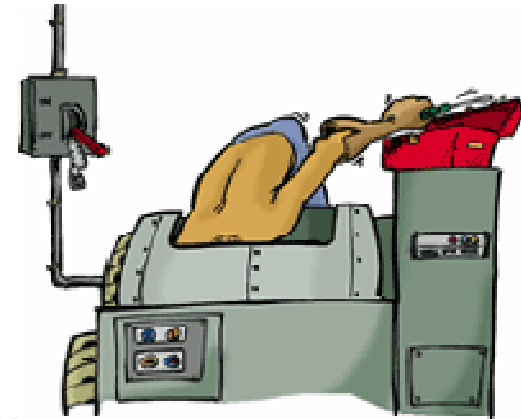
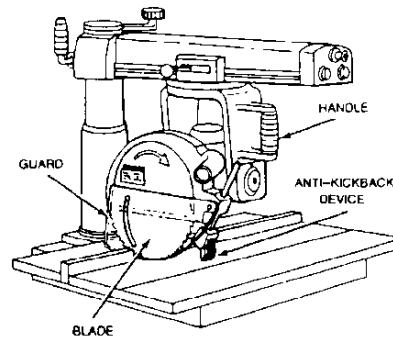
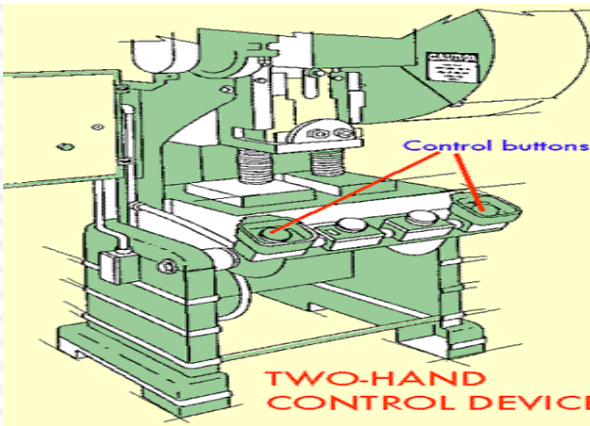
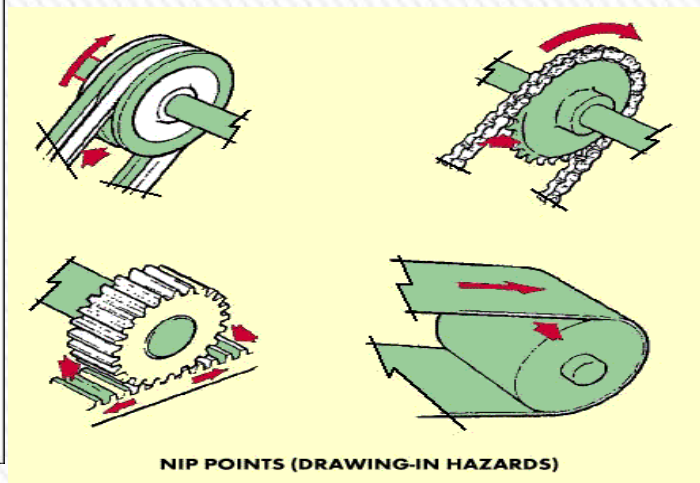
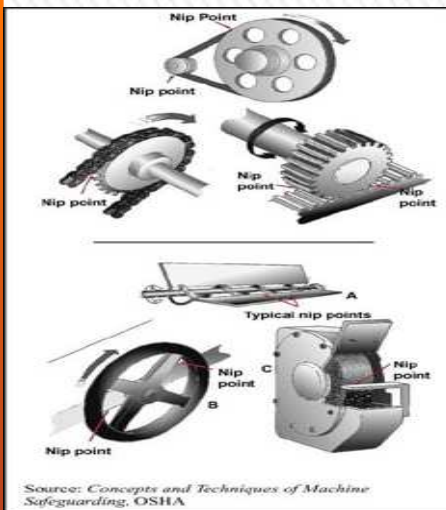




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Mechanical Hazard





Work Equipment Hazards and Control



Work Equipment

Definition

Any machinery, appliance, apparatus, tool or installation for use at work (whether exclusively or not).

