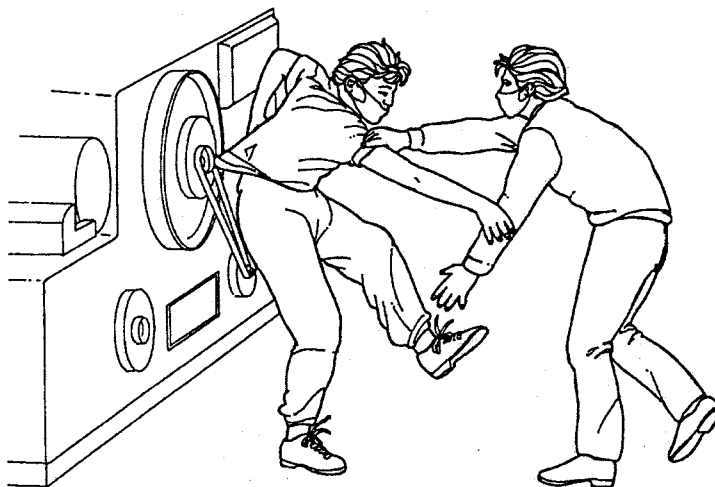


# Machine injuries

## 9



Sharp, hot, or moving machine parts and materials are always dangerous. Many factory workers have been burned or lost fingers, hands, arms, legs, or eyes because they were not properly protected from the danger areas of a machine. Machine injuries can cause permanent disabilities and sometimes death. Broken machines can also harm workers by leaking dangerous chemicals, hot steam, or liquids that can make floors slippery or burn workers.

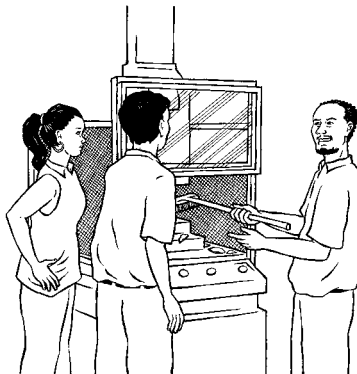
Most machine injuries can be prevented by installing and using proper machine guards, by training workers to use machines safely, and by keeping machines in good condition. Too many workers are injured because bosses disconnect guards and other safety features to speed up production, push people to work faster, and do not maintain or repair machines.

To prevent machine injuries:

- Give workers plenty of time and training to learn how to operate, adjust, and maintain their machines.
- Design machines and job tasks so a worker never has to put any part of her body near the dangerous parts of a machine.
- Provide workers with the necessary protective equipment that fits them well.
- Give workers the power to shut down a dangerous machine before it causes an injury.

## Working safely with machines

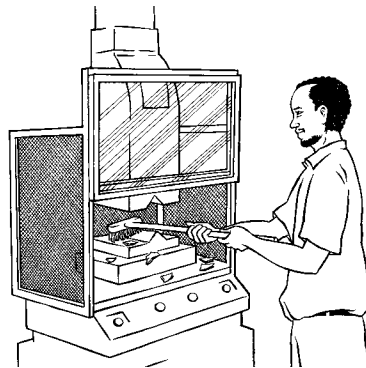
Each worker should be trained to safely use every machine she operates. Because operating a machine often includes tasks such as maintenance, cleaning, and making adjustments to the machine, be sure you are trained to do this safely as well.



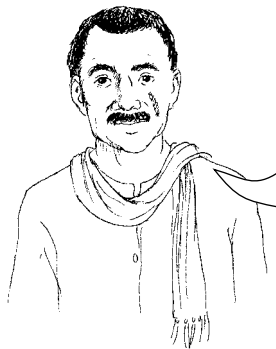
**An experienced worker can train new workers to use machines safely.**

### Clearing jams and debris

If you must clear a jam or remove debris from inside a machine, be very careful. Use methods that prevent injuries. For example, use tools and avoid putting your hands or body in a dangerous area. If you do not have the right tool, or if you cannot clear the machine with the tool you have, be sure to disconnect and lock out the machine before you get near a dangerous area. If you are not trained to lock out and tag out the machine, do not try to clear the jam or debris yourself. Get help from a worker who is trained to safely repair the machine.



