Machine Safeguards: access denied

Brenda Dietrich's only child Jared died as a result of a workplace incident January 7, 1999. Jared was 19 years old. It was his second day working in a plastics recycling plant. He was working alone on an oven conveyor that strips plastic from foam seating and moves it along a conveyor. Somehow his hand got caught between the edge of the conveyor and a table, pulling him in.

Dietrich questions why Jared was not able to free his hand, why the cut-off switch was located six feet away, why he was working alone the second day on the job and just as important why the machine was not properly guarded. In the end, the company was found guilty of failing to protect a worker from being caught in a pinch point and was fined \$30,000 while the supervisor was charged an individual fine of \$10,000.

Even the most experienced worker can fall victim to this hazard. Joel Murray, 39, was a 14-year employee at an automotive components plant in St. Catharines. Murray was killed while changing tools in a multi-head vertical lathe. Six switches for the perimeter gates around the machine, designed to prevent access to the moving loader, were bent and inoperable. The company pleaded guilty to one charge of failing to maintain an interlocking device in good condition and was fined \$325,000.

These are but two examples of workplace incidences involving unguarded or improperly guarded machines. In each case, workers had access to moving parts of machinery, which resulted in their fatalities. Machine-related injuries are often severe; they include crushed hands and arms, loss of limbs, severed fingers, blindness and death. It is estimated that workers in Canada who operate and maintain machinery suffer approximately 1,800 amputations, lacerations, crushing injuries, and abrasions, and over 80 deaths per year.

Ontario employers have a duty under the *Occupational Health and Safety Act* to inform their workers about and protect them from machine hazards. More specific provisions for machine guarding are found in the Industrial, Mining, Construction, Window Cleaning and Health Care Regulations. Enforcement of these provisions has long been the subject of debate.

Recently, the Ministry of Labour (MOL) drafted internal guideline notes to assist their inspectors in the interpretation of these machine-guarding regulations. These guidelines currently under review, propose among other things, use of "awareness means" such as yellow tape, signs saying, "stay away", or a painted line on the floor as viable methods of protecting workers from harm. Workers and their representatives believe the only way to adequately protect workers is to prevent access to moving parts, thereby eliminating or reducing risk of injury.

What are machine hazards?

Machines are potentially hazardous for a number of reasons. They almost always include moving parts that may accidentally come into contact with a worker's body and they incorporate other hazards such as hydraulic and pneumatic systems, electrical circuits, hot exhausts or surfaces and toxic chemicals. Objects flying off machines such as pieces of process material or waste are equally dangerous because they can strike a worker unexpectedly causing serious harm. Finally, workers should watch for broken parts of machinery.

When enforcing the law, the MOL references the Canadian Standards Association (CSA). According to the CSA, mechanical hazards are "physical factors, which cause injury because of the mechanical action of a machine, machine parts, tools, workplaces, loads, or of projected solid or fluid materials." These include the following: entanglement, friction or abrasion, cutting or severing, shearing, stabbing or puncturing, impact, crushing, drawing-in or trapping, and pressurized liquids or gases injection or ejection.

Mechanical hazards occur in three areas:

- 1. The point of operation** – where work is performed on the material. It includes such actions as cutting, shaping, boring, and drilling. At this point machine parts are often sharp, may be moving very quickly and may operate under great force.
- 2. Power transmission parts** – all components of the mechanical system that transmit energy to the part of the machine performing the work. These components include flywheels, pulleys, belts, connecting rods, couplings, cams, spindles, chains, cranks, and gears.

- 3. Other moving parts** – all parts of the machine that move while the machine is working. These include reciprocating, rotating, and transverse moving parts, feed mechanisms and auxiliary parts of the machine.

How are machine hazards controlled?

Engineering controls that eliminate the hazards at the source (i.e. at the design stage) offer the best and most reliable means of protection. When it is not possible to design a safe machine or enclose dangerous moving parts, the machine must be equipped with some type of safeguard or safeguarding device to protect the user and other workers close by.

Machine safeguarding refers to requirements, equipment and methods designed to prevent workers from coming into direct contact with moving parts. A machine safeguard designed for a specific type of operation will offer the best protection for workers. Knowing how a safeguard protects workers is just as important as having the machine guard itself in place.

There are many ways to safeguard machines. The type of operation, the size or shape of stock, the method of handling, the physical layout of the work area, the type of material and production requirements or limitations, help to determine the appropriate safeguarding method for each machine. Safeguards can be grouped into five general classifications: guards; devices (presence sensing, pullback, restraint, safety controls, gates); location/distance; feeding/ejection methods (automatic feed/ejection, semiautomatic feed/ejection and robot); miscellaneous aids (awareness barriers, protective shields, hand-feeding tools and holding fixtures).

Machine guards

Machine guards are barriers made from various materials (usually metal) that prevent worker access to danger areas. Guard framework is usually made from structural shapes, pipe, or rod stock. There are four types of guards: fixed, interlocked, adjustable, and self-adjusting.

In order to be effective a machine guard should do the following:

- **Prevent contact** – The guard must prevent any part of a worker's body or clothing from making contact with dangerous moving parts.



