Machinery & Equipment: How to Choose an Appropriate Guard

If machinery and equipment in your workplace has pinchpoints, energized parts and other hazards that could endanger workers using or working near that machinery, the OHS laws require you to install guards to prevent workers from these hazards. But keep in mind that the OHS laws don't just require guards—they require "adequate" or "effective" guards. So it's crucial that you select the appropriate guard for each piece of equipment. Choosing the wrong guard can not only fail to protect workers from the machine's hazards but also create additional hazards. We'll tell you how to ensure that you choose an appropriate guard that complies with the OHS laws. There's also a chart that tells you the design requirements for machine guards in each part of Canada.

Defining Our Terms

The OHS laws use the terms "guard," "safeguard" and "protector" to describe a device that physically protects a worker from machine hazards. We'll use the term "guard" throughout this article to refer to such devices. In addition, this article addresses general machine guarding requirements only. It doesn't cover specialized guarding requirements for certain types of equipment, such as abrasive wheels, grinders and saws.

CHOOSING AN APPROPRIATE GUARD

Every jurisdiction's OHS regulations contain machine guarding requirements. In general, they all require the use of engineering controls—including guards—that form a physical barrier to keep workers who work with or near the machine from coming into contact with points of danger. And the OHS regulations typically include design requirements for those guards. (See the chart below for the design requirements for machine guards in each jurisdiction.)

If you're at the point of choosing an appropriate guard for a piece of machinery, then you should've already done a risk assessment of the machinery in question and determined that a guard was required.

To ensure that your company complies with the design requirements when choosing a machine guard, you should consider the following questions:

Does the Guard Protect Workers from the Machine Hazard'

The OHS laws require machine guards to be adequate, effective and capable of performing their intended function. In other words, a guard must actually protect workers from the hazard from which it's intended to shield them. Otherwise, workers could get hurt—and your company could get hit with an OHS violation.

Example: After a printing press jammed, workers shut it down and engaged a safe button to prevent it from restarting as they looked for the jam. A summer student found a jam in the rear of the press and started to remove it, out of sight of the other workers who'd found another jam in the front of the press. When the workers restarted the press, the young

worker's hand was drawn between two rollers and injured. The Ontario MOL found that the area of the press where the incident occurred was protected by a guard but it was inadequate to prevent the worker's hand from being drawn into the rollers. The company pleaded guilty to a guarding violation and was fined $60,000 [*American Color Graphics Inc.*, Govt. News Release, June 11, 2012].

So make sure the guard you select protects workers from coming into contact with the following types of machine hazards:

- Moving parts, such as belts, rollers and chains;
- Electrically charged parts;
- Pinchpoints;
- Points of machinery at which material is cut, shaped, bored or formed;
- Surfaces with temperatures that may cause skin to freeze, burn or blister;
- Open flames;
- Energized electrical cables or components;
- Power transmission parts;
- Debris, material or objects ejected from the machinery;
- Items falling into the machinery;
- Material being fed into or removed from process machinery; or
- Any other hazard posed by the machinery.

Does the Guard Comply with Applicable Standards'

Some OHS laws require machine guards to comply with voluntary safety standards, such as those issued by the Canadian Standards Association (CSA). For example, in BC, MB, NL and YT, the application, design, construction, installation, maintenance and/or use of guards must comply with CSA Standard *Z432, Safeguarding of Machinery*. NT and NU require guards to comply with the current CSA standard, current ANSI standard or

another standard accepted by the territory's Chief Safety Officer.

Even if your jurisdiction's OHS laws don't specifically require guards to comply with the CSA standard, it's a good idea to comply with it anyway or at least consult it. A court may considered the standard's requirements to reflect best practices and so expect you to comply with them to show due diligence.

Among other things, CSA Z432 contains general design requirements, some of which mirror similar requirements in the OHS laws. For example, it says that machine guards should generally be designed and constructed with the goal of preventing any part of the body from reaching a danger point or area, taking into account the physical characteristics of the workers involved and their abilities to reach through openings and over or around barriers or guards. In addition, guards should:

- Be of robust construction;
- Not create additional hazards;
- Not be easy to by-pass or make non-operational;
- Be located an adequate distance from the machine hazard;
- Cause minimal obstruction of the view of the machine's operation; and
- Enable essential work, such as maintenance, to be carried out without the guard having to be removed.

In addition, the standard includes detailed design requirements for specific types of guards, such as barrier guards, fixed guards, movable guards, interlocking safeguarding devices, light curtains and safety mat systems.