Suitability of Work Equipment

Its initial integrity

The purpose for which it is being used

The Environment in which it is being used

Ergonomic principles

Has CE mark if necessary

Used for purpose manufacturer intended



Examples of Work Equipment

Work Equipment	Examples
Hand tools	• Hammers, meat cleavers, stapler
Power tools	• Drills, sanders, jig saws, powered screw drivers
Machinery	• Single machines, e.g. power presses, photocopiers • Several machines, e.g. a food production line
Apparatus	• Bunsen burners
Lifting equipment	• Hoists, lift trucks, lifting slings
Other	• Ladders, pressure water cleaners



Factors when installing a new machine

What are the hazards i.e.

- a) Heat or cold problems
- b) Chemicals
- c) Biological

Suitably guarded

The location

Capable of being isolated/lock off

Safe access and egress

Personnel trained and competent

Any other specified risks

Work Equipment Precautions

Control Hazards and risks

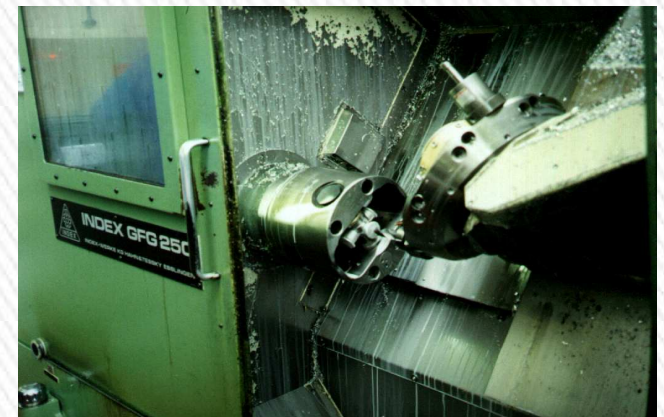
Information and instruction

Training

Inspection

Users

Operation



Statutory Inspections

Equipment	Inspections of	Frequency
Cranes, hoists and lifting equipment	• All equipment used for lifting people and lifting accessories	6 months
	• Other lifting equipment	12 months
Pressure systems	• Steam plant (boilers)	14 months
	• Steam receivers	26 - 38 months*
	• Air receivers	24 - 48 months*
Power presses	• Fixed guards	12 months
	• Other guards	6 months
	• Inspection of guards and protective devices during work	4 hourly

Selection of Guards

Suitable for purpose which they are provided

Good construction, material and adequate strength

Maintained in an efficient state, working order

Not give rise to increased risks

Not be easily bypassed or disabled

Sufficient distance from danger zone

Not restrict operators view

Eliminate the need for the worker to place any part of their body into dangerous parts in whilst in motion

Remove possibility of accidental contact



Hierarchy of Control for Guards

- F**ixed Guards where practicable
- O**ther Guards or protection devices
- J**igs, Holders, Push sticks
- I**nformation, Instruction, Training