**Use a tool, not your hands, to clear a machine.**



*Experienced workers know machine dangers better than anyone else. They can show the boss and other workers the dangerous areas of a machine that need guards or other protections.*

## Protect workers from machine injuries

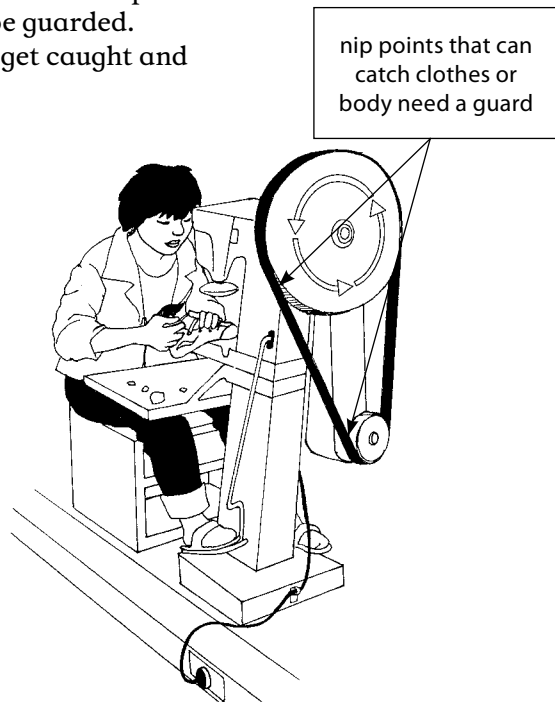
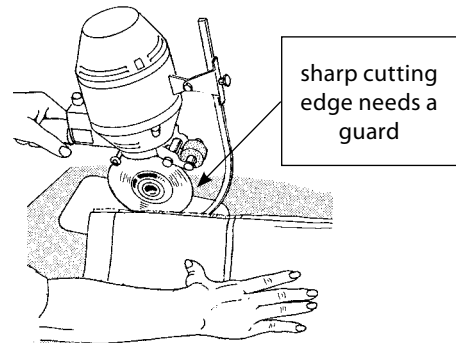
Machine guards prevent a worker's body or clothing from getting caught or cut by moving parts, from getting burned by hot surfaces or materials, and from being injured by materials or parts that can break off or fly out of a machine.

Guard the dangerous areas of a machine:

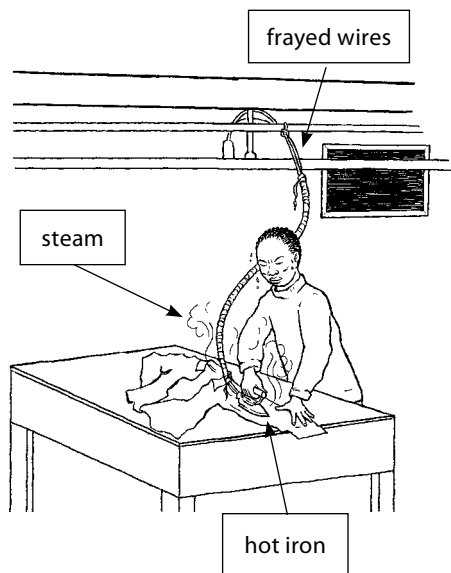
- **where the work happens.** Guard where the machine does the work, such as the cutting edge of a saw or knife, the molds of an injection molding machine, or the needle of a sewing machine. If you have to put your hands inside the machine's working area, it should also have a mechanism to prevent it from operating while your hand is there, such as an automatic shutoff (see pages 193 to 199).
- **where the power is transferred.** Belts, chains, flywheels, pulleys, connecting rods, cams, spindles, gears, cranks, and any other parts that transfer power from one part of the machine to another need to be guarded. Workers' hair, clothes, or body can get caught and be crushed by these moving parts.

The danger areas to be guarded are the nip points or pinch points where 2 moving parts meet. For example, the point where a drive belt meets a pulley, where 2 gears mesh, or where 2 rollers come together.

You can help prevent injuries by not wearing loose clothes, scarves, veils, or jewelry such as rings, bracelets, long chains, necklaces, or earrings that can get caught in the moving parts of a machine. Keep long hair covered or gathered so it does not get caught in the machine.



