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PRÉVENTEX

DANGER LIES CLOSE AT HAND

Protect yourself from machines

We all know that the list of injuries caused by machines is far too long. Yet, some people think that accidents “only happen to others”. But danger does not choose its victims.

Without protection, no one is safe from the risk of injury. It is crucial to isolate any process, part or function of any machine that may present a source of hazard for workers.

You have probably figured out what our topic is by now. More specifically, this information bulletin will cover the following issues:

- ◆ The sources of mechanical hazards
- ◆ Safeguarding requirements
- ◆ Safety measures for machines
- ◆ Worker training
- ◆ Planned inspections as methods of control

Knowing how to identify hazards related to machines is the first step towards a safe working environment.

WHERE ARE MECHANICAL HAZARDS LOCATED ?

At the point of operation

The place where work is performed (machine, etc.) is the primary source of hazard. Operations such as cutting or forming, for example, can threaten your safety.

In power transmission systems

Beware of components of the mechanical system that supply power to the machine parts performing the work. They may cause serious injury.

Other moving machine parts

Make sure that moving machine parts, its power feeding mechanisms and auxiliary parts are well safeguarded.

In power sources

Pay attention to sources of power such as electrical or high-pressure systems. They are sources of hazard.

In mechanical functions and motions

Learn how to spot hazardous mechanical functions and motions. Beware of **rotating** motions: your clothing, your hand or your whole arm can get caught. Beware of **reciprocating** motions (back-and-forth, up-and-down) and **transversing** motions (in a straight, continuous line). You can get hit or jammed by a moving part.

Be careful as well during operations involving cutting, punching, clipping and bending. Inserting stock, maintaining it in place or withdrawing it from the work area can be hazardous. There is danger of injuries to fingers, arms, head, eyes or face.

Legal reference

“Moving parts of motors and transmission devices as well as all hazardous machine parts they serve to activate must be built and located so as to prevent contact with any person or object.”
(Our translation of S-2.1, r.9, Section VI, Section 6.1.2)

GUARDS TO PROTECT YOU

The basic rule is simple enough: any machine process, part or function which may cause injury must be safeguarded. When the operation of a machine or accidental contact with it can injure

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Where are mechanical hazards located?

Guards to protect you

What are the requirements for effective safeguarding?

What types of guards should be used?

Do not forget locking out and tagging out

How should protection devices be used?

Inspect and control



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the operator or other people in the vicinity, the hazard must be either controlled or eliminated.

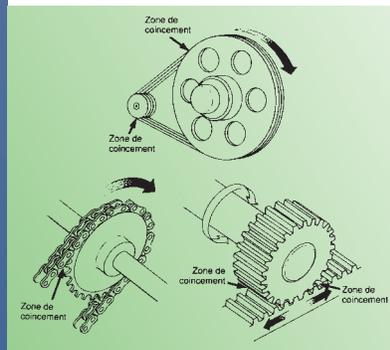
To respect that rule, install safety devices such as guards, gates, presence sensing emergency cut-off devices, two-handed controls and trips.

Legal reference

“The establishment supervisor must ensure that machines, machine components and tools are equipped with all appropriate protection devices.”
(Our translation of S-2.1, r.9, Section VI, Section 6.1.3)

WHAT ARE THE REQUIREMENTS FOR EFFECTIVE SAFEGUARDING?

Prevent contact



Proper machine safeguarding eliminates all possibilities for operators and other workers to come into contact with dangerous moving parts.

Secure at all times

Guards should be secure at all times; it should be impossible to remove it or alter it easily since this would make it ineffective.

Protect from falling objects

It should be impossible for objects to fall into moving parts. Otherwise the guard becomes a source of hazard.

Create no new hazards

Guards are designed to eliminate sources of hazard. They should not create additional sources of hazards.

Not interfere with productivity

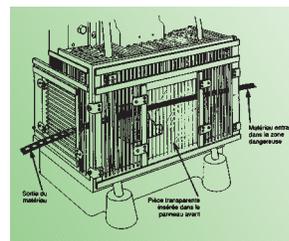
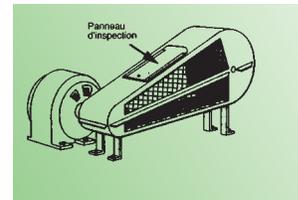
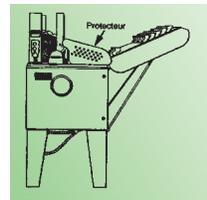
A well-designed protection device does not interfere with work, make it uncomfortable or less productive. On the contrary, it should improve productivity by eliminating accidents.