Mechanical Hazards

EN tanglement

T raps

Shearing, drawing in, crushing

I mpact

C ontact

Friction, abrasion, cutting and
stabbing, puncture

E jection

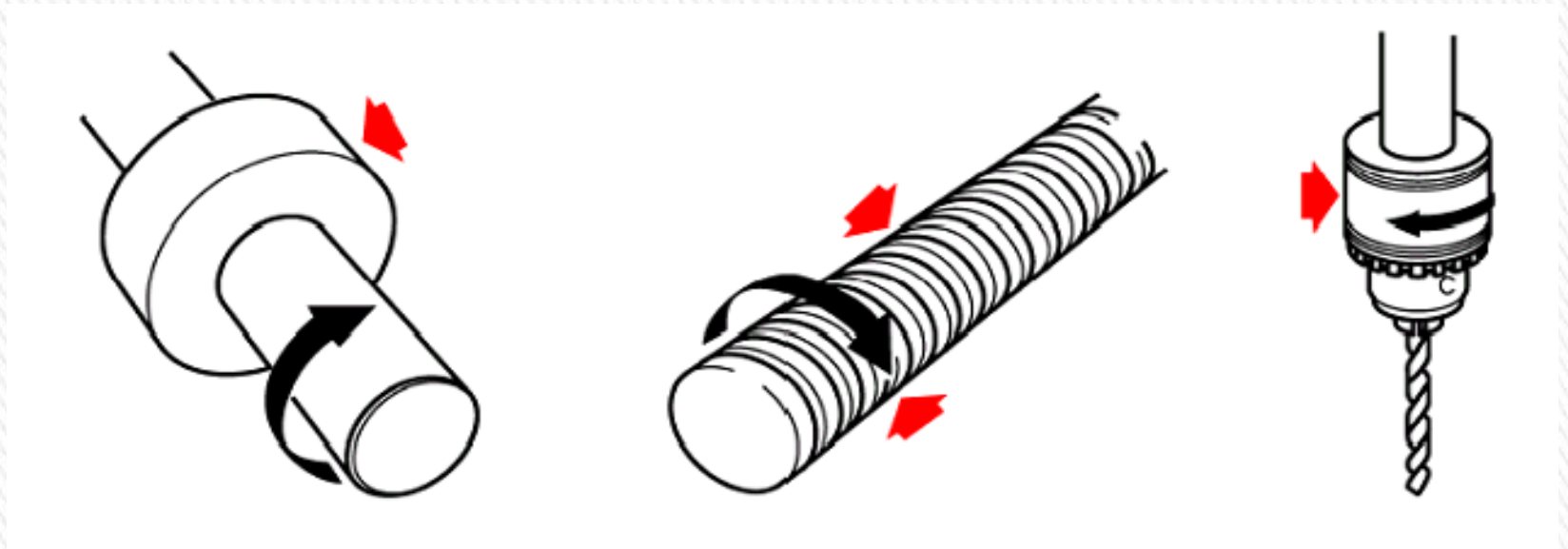


Remember: ENTICE



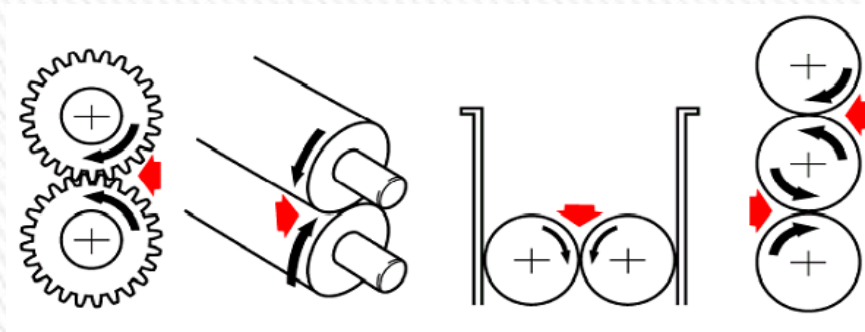
Mechanical Hazards: ENtanglement

ENtanglement: Clothing, Hair, Jewelry getting wrapped around machinery



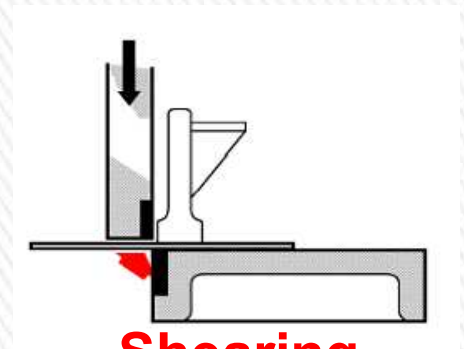
Mechanical Hazards: Trapping

Traps involve:



