
MACHINE SAFETY

Introduction

Unguarded moving parts of machines/equipment and the sudden or uncontrolled release of their power systems can result in serious injuries.

Personnel working with machines must be aware of the risks involved and follow safe work practices.



Causes of accidents while working with machinery

- Loose clothing, hair, jewelry being caught in moving parts.
- Materials ejected from the machine when it is operational.
- Inadvertent starting of the machine.
- Slipping and falling into an unguarded nip.
- Contact with sharp edges, e.g., cutting blade.
- Making adjustments while the machine is operational.
- Unauthorized operation of machines.
- Lack of preventive maintenance.



Hazards

- Rotating machine parts give rise to nip points. Examples are
 - Rotating gears
 - Belt and its pulley
 - Chain and sprocket
 - Between grinding wheel and tool rest
 - Between rotating and fixed parts
- Rotating parts operating alone
 - Shafts
 - Couplings
- Reciprocating and sliding motions



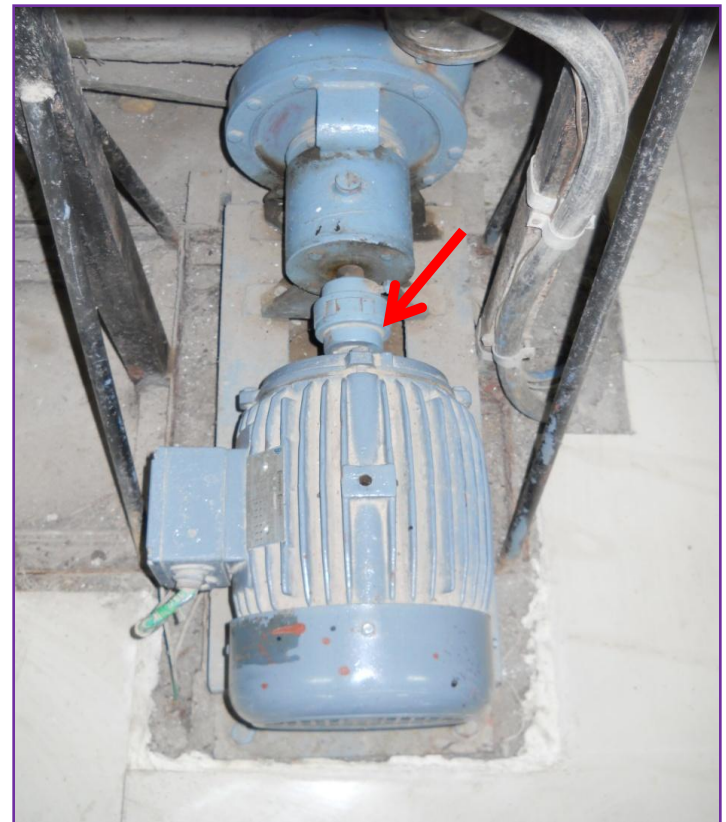
Dangerous parts of machinery

Running nips between parts rotating in opposite directions, for e.g., gear wheels.



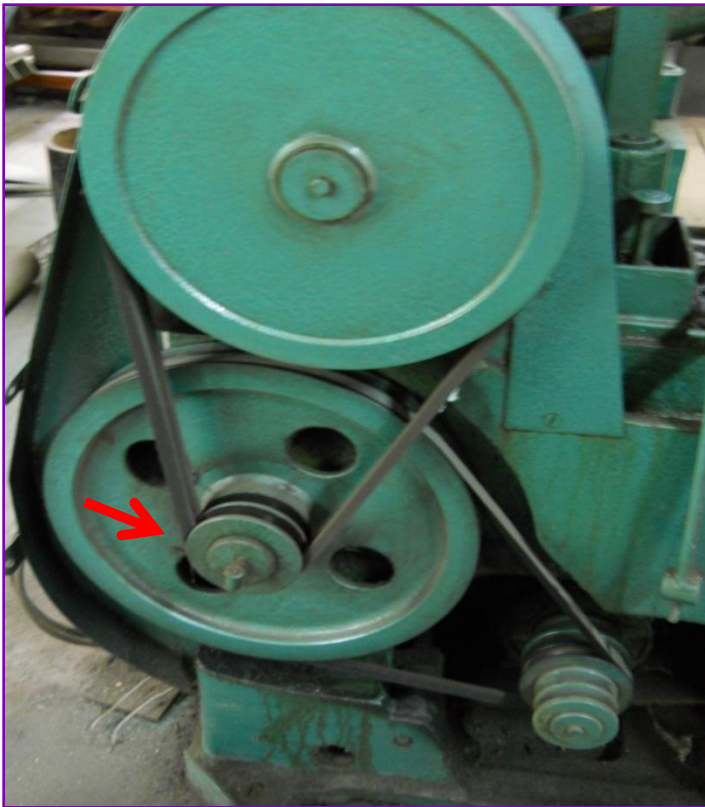
Dangerous parts of machinery

Rotating parts operating alone e.g., couplings.