Does the Guard Create New Hazards'

Remember—the purpose of a guard is to protect workers from machine hazards. So the guard itself shouldn't endanger

workers or create new hazards. For example, Québec's OHS regulation says that guards (which it calls "protectors" and "protective devices") shouldn't:

- Cause additional risks for workers; or
- Be themselves a source of danger, such as due to the presence of cutting edges, irregularities or burrs [Sec. 187].

So ensure that the selected guard doesn't create hazards for workers, either due to the physical characteristics of the guard itself or how it impacts use of the machine. For example, a guard that protects a worker from a pinchpoint could also force the worker to work in an awkward position, thus exposing him to the risk of developing a musculoskeletal injury. In that case, try to find an alternate guard.

Does the Guard Interfere with Use of the Machine'

Ideally, an appropriate guard adequately protects workers from machine hazards without interfering with the way they do their work. That is, guards shouldn't make it harder for workers to use the machine. Workers should still be able to do their work quickly and comfortably on a properly guarded machine. So consider any ways in which a guard may impact the work being done on the machine for which it's intended. There may be no way to safely guard a machine without interfering to some extent with the machine's use. But try to select an appropriate guard that minimizes such interference.

Can the Guard Be Easily Removed'

Choosing a guard that doesn't interfere with workers' jobs is especially important because workers may remove guards they believe are slowing them down or making their work hard to do. And the result of removing a guard can be an injury or worse.

Example: At an Ontario glass manufacturer's plant, a worker was unloading glass sheets from a mechanized conveyor when he stumbled and reached out to keep from falling. His hand contacted a mechanized roller and was pulled around it. As a result, he lost a finger and tendon. The MOL found that the manufacturer had installed a guardrail in front of the conveyor. But workers had removed it to make their job easier. So at the time of the incident, there were no protective devices to prevent workers from accessing the rollers. The manufacturer pleaded guilty to a guarding violation and was fined $50,000 [*Southwest Glass Products Inc.*, Govt. News Release, March 22, 2012].

So the OHS laws often specifically say that, when practicable, guards should be designed so that they can't be removed or can only be removed with tools. Thus, when choosing a guard, try to select one that's difficult, if not impossible, to remove.

Can Maintenance Be Done Without Removal of the Guard'

Some jurisdictions, including AB, BC, NL and YT, say that, when practicable, guards should be designed so that workers can lubricate the machinery or perform routine maintenance on it without having to remove guard. The idea is that once a guard is in place, it's best that it stays in place. If a worker has to remove a guard every time he oils the equipment, there's always a chance he'll forget to replace it when he's done, thus exposing himself and his co-workers to the risk of injury. So if possible, choose a guard that permits repairs, lubrication and other routine maintenance tasks to be done while the guard is in place.

BOTTOM LINE

Machine guarding violations are all too common. And unfortunately, such violations can lead to serious injuries and even fatalities. These violations and the resulting safety incidents can almost always be prevented if machines have the proper guards. As your company's safety coordinator, you should be familiar with the design requirements for machine guards in your jurisdiction and ensure that your company chooses guards that comply with these requirements.

KNOW THE LAWS OF YOUR PROVINCE **Design requirements for machine guards under the OHS laws**		
		LAW
FED	1) Machine guards must: a) prevent a worker or any part of his body from coming into contact with exposed moving, rotating, electrically charged or hot parts or material that constitutes a hazard; b) prevent access by a worker to the area of exposure to the hazard during the operation of the machine; or c) make the machine inoperative if a worker or any part of his clothing is in or near a part of the machine that's likely to cause injury [Sec. 13.13(1)]. 2) To the extent that it's reasonably practicable, a machine guard must not be removable [Sec. 13.13(2)].	*Canada OHS Regs.*

AB	*OHS Code 2009* doesn't include design requirements for safeguards. But the Explanation Guide to Part 22 does say that all safeguards should do the following: 1) prevent a worker's hands, arms and any other part of the body from making contact with dangerous moving parts; 2) be secure—workers shouldn't be able to easily remove or tamper with the safeguard; 3) protect moving parts from the entry of falling objects, such as tools and materials; 4) create no new hazards of their own, such as a shear point, jagged edge or unfinished surface that can cause a cut; 5) create no interference—that is, they shouldn't prevent workers from doing their work quickly and comfortably; and 6) permit safe lubrication of the machine without having to remove the safeguards.	