- **where debris is thrown into the air** from grinding and cutting equipment, including powered saws, grinding wheels, sanding belts, and riveters.
- **where parts can break or shatter.** Sewing machine needles or a grinding wheel can break and cause eye injuries and deep, even deadly wounds.
- **where machines and materials get hot.** Parts and materials that can burn a worker's skin or clothes, such as steam presses, curing ovens, injection molding machines, and soldering equipment need guards. So do processes that use hot materials, such as molten plastic, metals, dyes, or acids that can leak or spray from equipment.



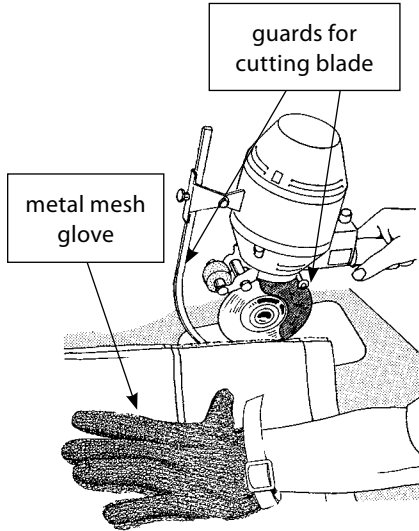
**How would you change this workstation to protect the worker from injury?**

There are many different kinds of guards and no one kind of guard is best for all machines and all tasks. Workers must be protected during regular production, during setup for a new product run, when re-tooling or making adjustments to machines during use, and when clearing parts that get jammed.

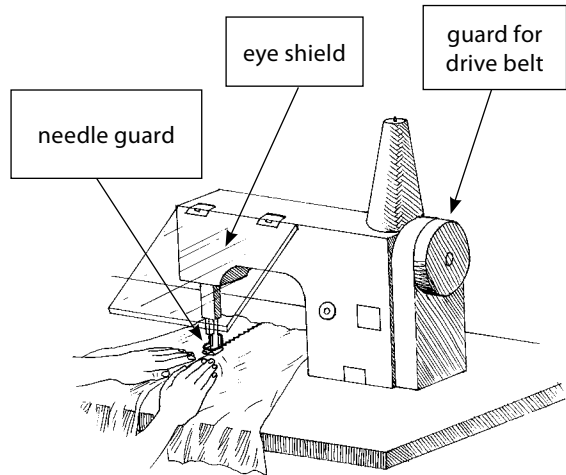
All machine guards should be inspected and tested regularly to be sure they are in place and working.

## Fixed guards

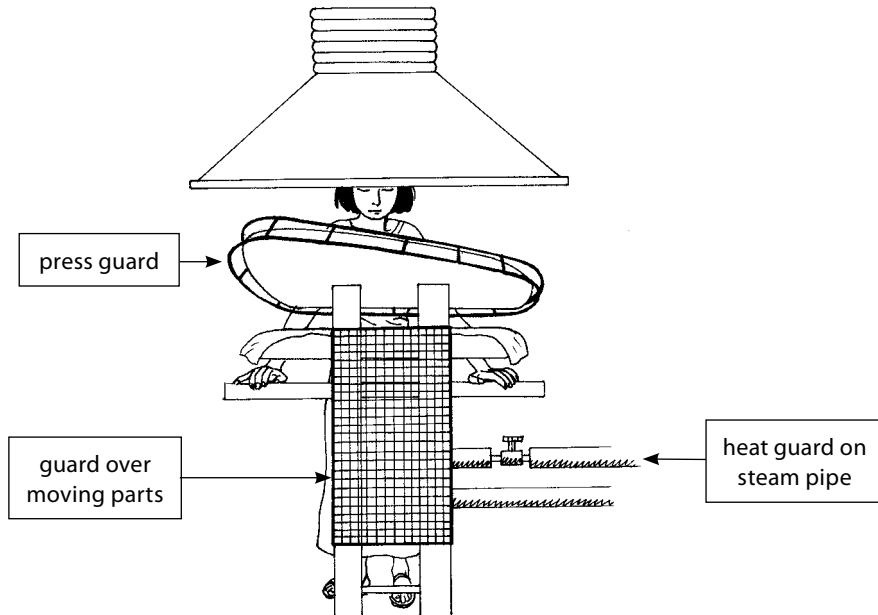
A fixed guard prevents a worker's body from getting near dangerous areas of a machine, or from being hit by broken parts flying out of a machine.



