

Chapter Seven: Machine Guarding

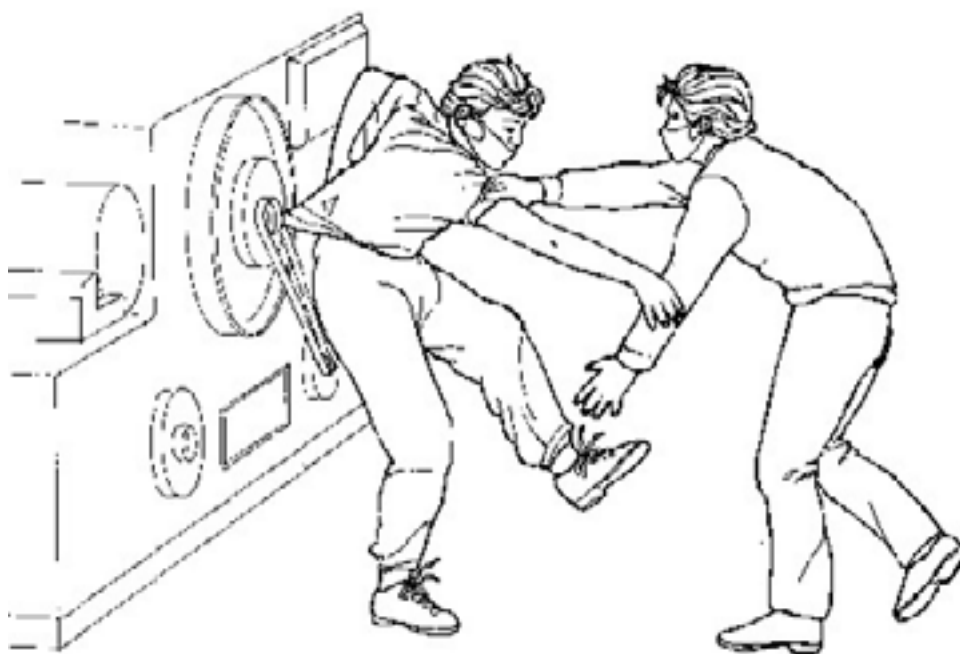
7.1. Introduction

Many serious accidents at work involve machinery and occur for several reasons, including:

- Badly designed machine guards (e.g. those that can be removed);
- Poor maintenance of machines and guards;
- Guards are not provided;
- No supervisory system to ensure that guards are used;
- Payment/bonus systems that encourage “shortcuts” (e.g. guards can be removed if they restrict production);
- Lack of adequate training for workers on the safe use of machines.

Machine guards are essential for protecting workers from needless and preventable injuries (see figure 18). A good rule of thumb to remember is that any machine part, function, or process which may cause injury must be guarded. Where the operation of a machine, or accidental contact with it, can injure the operator or other workers in the immediate area, the machine **must be guarded**.

Figure 18: All too often workers can get caught in unguarded machinery. A combination of unguarded machines and loose clothing, long hair, dangling chains, gloves, rings, etc., can be fatal.



7.2. Core Information

How Workers Get Injured at Machines

Basically a worker may be injured at machinery as a result of:

- Coming in contact with moving parts of a machine – being hit or getting caught;
- Getting trapped between moving parts of a machine or material and any fixed structure;
- Being hit by material or parts which have been thrown out of the machine.

Where Mechanical Hazards Occur

There are three basic parts of a machine that must be guarded:

1. **The point of operation** – the actual point where the work is performed on the material, such as cutting or sewing (refer back to picture 12);
2. **The power transmission apparatus** – 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 (refer back to pictures 5 and 6);
3. **Other moving parts** – all parts of the machine which move while the machine is working. These can include reciprocating, rotating, and transverse moving parts, as well as feeder mechanisms and auxiliary parts of the machine.

Types of Hazardous Mechanical Motions and Actions

There are a number of mechanical motions and actions that can be hazardous to workers if safeguards are not present. Most machines perform their function of cutting, shearing, bending or punching by a series of mechanical motions, namely through rotation of machine parts (produces nip point hazards); through reciprocation of machine parts (this basically refers to up-and-down or back-and-forth motion as with sewing machines); and, transverse motion (movement in a straight, continuous line) in which a worker may be struck or caught in a pinch point by the moving part.

Requirements for, and Types of, Machine Guards

There are a number of general requirements for all machine guards if they are to protect workers against mechanical hazards. These include:

- **Prevent contact** – the guard must prevent hands, arms, or any other part of a worker's body from coming in contact with dangerous moving parts. A good guard eliminates the possibility of the operator placing their hands near dangerous moving parts;
- **Secure** – the guards should be firmly fixed to the machine (or preferably an integral part of the machine) and not easily removed. **(Remember that if a guard can be removed easily, it is no safeguard at all!).** Guards should be

made of durable materials that can withstand workplace conditions over the lifetime of the machine;

- **Protect from falling objects** – the guard should ensure that no objects (such as a tool) can fall into moving parts;
- **Create no new hazards** – a guard defeats its own purpose if it creates another hazard such as its own shear point, a jagged or sharp edge, which can cause cuts;
- **Create no interference with work** – any guard which impedes a worker from performing his/her job efficiently and in comfort, is likely to be removed or overridden. It should be pointed out that proper guards on machines can actually improve productivity as workers then have confidence that they will not be injured;
- **Allow safe lubrication** – if possible, the operator or maintenance worker should be able to lubricate the machine safely without removing the guard or having to reach inside the machine and into any hazardous area.