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- **Be securely attached** – All guards must be securely affixed to the machine to prevent tampering or removal.
- **Create no new hazards** – The guard itself must not create an additional hazard such as jagged edge or shear point.
- **Protect against falling objects** – Safeguard should ensure objects do not fall into moving parts. A small tool dropped into a cycling machine could become a projectile that could strike and injure a worker.
- **Create no interference** – Guards must not impede workers in the performance of their jobs. A machine guard provides safety and enhances efficiency.

Preventive maintenance

Another way to control machine hazards is with maintenance. This includes systematic cleaning, lubrication and alignment, as well as periodic replacement of critical parts. Preventive maintenance procedures should also include inspection of machine guards.

Ideal machine design permits routine lubrication and adjustment without the removal of guards. However, if guards are removed there must be detailed written procedures in place and they must be followed at all times. Safe work procedures include lockout procedures to eliminate all sources of energy while the maintenance work proceeds.

Like maintenance work, repair work can be hazardous because it is often done with guards and other safety devices temporarily removed or disabled. As with maintenance procedures, lockout is essential. And a repaired machine should never be put back into service unless all of its guards and safety devices are in good working order.

Training

Even the most elaborate safeguarding system is not effective unless workers know how to use it and why. While it is the employer's duty to train workers, the joint health and safety committee has an important role in ensuring all workers are properly trained. Training should be developed in consultation with the committee and should include the following:

- Description of hazards of particular machines.
- Previous incidents experienced on particular machines.
- How and why guards should be used.
- Under what circumstances, and by whom, machine guards can be removed.
- What to do if a guard is missing, damaged, or unable to provide adequate protection, and
- The need for good housekeeping.

The same training should be provided for new machine operators and maintenance or setup workers, when any new or altered safeguards are implemented, or when operators are assigned to a new machine or operation. The CSA also suggests that workers/supervisors should take advantage of any training courses offered on the operation and maintenance of the machinery by the manufacturer.

Protective clothing

If engineering controls are not possible and a machine can't be fully enclosed, extra protection is necessary. In addition to a safeguard, workers should wear appropriate protective clothing. This includes hard hats, caps, hairnets, face shields, safety goggles, coveralls, jackets, vests, body suits, and safety boots.

What is the law?

According to Section 25, 2(h) of the *Occupational Health and Safety Act* the employer must take every precaution reasonable in the circumstances for the protection of a worker. This includes providing proper machine safeguards, safe work procedures and adequate health and safety training.

Workers, through the JHSC, have the right to participate in the development of machine safeguard procedures and workplace training programs. Also, the committee has the right to conduct periodic inspections of machine guards. If the employer fails to meet their responsibilities when it comes to machine safety (i.e. failing to prevent worker access to moving parts), workers have the right to refuse unsafe work.

Regulation for Industrial Establishments

Section 24 of the Industrial Regulations made under the *Act*, states: "Where a machine or prime mover or transmission equipment has an exposed moving part that may endanger the safety of any worker, the machine or prime mover or transmission equipment shall be equipped with and guarded by a guard or other device that prevents access to the pinch point."

Section 25 requires: "An in-running nip hazard or any part of a machine, device or thing that may endanger the safety of any worker shall be equipped with and guarded by a guard or other device that prevents access to the pinch point." Also, Section 26 states, "A machine shall be shielded or guarded so that the product, material being processed or waste stock will not endanger the safety of any worker."

Guidelines

Recently, the MOL published the *Guideline for Pre-start Health and Safety Review*. The purpose of this guideline was to clarify the intent and requirements of Section 7 of the *Regulation for Industrial Establishments*, which was amended in October of 2000.

Section 7 of the *Industrial Regulation* requires the employer (under certain conditions) to develop a written review on the construction, addition or installation of any new apparatus, structure, protective element or process or the modification of an existing one. The review must be conducted by a professional engineer, or now in one set of instances by a "knowledgeable person", who will detail the measures (steps, actions or engineering controls) necessary to bring the construction, addition, installation or modification into compliance with the provisions of the *Industrial Regulation*.

The employer must address any measures necessary to bring the new or modified apparatus into compliance before production begins. The review is to be kept on file and a copy given to the JHSC or health and safety representative. Prior to 2000 amendments, the employer would have been required to send the review to qualified staff at the MOL. However, the burden has now been placed on the worker members of the JHSC who often possess far less expertise in this area than the former qualified MOL staff.

Standards

As mentioned above, the MOL references the Canadian Standards Association's CAN/CSA-Z432, Safeguarding of Machinery standard first published in 1994, (soon to be replaced by CSA Standard Z432-03, Safeguarding of Machinery, Occupational Health and Safety).

This Standard specifies legal requirements for the design, manufacture (including re-manufacture and rebuilding), installation, maintenance, operation, and safeguarding of industrial equipment to prevent injuries and accidents and enhance the safety of personnel who operate, setup and maintain machinery.

NOTE: The Workers Health & Safety Centre has a three-hour hazard specific module on Machine Guarding and a module and Resource Line on Lockout.



RESOURCE LINES

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