Guards on a fabric cutting saw and protective glove



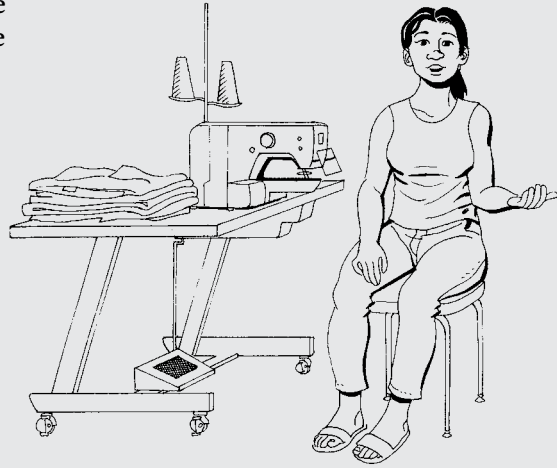
Guards on a sewing machine



Guards on a garment press

### Getting the boss to replace needle guards

My name is Cecilia. I work in a large garment factory in Mexico. Workers in my factory have organized for many years, and we have won changes that make our work safer and the workplace better for everybody. We have a good relationship with our boss. He understands that many of the things we have requested to make our work safer benefit him too. But he also sees that we are united and strong and that we are going to fight for better conditions even if they are not “convenient” for him. Sometimes he agrees to some of our demands right away instead of resisting. That is how we got new needle guards on our machines.

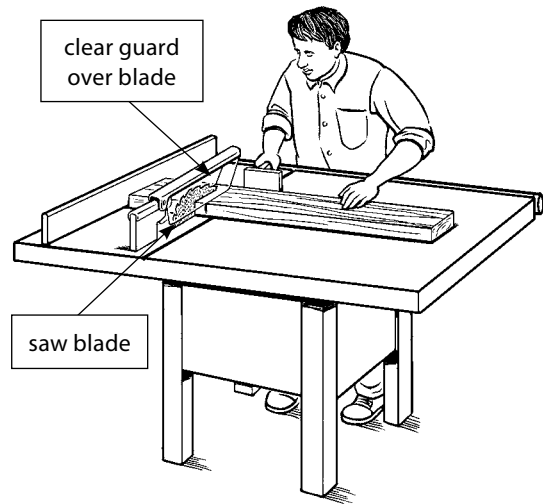


Our machines had guards to keep our fingers from getting caught under the needle. But the guards often broke. At first, when a needle guard broke, we just kept sewing. We have to meet a production quota and stopping can make us miss it and lose our bonus for that day. The boss would see us working without the guards and think, “they can work without them, they don’t need them,” and then he would not replace them. But without the needle guards, several workers injured their fingers badly.

We needed to act! We work very fast with powerful sewing machines and they need to have guards. The injured workers led the campaign. We told the boss that we would stage a sit-in if he did not replace all the broken guards and make a plan to ensure that guards are replaced promptly when they break. The boss knew a sit-in would cost him a lot of money and he did not want to pay the health costs for injured workers. Besides, needle guards are cheap and easy to replace. So he agreed to keep guards on all the machines and extras in stock. Now when a needle guard breaks, we can have it fixed the same day. Since we made this change, no workers’ fingers have been seriously injured by a needle.

## Adjustable guards

Some guards can be adjusted for different uses and materials. They protect workers only if they are adjusted properly and used. But because they can be adjusted, they are easy to remove. Do not let your boss remove or disable these guards to speed up the work and meet unsafe production goals. Take the time to make the adjustments and save your fingers — and your life!