BC	1) Unless provided for elsewhere in the Regulation, safeguards must: a) protect a worker from contact with hazardous power transmission parts; b) ensure that a worker can't access a hazardous point of operation; and c) safely contain any material ejected by the work process that could be hazardous to a worker [Sec. 12.2]. 2) 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* [Sec. 12.3] 3) A safeguard must be capable of effectively performing its intended function [Sec. 12.4]. 4) A safeguard must be designed, where practicable, to allow lubrication and routine maintenance without its removal [Sec. 12.6].	*OHS Reg.*

MB	1) Safeguards must prevent a worker from coming into contact with the following hazards: a) moving parts on the machine; b) points of the machine at which material is cut, shaped or bored; c) surfaces with temperatures that may cause skin to freeze, burn or blister; d) energized components; e) debris, material or objects thrown from a machine; f) material being fed into or removed from the machine; and g) any other hazard that may pose a risk to the safety or health of the worker [Sec. 16.5(1)].2) An employer must ensure that any required safeguard is designed, constructed, installed, used and maintained in accordance with CSA Standard *Z432-04, Safeguarding of Machinery* [Sec. 16.5(2)].	*Workplace Health and Safety Reg.*
NB	1) Safeguards must prevent a worker from coming into contact with moving drive or idler belts, rollers, gears, driveshafts, keyways, pulleys, sprockets, chains, ropes, spindles, drums, counterweights, flywheels, couplings, pinchpoints, cutting edges or other moving parts on a machine that may be hazardous [Sec. 242(1)]. 2) If it's possible that the failure of a machine may result in an injury to a worker from a flying object, the employer must install a safeguard strong enough to contain or deflect any flying object [Sec. 242(3)].	*OHS Regs.*

NL	1) Except as otherwise provided, safeguards must: a) protect a worker from contact with hazardous power transmission parts; b) ensure that a worker can't access a hazardous point of operation; and c) safely contain material ejected by the work process that could be hazardous [Sec. 89]. 2) 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, Safeguarding of Machinery* [Sec. 90(1)]. 3) A safeguard must be capable of effectively performing its intended function [Sec. 90(2)]. 4) A guard must be designed, where practicable, to allow lubrication and routine maintenance without its removal [Sec. 91(2)].	*OHS Regs. 2012*

NT/ NU	1) Guards must prevent workers from contacting moving parts and from entering a danger area during operation [Sec. 97].2) A guard must be designed, constructed, installed and maintained so it's capable of effectively performing the functions for which it's intended [Sec. 98(1)].3) The application of guards and associated devices must be in accordance with the current standards of: a) the Canadian Standards Association; b) the American National Standards Institute; or c) other standards accepted by the Chief Safety Officer [Sec. 98(2)].	*General Safety Regs.*
NS	Safeguards must: 1) prevent a person from coming in contact with a moving part of a machine or tool that may present a hazard [Sec. 87(2)]; or 2) protect a person from being injured by a flying object from a machine [Sec. 87(6)].	*Occupational Safety General Regs.*
ON	1) Guards must prevent access to an exposed moving part of a machine, prime mover or transmission equipment that may endanger the safety of any worker [Sec. 24]. 2) Guards must prevent access to a pinch point created by an in-running nip hazard or any part of a machine, device or thing that may endanger the safety of any worker [Sec. 25].	*Industrial Establishments Reg.*

PE	1) Safeguards must be effective [Sec. 30.9(1)]. 2) Where it's possible that a machine failure may result in an injury to a worker from flying objects, the employer must install safeguards strong enough to contain or deflect the broken parts or particles of the machinery and flying particles of any product [Sec. 30.9(3)].	*OHS General Regs.*
QC	1) The regulation includes specific design requirements for: a) interlocking protectors [Sec. 175]; b) interlocked protectors [Sec. 176]; and c) two-hand controls [Sec. 180].2) A protector or a protective device must not: 1) cause additional risks for workers; or 2) be in itself a source of danger, for instance due to the presence of cutting edges, irregularities or burrs [Sec. 187].	*Regulation respecting Occupational Health and Safety*
SK	1) Safeguards must be effective [Sec. 137(1)]. 2) Where there's a possibility of machine failure and injury to a worker resulting from the failure, an employer or contractor must install safeguards that are strong enough to withstand the impact of debris from the machine failure and to contain any debris resulting from the failure [Sec. 137(5)].	*OHS Regs.*

YT	1) Safeguards must be proper and adequate and: a) protect a worker from contact with hazardous power transmission parts; b) ensure that a worker can't access a hazardous point of operation; c) safely contain any material ejected by the work process, which could be hazardous to a worker; and d) meet all the requirements of CSA Standard *Z432, Safeguarding of Machinery* or other similar standard acceptable to the director [Sec. 7.02].2) A safeguard must: a) be capable of performing its intended function; and b) be designed, where practicable, to allow lubrication and routine maintenance without its removal [Sec. 7.03(a) and (b)].	*OHS Regs.*