In running nips

Drawing in



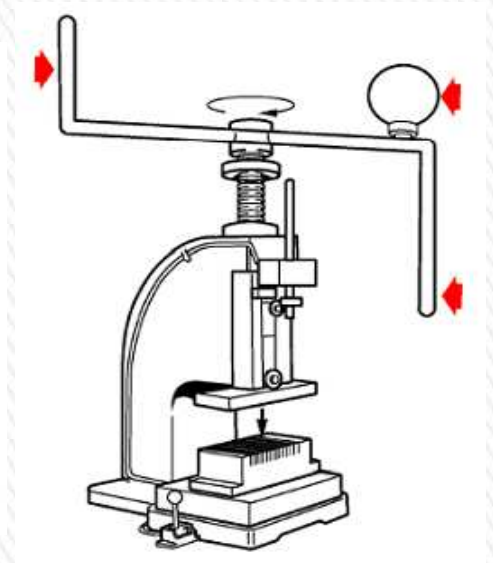
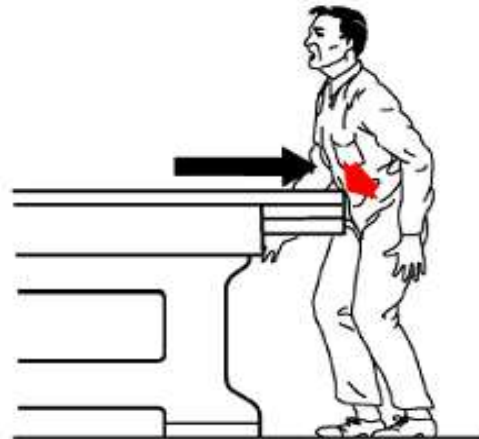
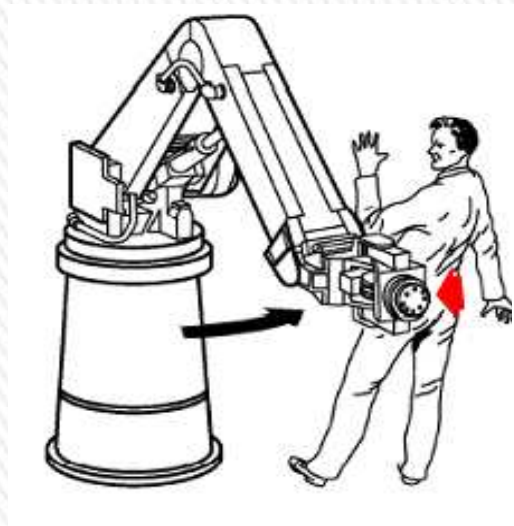
Shearing



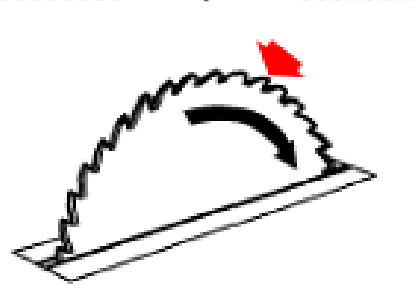
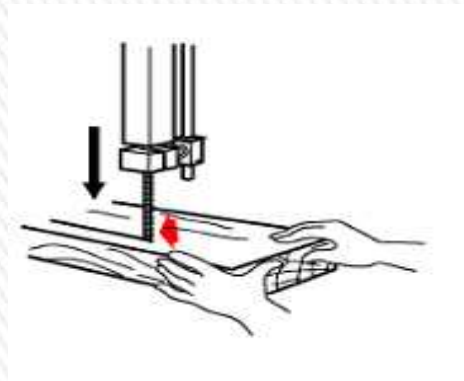
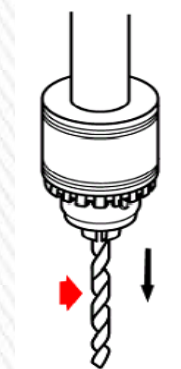
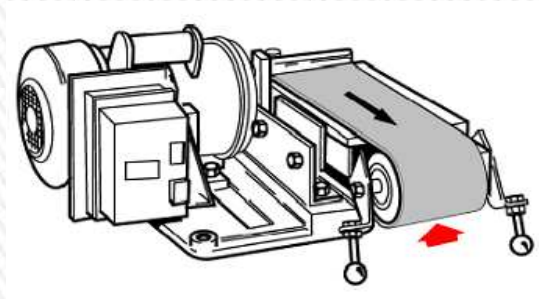
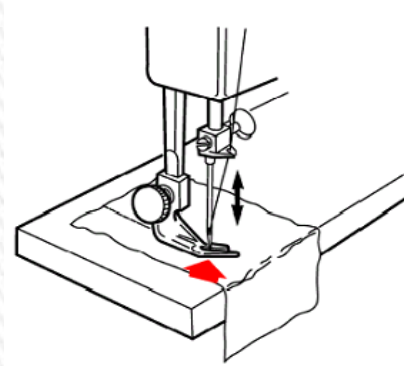
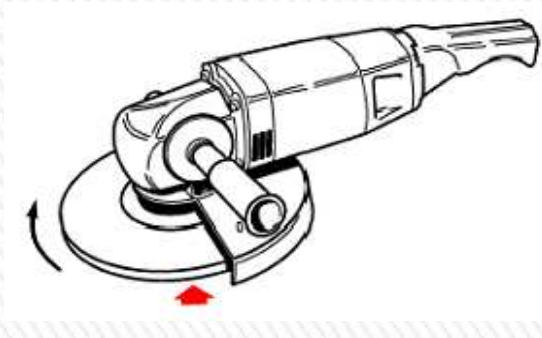
Crushing