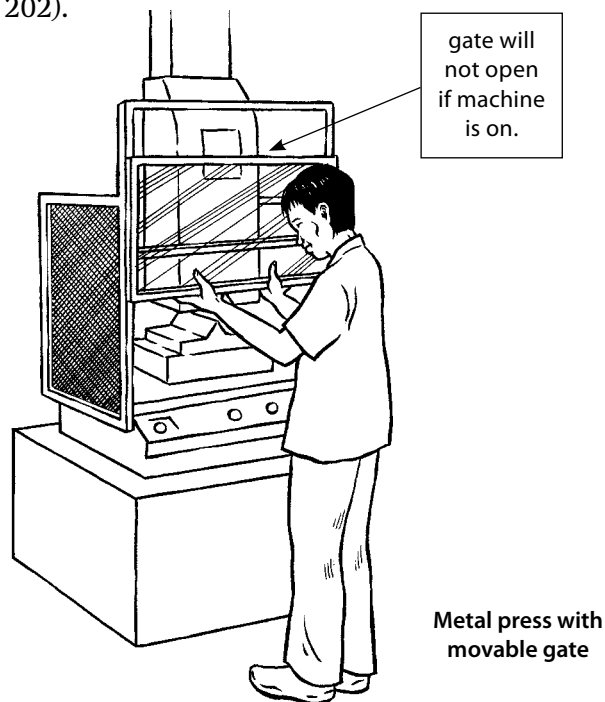
Saw for cutting wood with adjustable guard

## Interlocking guards

An interlocking guard turns off power to the machine when it is not in place. A worker can remove the guard to safely adjust or clear a machine, and then replace the guard to safely restart it. Removing an interlocking guard does not make the machine safe to repair — you still need to lock it out and tag it out first (see pages 201 to 202).

## Movable barriers

Some machines have a gate that opens to feed new material into the machine only when the machine is turned off. That way, the gate will not close, and the machine will not turn on, if a worker's hand or arm is in the way.



Metal press with movable gate

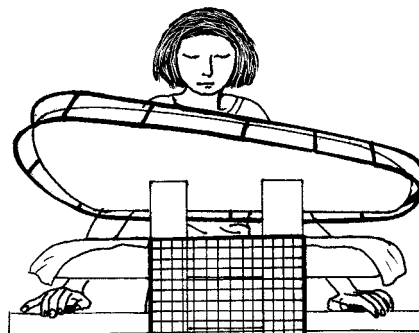
### Automatic shutoff devices

Machines with doors or gates that open and close often have safety controls that cut off power to the machine when the door is open. Automatic shutoff devices must be regularly maintained and tested to be sure they always work.

### Two-hand controls

Machines with 2-hand controls will start only when you push 2 buttons at the same time. These controls are separated so you must use both hands to push them.

While excellent for the worker who uses the controls, this does not prevent other workers near the machine from getting caught by moving parts.



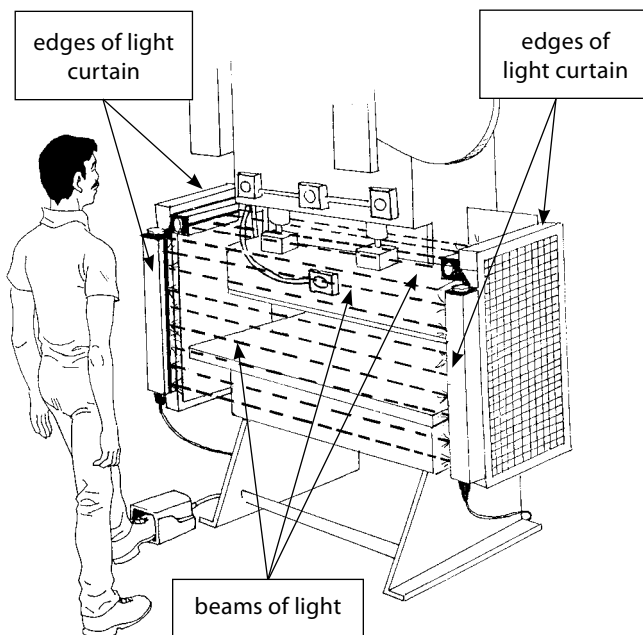
The worker must use both hands to close the press.

### Light curtains and presence-sensing mats

A light curtain is made of many rows of light that sense when a worker gets too close to a machine. When you cross the light curtain, the machine automatically shuts off.

A presence-sensing mat shuts off a machine as soon as someone steps on the mat.

Light curtains and presence-sensing mats must be far enough from the machine so you cannot reach the danger zone before the machine stops moving.