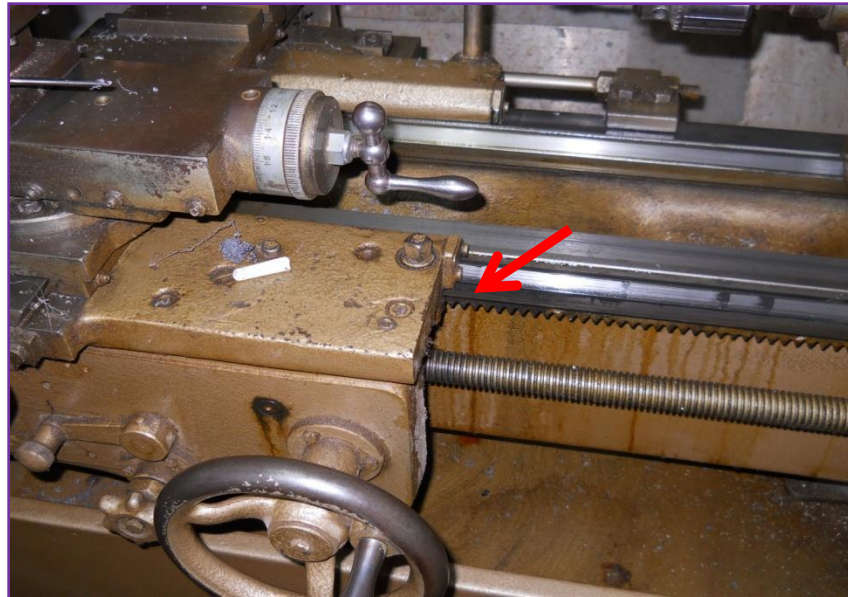
Dangerous parts of machinery

Between rotating and tangentially moving parts e.g., belt drives.



Dangerous parts of machinery

- Wherever there is a rotating part operating close to a fixed structure there is a danger of trapping or crushing.
- Reciprocating and sliding motions.



Machine Guarding

Any machine part which can cause injury, must be guarded.

Machine guards help to eliminate personnel hazards created by points of operation, ingoing nip points, rotating parts and flying chips.



Types of guards

Commonly used machine guards are

- Fixed guard
- Interlocked guard
- Adjustable guard
- Self adjusting guard
- Pull back device
- Two-hand control



Types of guards

Fixed guard- is kept in place permanently by fasteners that can only be released by the use of a tool.



Types of guards

- **Interlocked guard**- shuts off or disengages power to the machine and prevents it from starting when the guard is removed/opened.
- **Adjustable guard**- provides a barrier which can be adjusted to suit the varying sizes of the input stock.
- **Self adjusting guard**-provides a barrier which moves according to the size of the stock entering the danger area.



Types of guards

- **Two hand control** - concurrent use of both hands is required to operate the machine, preventing the operator from reaching the danger area.
- **Pull back** - the device is attached to the wrist of the operator which pulls the operator's hands away from the point of operation or other hazardous areas when the machine operates.



Miscellaneous safeguarding aids

- Shields can be used to provide protection from flying particles, splashing metal working fluids or coolants.
- Holding tools can be used to place and remove stock. Example, reaching into the danger area of a power press.
- Holding tools must not be used as a replacement of machine guards.



Safety precautions while working with machinery

- Ensure that the guards are in position and in good working condition before operating.
- Know the location of emergency stop switch.
- Do not wear loose clothing or jewelry that can be caught in the rotating parts.
- Confine long hair.



Safety precautions while working with machinery

- The keys and adjusting wrenches must be removed from the machine before operating it.



Safety precautions while working with machinery

- Stop the machine before measuring, cleaning or making any adjustments.
- Do not handle metal turnings by hand as they can cause injury. Use brush or rake to remove turnings.
- Keep hands away from the cutting head and all moving parts.
- Cutting tools and blades must be clean and sharp, so that they can be used without force.



Safety precautions while working with machinery

- Avoid awkward operations and hand positions. A sudden slip could cause the hand to move into the cutting tool or blade.
- Keep work area clean. Floors must be level and have a non-slip surface.
- There must be enough space around the machine to do the job safely.