Mechanical Hazards: Impact



Mechanical Hazards: Contact



Contact Injuries:

Burns

Lacerations

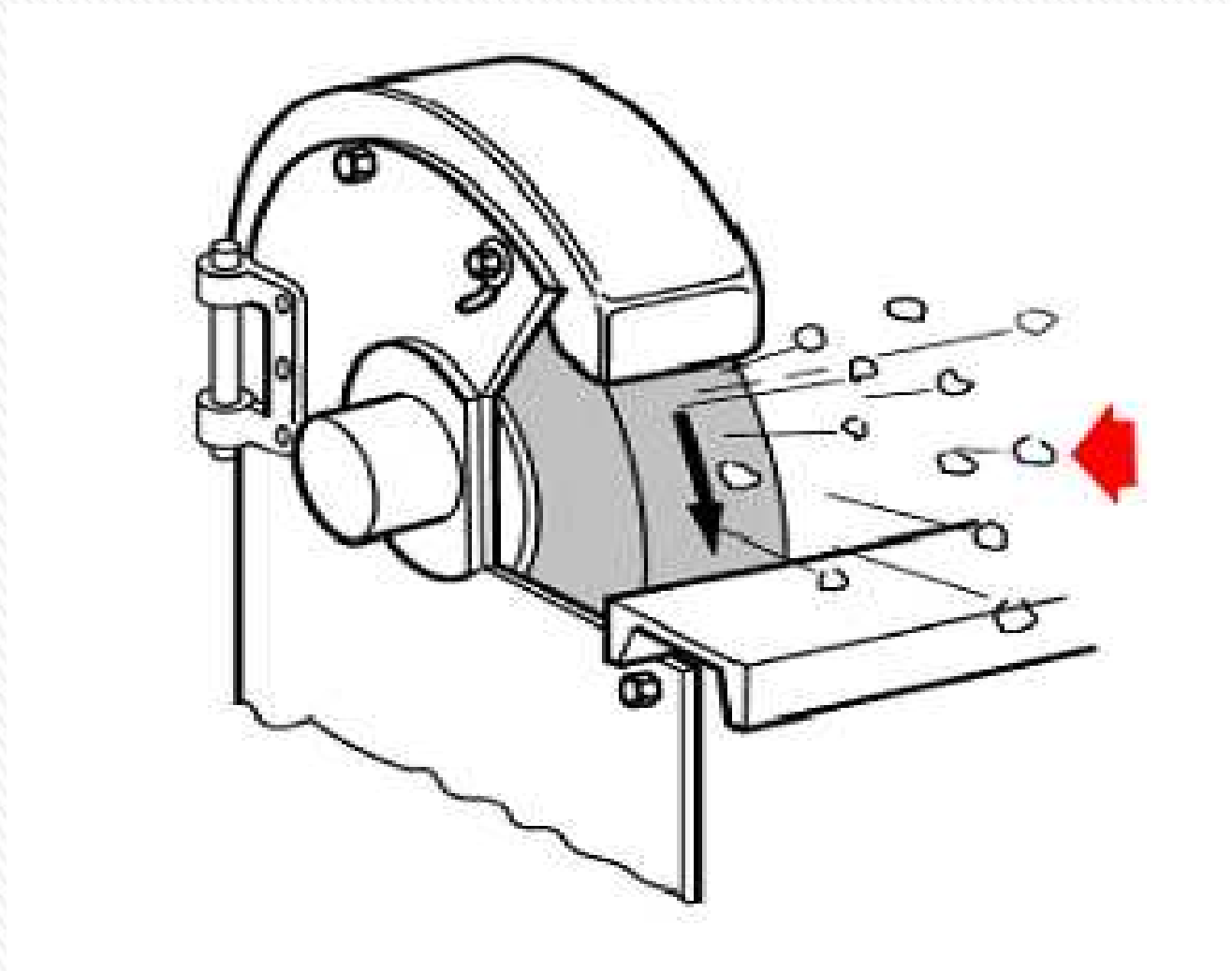
Abrasions

Puncture wounds

Cuts

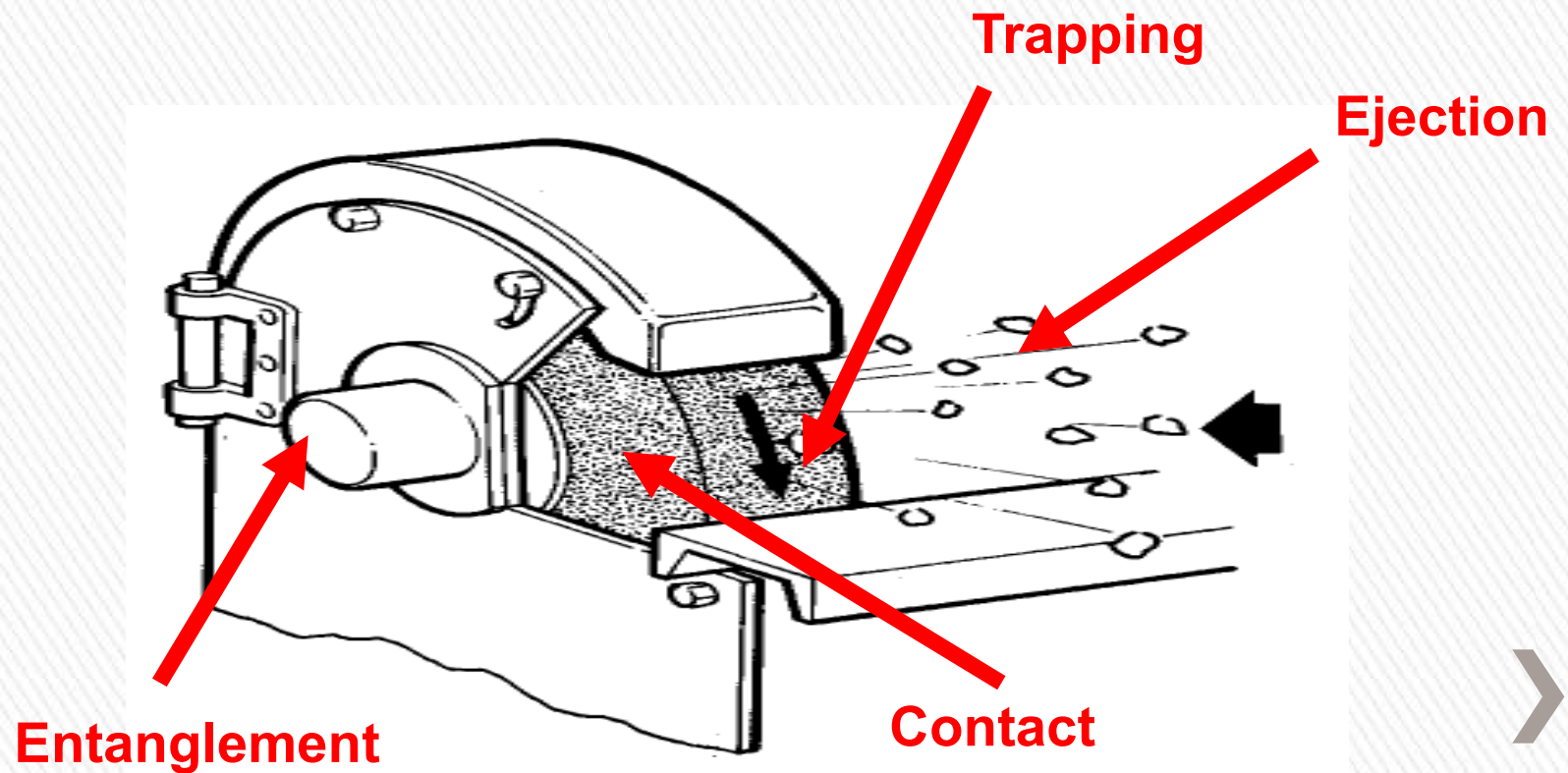


Mechanical Hazards: Ejection

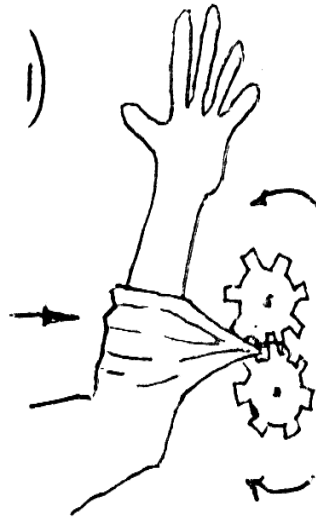


Abrasive Wheel (Grindstone)

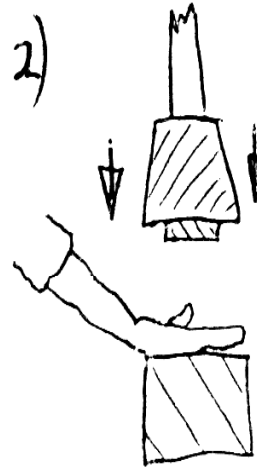
Machinery Mechanical Hazards



Mechanical Hazards Drawings



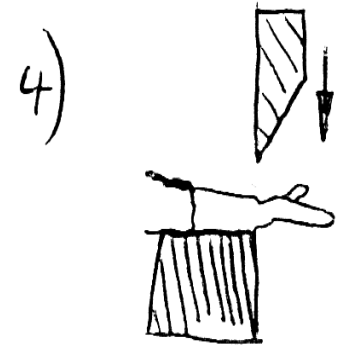
Entanglement



Crushing



Drawing in



Shearing



Non-Mechanical Hazards

- a) Electricity
- b) Hot/cold surfaces
- c) Dust and fumes
- d) Fire/explosion
- c) Noise and vibration
- d) Biological
- e) Chemicals
- f) Radiation
- g) Access and egress
- h) Obstructions
- i) Manual handling
- j) Splinters