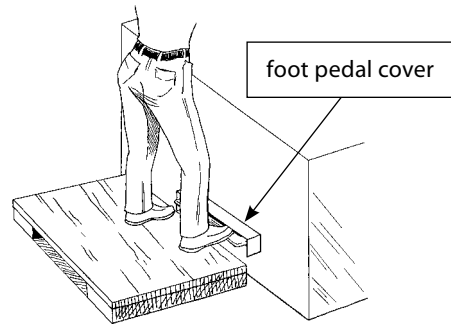


Machine with light curtains



## Covered foot pedals

Many machines start when someone presses a foot pedal. If a person presses the pedal by mistake or if something falls on the pedal, the machine can start while a worker's hands are inside. A protective cover over a foot pedal can help stop this from happening.

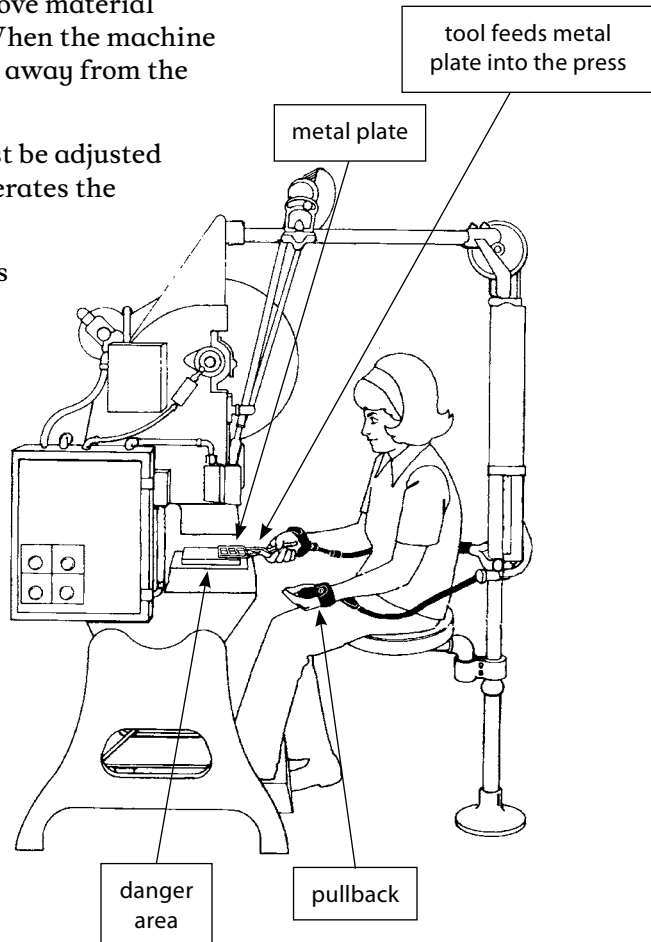


## Restraints and pullbacks

A restraint is a strap tied to a worker's wrist or arm that keeps her hands away from the dangerous areas of a machine all the time. A pullback allows a worker's hands to enter a dangerous area to feed and remove material while the machine is stopped. When the machine starts, the straps pull her hands away from the dangerous area.

Restraints and pullbacks must be adjusted each time a different worker operates the machine.

Some countries ban restraints and pullbacks because they are unsafe in emergencies, making it difficult for the worker to leave her machine quickly. They are also humiliating.

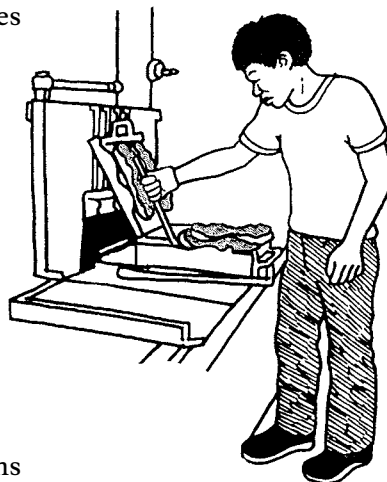


## Protect workers with personal protective equipment

The boss must provide workers with equipment and clothing that can help protect them from machine injuries. These are not a replacement for having good guards on the machines.

**Protect your face and eyes.** Safety glasses and face shields protect you from flying debris, broken parts, and splashes of chemicals or hot materials. If you are working with hot materials, wear face shields made from material that will not melt, burn, or shatter from heat. When you remove the face shield or goggles, tip your head forward and close your eyes to prevent hot particles or debris from falling into your eyes. Hats, hair ties, and hair nets keep your hair from getting caught in moving machine parts.