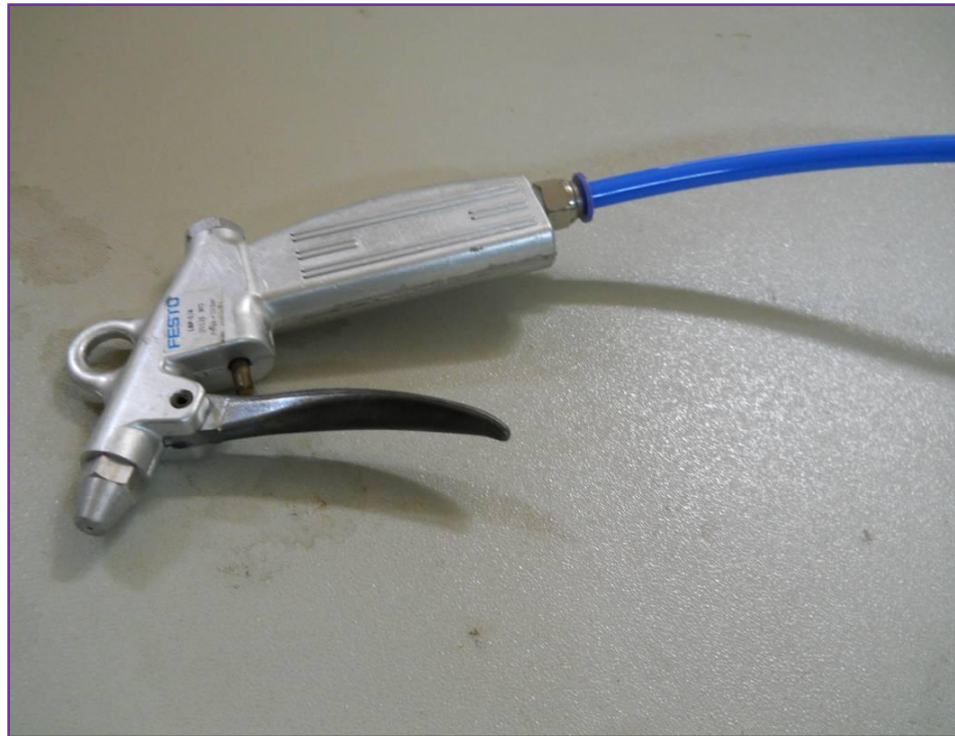
Safety precautions while working with machinery

- The person working with the machine must not be distracted.
- Machines must not be left unattended. Switch off the machine before leaving.
- Rotating parts of machines must not be stopped with hands after switching off.



Safety precautions while working with machinery

- Compressed air must not be used to clean machines, as this can force small particles to fly off and can cause injury.



Personal protective equipment

- Safety glasses must always be used while working with machinery for protection from flying particles.



- Safety glasses must be worn by all personnel entering an area where machines are operated.



Personal protective equipment

- Ear protection must be worn for protection from high noise.



- Safety shoes must be worn if there is handling of heavy materials.
- Hand gloves must NOT be used while working with machinery, due to the chances of getting caught in the nip point.



Safe work practices – Drill press

- When making deep holes, clean the holes frequently.
- Use a clamp or drill vise to prevent work from spinning.
- The drill bit or cutting tool must be locked securely in the chuck.
- Remove the chuck key before starting the drill press.
- Lubricate drill bit when drilling metal.



Safe work practices – Drill press

- Reduce the drilling pressure when the drill begins to break through the work piece. This prevents drill from pulling into the work and breaking.
- Do not force the drill with extra pressure.
- Do not hold the work by hand.
- Do not place hands under the stock being drilled.



Safe work practices- Lathe

- Centre the drill work deeply enough to provide support for the piece while it is turning.
- Secure and clamp the piece being worked.



Safe work practices- Lathe

- Guard must be provided to the chuck.
- Inspect chucks for wear or damage.
- Remove chuck wrench immediately after adjusting chuck.



Safe work practices -Grinding machine

Causes of personal injury while working with abrasive wheels are follows:

- Holding the work incorrectly.
- Incorrect adjustment or lack of work rest.
- Using the wrong type of wheel or disk or a poorly maintained or imbalanced one.
- Grinding on the side of the wheel.



Safe work practices -Grinding machine

Causes of personal injury while working with abrasive wheels are follows(contd.)

- Grinding too high above the center of a wheel.
- Incorrect mounting and exceeding speeds recommended by manufacturer can lead to bursting of wheel.
- Using spindle with incorrect diameter.



Safe work practices - Grinding machine

Tool/Work rest

- The work rest must be securely clamped and the gap between the tool rest and wheel must not be more than 3mm.
- The work rest height must be on the horizontal center line of the machine spindle.
- The rest must never be adjusted while the wheel is in motion as the work rest may slip and strike the wheel and break it, or cause injury to the operator.



Lockout-Tagout

Lockout-tagout or lock and tag is a system used to ensure that machines are properly shut off and not started up again before the completion of maintenance or servicing work.



Lockout-Tagout

- Hazardous power sources must be isolated before any repair procedure is started.
- Different types of locks are used for locking the machine or the power source in a manner that no hazardous power sources can be turned on.
- A tag is also attached to the locked device indicating that it must not be turned on.



THANK YOU