WHAT TYPES OF GUARDS SHOULD BE USED?

There are five types of guards. As a general rule, power transmission apparatus is best protected by fixed guards that enclose the danger area.

At the point of operation, where moving machine parts perform work on stock, many types of guards can be used. Here are the three main ones.

Guards



Fixed guards are a permanent part of the machine. They are generally constructed of sheet metal, plastic, screens or bars.

They are made of material substantial enough to withstand shocks.

Interlocked guards, as their name implies, can be opened. When an interlocked guard is removed, the tripping mechanism and/or power automatically disengages or shuts off and the machine cannot be operated or started until the guard is back in place.

Adjustable guards should be used if various sizes of stock need to be accommodated.

Finally, there are **automatic guards**. As the operator moves the stock into the danger area, the guard is pushed away, providing an opening which is only large enough to admit the stock. Once the stock is removed, the guard returns to the rest position.

Safety devices

There are many **safety devices** available.

Photoelectric presence sensing devices use a system of light sources and controls which can interrupt the machine's operating cycle. If the light field is broken, the machine stops and will not cycle. This type of device must only be used on machines which can be stopped before the worker can reach the danger area.

Radio frequency presence sensing devices use a radio beam that is part of the machine circuit. When the field is broken, the machine will stop or will not activate.

References

Dispositifs de protection sur les machines, CSST, 1993

Lupin, H. Marsot, J.: Sécurité des machines et des équipements de travail; INRS, Paris, 1988

Machine Guarding, Coastal Video Communications Corp., 1994

Safety Devices; Préventex Information Bulletin, Volume 14, Number 1, Spring 1997

Lock Out / Tag Out; Préventex Information Bulletin. Volume 16, Number 1

Amélioration de la sécurité des machines dangereuses par le bon usage des dispositifs de protection; IRSST

Electromechanical sensing devices have a probe or contact bar which descends to a predetermined distance when the operator initiates the machine cycle. If there is an obstruction preventing it from descending its full predetermined distance, the control circuit does not activate the machine cycle.

Safety trip controls provide a quick means for deactivating the machine in an emergency situation. These are often pressure-sensitive body bars.

Two-handed controls require constant, concurrent pressure by the operator to activate the machine. Similarly, **two-handed trips** require concurrent application of both of the operator's control buttons to activate the machine cycle.

Gates are moveable barriers which protect the operator at the point of operation before the machine cycle can be started.

Other aids

Finally, miscellaneous aids can be used jointly with the protection devices listed above. These include awareness barriers, shields to protect operators from flying chips, and other means. Even if they do not give workers complete protection against hazards they can provide an added safety margin.

DO NOT FORGET LOCKING OUT AND TAGGING OUT

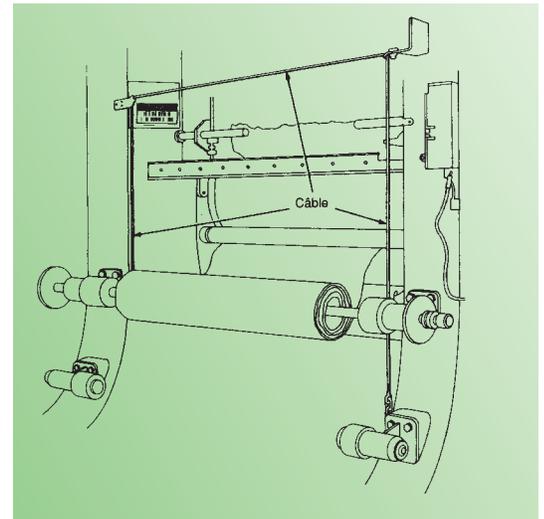
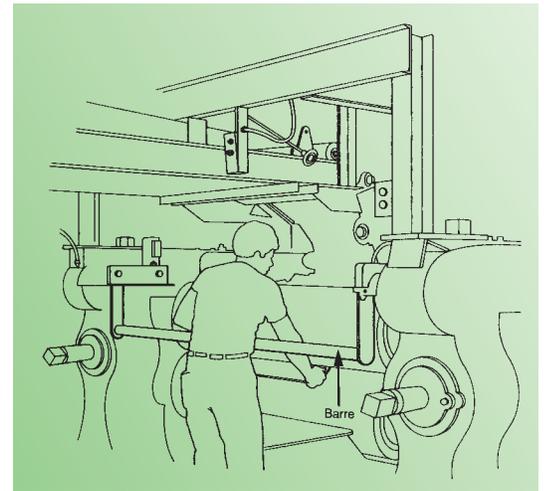
We addressed the issue of lock out/tag out in the Préventex Information Bulletin 16, Number 1. The procedure should be followed every time maintenance or repair work is performed on machines or equipment.