**Protect your hands.** Use gloves. Wire mesh gloves are used to protect workers from being cut by blades. Leather or fabric gloves and sleeves protect your skin from sharp edges. If you are working with a hot machine or material, use gloves made of leather or other material that will not pass heat to the skin, will not melt, and will not catch fire. If you are working on a machine with moving parts, wear tight gloves that will not get caught in the machinery. Always change gloves right away if they get wet or covered with chemicals.



Use tools to handle hot materials.

**Protect your body and feet.** Coveralls and aprons protect your clothes and skin from dust and chemicals, and help prevent clothes from getting caught in moving machine parts. Wear long clothing and closed shoes made of leather, wool, or canvas that does not burn easily or melt. If you work with hot liquids, such as chemical or electroplating baths, a heavy rubber apron and rubber boots will keep splashes from burning through your clothes.

For more information on the different kinds of personal protective equipment (PPE), see chapter 18.

## Lock out and tag out machines for safe repair

Workers who clear jams or repair machines need additional protection, because they must work inside the dangerous areas of a machine. To prevent a machine from starting or moving during repairs, workers need the time, training, and tools to:

- **Lock out** the machine so it cannot start or move. This means not only disconnecting the electricity from a machine but also disconnecting any belt or drive shaft from another machine that might drive the machine being repaired.
- **Block out** the machine so water, chemicals, or other materials that flow into it are completely blocked or shut off during maintenance and repair. Also, energy stored in springs, in electronic parts such as capacitors, and as water or air pressure in pistons, hoses, and pipes must all be released or blocked.
- **Tag out** the machine so other workers know the machine, power cord, and belts were disconnected on purpose and they should leave them alone.

Employers are responsible for making lock out and tag out required, easy, and routine.

### Guidelines for lock out

Every factory should have a lock out program to prevent repair and maintenance workers from being killed or injured by a machine. A good lock out program will follow these guidelines:

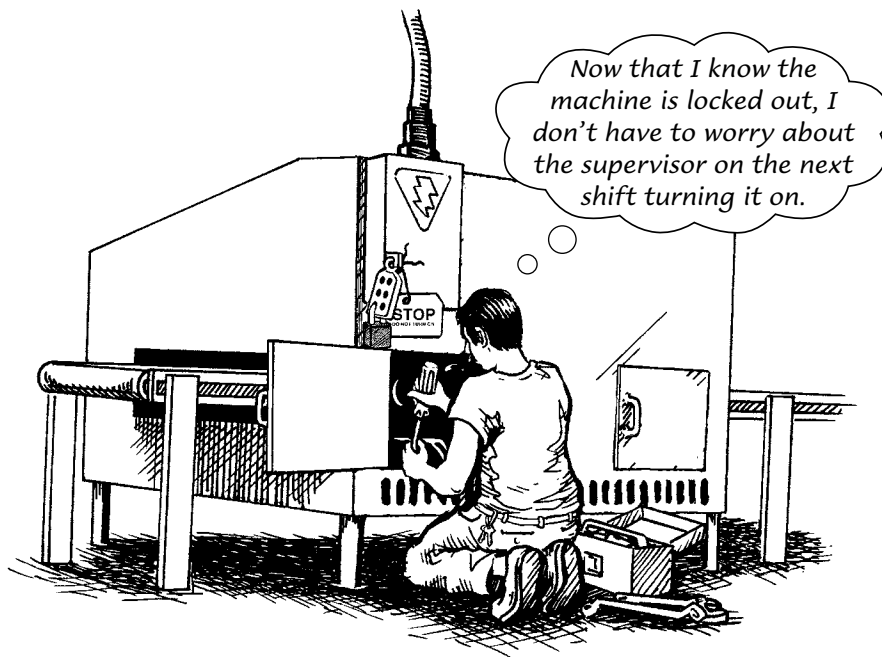
- A worker never repairs or maintains a machine until all the energy sources to the machine are disconnected, blocked, and locked. This will prevent the machine from starting up unexpectedly.
- A repair worker attaches a tag to his locks that says why the machine is locked out, says who is responsible for the lock out, and shows other workers and supervisors not to reconnect and start the machine.
- The repair worker has the only key to his locks and is the only one who can unlock the machine, remove the blocks and tags, and reconnect the power.
- If more than one worker is repairing the machine, each must attach his or her own lock and tag and remove them when done.
- All workers are trained on why lock out procedures are used and why respecting these rules is important.