There are various types of guards¹ that can be used to prevent injury in the workplace, including:-

- **Fixed guards** – these are the most common type of guard found in garment factories and basically prevent any contact between hands, arms etc and any moving machine parts. They should not easily be removed. In the best cases they provide the maximum amount of protection and require the minimum amount of maintenance. In some cases these guards can interfere with visibility;
- **Interlocking guards** – when this type of guard is opened or removed, the tripping mechanism and/or power automatically shuts off or disengages. The machine cannot start until the guard is back in place;
- **Adjustable guards** –these guards are useful because, as the name implies, they allow flexibility in accommodating various sizes (thickness, width, height etc.,) of stock. The best examples in a garment factory are the band knives in the cutting section where the guards are adjustable and can deal with varying thicknesses of material blocks;
- **Self-adjusting guards** – the openings of these barriers are determined by the movement of the stock. 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. After the stock is removed, the guard returns to the rest position. In some cases, these guards can interfere with visibility.

There are also a number of other techniques that can be used including – photoelectric trips; restraints; two-hand controls; safety trips; pullback mechanisms; automatic feeds. Their name describes the mode of action but all work on a principle of disabling the machine as soon as a part of the body gets near a dangerous, moving component. These safety devices are rarely found in garment factories in Cambodia.

¹ Adapted from U.S. Department of Labor, OSHA publication – *Concepts and Techniques of machine Guarding (1980)*.

Some of the Main Machine Guarding Problems in a Garment Factory

The most common accidents in the garment industry tend to be:

- Cut fingers for machine operators in the cutting section;
- A needle in the finger of sewers (refer back to picture 13);
- Burns from irons in the ironing section;

(this information is available from looking at the accident record book. A close analysis of these records can help you to identify priority areas that need to be addressed as a matter of urgency).

As with all machinery, the machines in the garment industry are potentially dangerous. The most obvious are probably the band knives in the cutting section (see picture 44).



Picture 44: A typical picture from the cutting section. It is essential that the adjustable guard is in place and the operator has been given the appropriate training to use the machine. The worker is wearing PPE – a dust mask and chain-mail gloves. One problem often encountered is that the chain-mail gloves are too big with the ends dangling near the blade. With gloves that are too large, workers lose control and accuracy.

If you take a walk-through survey of a garment factory, one of the most common observations is the number of machines that have guards missing or that the guards are inadequate. As has been discussed, it is important that you purchase so-called safe

machines with fixed guards as an integral part – guards that cannot be removed, that allow for safe maintenance, and that provide clear visibility.

Let us look at some examples:



Pictures 45 and 46: Look closely at these pictures of two sewing machines next to each other. In one, the belts are fully guarded but not in the other. Managers said that they had only been removed for maintenance, but they were nowhere to be found. Look at the use of PPE – do you notice anything?

It isn't just above the workbench that you should inspect, look under the table as well.



Pictures 47 and 48: Guards must be placed on all dangerous parts wherever they are.

Accidents and Unguarded Machines

Tragically, accidents occur in all workplaces and the garment industry is no different. Accidents are costly to the employer in terms of loss of productivity; to the worker in terms of injury, loss of wages etc.; and to society as a whole². The three factors that contribute to accidents are:

1. Faulty technical equipment;
2. The working environment; and
3. The worker.

In the analysis of workplace accidents, it is clear that they are always the result of either unguarded machines/unsafe conditions in the workplace and/or unsafe acts. In companies with poor industrial relations, there tends to be a “culture of blame”. In apportioning blame:

- Many employers tend to “blame the worker” for unsafe acts;
- Many workers tend to “blame the employer” for faulty equipment and unsafe environments. (It must be remembered that international and Cambodian standards specify that it is the EMPLOYERS’ duty to provide a safe and healthy workplace).

In reality, accidents occur as a combination of unsafe conditions and unsafe acts.

Here is an example of unsafe conditions and unsafe acts (see picture below).



Picture 49: Workers are performing unsafe acts by leaning over poorly guarded machines (unsafe conditions). Look at the workers clothing, hair etc.

² In this manual we will not be dealing with types of accidents; the causes; accidents models; accident investigation; direct and indirect costs of accidents, etc. Readers can refer to ILO training manual on *Improvements in Law Enforcement and Working Conditions in Cambodia’s Garment Sector*- Antero Vahapassi (2003).

7.3. Checklist for Machine Guarding

	Yes	No	Action required
Do workers know how to switch off the machine in case of emergency? Are ON/OFF and cut-off emergency switches clearly marked?			
Are all workers trained to use the machines safely prior to operation?			
Are robust, fixed guards attached to dangerous moving parts of machines and power transmission equipment?			
Are these machine guards and other protective devices regularly checked and maintained by a qualified person?			
Have any of the machine guards been removed or are missing?			
Is the area around the machine clean, tidy and free from obstruction?			
Are supervisors informed if machines are not working properly?			
Do any workers have dangling chains, loose clothing, gloves, rings or long hair which could get caught in moving parts of machines?			
Are workers wearing appropriate PPE when working with such machines?			

7.4. Summary

All machines in the garment industry can be dangerous. Machine guards have been developed to prevent accidents happening when workers get too close to dangerous machine parts. These parts should either be out of reach or enclosed so that no one can touch them or fall into them accidentally. It is best to purchase machines with guards included as an integral part. All guards must be robust and cannot be removed easily. All workers should be trained in the safe use of machinery and shown how to stop machines in the case of an emergency. Workers must wear the correct PPE where appropriate and should not wear dangling chains or necklaces, loose clothing, gloves, rings or long hair which could get caught up in moving parts.