HOW SHOULD PROTECTION DEVICES BE USED?

The question may seem simple, but if workers do not know why they are using protection systems or how to use them, they will not be protected adequately. **Detailed and specific training** is a crucial element of any effort to protect workers against hazards related to machines.

Operators should know the hazards associated with each machine and learn how to identify them.

Workers should be shown how safety devices protect them against specific hazards. Then they should be shown how to use safety devices and why.



All possible situations should be addressed. For instance, how and in what circumstances can guards be removed? Who should remove them? What should be done if guards are damaged, missing or inadequate?

A complete and detailed training program will cover all this information. Do not forget to give this training to any new operator and to maintenance and set-up personnel. If new guards are installed or if existing ones are altered, provide training to the people concerned. If workers are assigned to new machines or new operations, give appropriate training on the related hazards, on guards and on ways to use them.

Check list

INSPECT AND CONTROL

Safety devices and guards sometimes get damaged. Don't wait until an accident happens. Inspect them regularly, using the following grid.

Requirements for guards

1. Do guards meet the requirements of provincial legislation?
2. Do they prevent hands, arms and other body parts from coming into contact with dangerous moving parts?
3. Are guards securely fastened and hard to remove?
4. Do they prevent objects from falling in moving parts?
5. Do they ensure safe operation of the machine?
6. Can the machine be lubricated without removing the guard?
7. Is there a shut-off mechanism before guards are removed?
8. Can the guards be improved?

Point of operation

1. Is the machine safeguarded at the point of operation?
2. Does the guard prevent the operator's hands, fingers and body from entering the danger area?
3. Are the guards damaged or removed?
4. Can you suggest more effective guards?
5. Can you completely eliminate hazards from the point of operation?

Transmission devices

1. Are all gears, pinions, pulleys or flywheels on the transmission devices safeguarded?
2. Are transmission belts or chains exposed?
3. Are there any exposed clamping screws, cotter pin slots, flanges, etc.?
4. Are operating and shut-off controls within the operator's reach?
5. On machines used by more than one operator, are there distinct controls?

Other moving machine parts

1. Are all dangerous moving machine parts safeguarded, including auxiliary parts?

Non-mechanical hazards

1. Are workers protected from hazards related to noise exposure?
2. Are workers protected from exposure to toxic products used to operate the machine?

Electrical hazards

1. Does the machine set-up meet provincial and federal standards?
2. Are connections secure?
3. Is the machine adequately grounded?
4. Is the source of electrical power correctly safeguarded and equipped with fuses?
5. Do workers get electric shocks when operating some machines?

Training

1. Have operators and maintenance personnel received training on guards and their use?
2. Were they trained on the location of guards, the protection they give and from what hazards?
3. Have workers been trained on the way to remove guards and the circumstances under which they should be removed?
4. Have they received training on the procedure to follow when guards are damaged, removed or inadequate?

Individual protective equipment, appropriate clothing

1. Is protective equipment required?
2. If so, is it appropriate for the work involved, in good condition, clean and sanitary, carefully stored?
3. Are operators dressed correctly and wearing no loose clothing or jewellery?

Repair and maintenance

1. Has the maintenance personnel received up-to-date information on the machines they are responsible for?
2. Do they lock out machines by cutting off power before they start repair work?
3. Are multiple lock out devices used when several people are working on the same machine?
4. Does the maintenance personnel use appropriate and safe equipment to carry out their work?
5. Is the maintenance equipment adequately safeguarded?