### Lock out instructions for each machine

Some factories have many kinds of machines and several types of the same machine. To make each machine safe for repair, you need to know exactly how to disconnect it and block it. Putting individual lock out and block out instructions with pictures on each machine helps workers be sure they are doing it the right way for each machine.

### Reinstall guards and other safety devices

Machine technicians and maintenance workers sometimes remove guards and disconnect safety devices while they work on a machine. Always reinstall the guards and reconnect safety devices before unblocking a machine and reconnecting the power.



Always lock out, block out, and tag out a machine before beginning repairs.

## First aid for machine injuries

Most machine injuries are very serious and should be treated by a health worker right away. If no health worker can come quickly, transport the injured worker to the nearest clinic or hospital. Have him lie down on the way. In the meantime:

**Watch for shock:** A person who is bleeding heavily from any type of injury can go into shock and die. Bleeding inside the body — although you cannot see it — can also cause shock.

**Signs of shock:** weak, rapid heartbeat; pale, cold, damp skin; weakness, confusion, and fainting.

**To prevent or treat shock:** have the person lie down on his side with his feet a little higher than his head. Stop any bleeding. If he vomits, clear his mouth immediately. Cover him with a blanket. If he is awake, give him sips of water.

### Protect your hands from blood:

Wear rubber or plastic gloves, or plastic bags, on your hands. Blood can carry germs, including hepatitis and HIV. Clean gloves keep dirt, germs, and chemicals out of the wound. But the most important thing is to stop the bleeding and help the injured worker as quickly as possible.

Here are procedures for certain types of injuries:

**Big or deep cuts, or part of the body cut off:** Have the person lie down. Raise the injured part of the body. Press a clean, thick cloth directly on the wound with your gloved hand. Keep pressing until the bleeding stops. This may take 15 minutes or more. Never use dirt, kerosene, lime, or coffee to stop bleeding.

**Deep wound in the stomach:** Have the person lie down. Cover the wound with a clean cloth. Do not give food or drink, not even water.

**Part of body crushed:** Have the person lie down. Watch for shock.



First call a health care worker.  
Stop the bleeding while you wait.

(continued)



First  
Aid



## First Aid

(continued)

**Objects stabbed into the body:** If part of a machine or another object stabs deeply into a worker's body, leave the object in his body while you wait for a health worker or transport him to a clinic. If the object is connected to something large or heavy, try to separate it but do not move the object or push it farther into his body. If he is bleeding, press a clean, thick cloth on the area. Keep pressing until bleeding stops.

**Eye injury:** Have the person lie down and cover the wound with a clean cloth. If you think there is something in the eye such as a piece of fabric, thread, plastic, or metal, rinse the eye with water for 15 minutes. If something is stabbed into the eye, do not take it out. Leave it in the eye until he gets to a clinic or hospital.

**Head injury:** Have the injured person lie down with his chest and head raised halfway to a sitting position. Support his head and chest with a cloth, blankets, pillows or clothing. Cover the wound with a clean cloth.

**Cuts and scrapes:** Wash the wound with lots of water. Dirt in the wound can cause an infection. Cover the cut with a clean cloth or bandage and change it each day. If the skin around a wound is red, swollen, and tender, or it does not heal, see a health worker.

**Burns:** Place the burned body part under running water for at least 15 minutes. Treatment for burns from hot machines or materials is mostly the same as for burns caused by fire (see First aid for burns, page 217).

**Cleaning up after an injury:** Once the injured person is cared for, make sure everyone in the area washes off any blood on their skin or hair with soap and water. Remove bloody clothes and put them in a plastic bag until they can be washed. Clean up blood in the work area using rubber gloves and a germ-killing cleaner, such as water with chlorine bleach. Put bloody rags and bandages in a plastic bag, tie it closed, and put it in the trash.

Tell the health worker if your skin or eyes were exposed to the injured person's blood. You may need a hepatitis vaccine or post-exposure prophylaxis (PEP) for HIV (see chapter 30).



Direct pressure will stop bleeding of nearly all wounds. But be patient — it can take a long time.