Preferred order of Guarding

BS EN ISO 12100-2:2003

Fixed

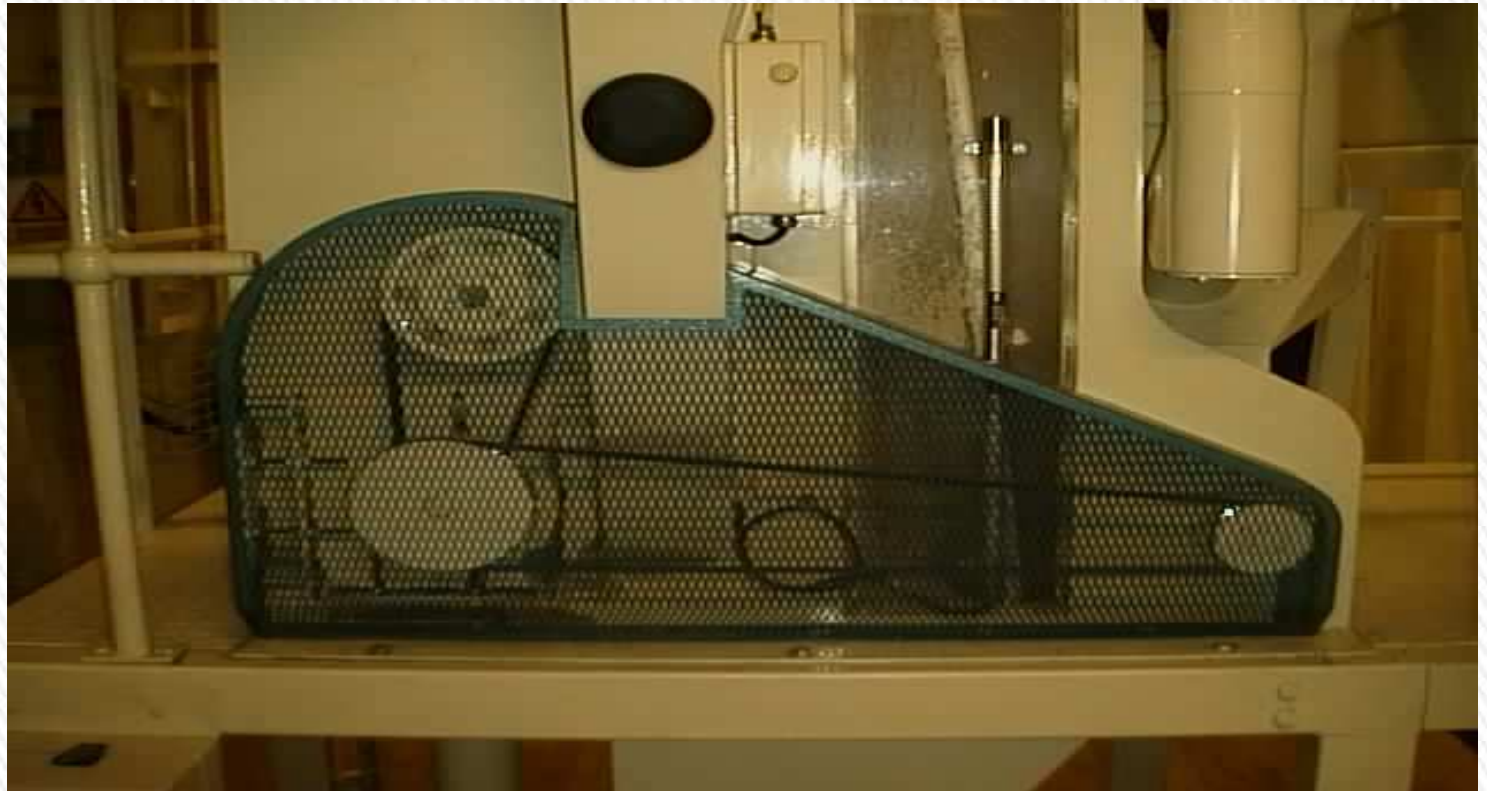
Interlock

Automatic

Trip (Safety device)



Fixed Guard

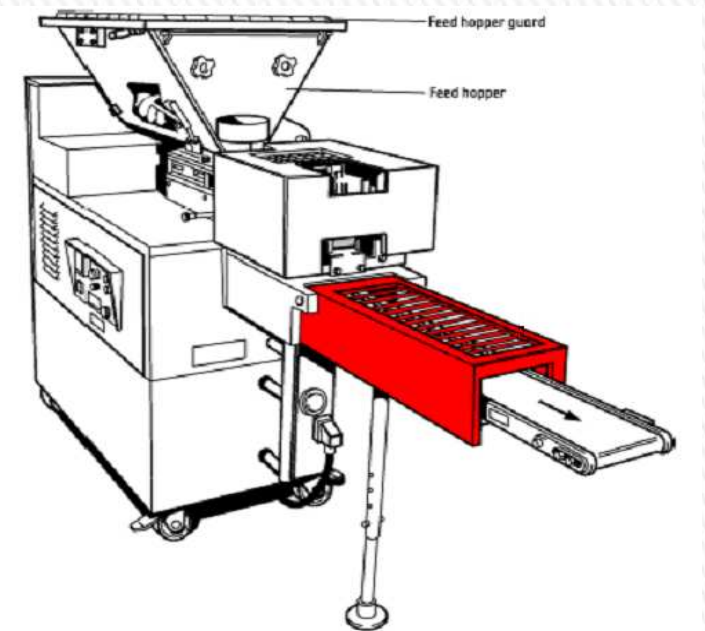


Physical barrier with no moving parts

Not connected to machine controls/motion ➤

Requires tool for removal

Fixed Distance Guard



Fixed Guards



Advantages

Creates a physical barrier

Requires a tool to remove it

No moving parts

Little maintenance

Easy to inspect

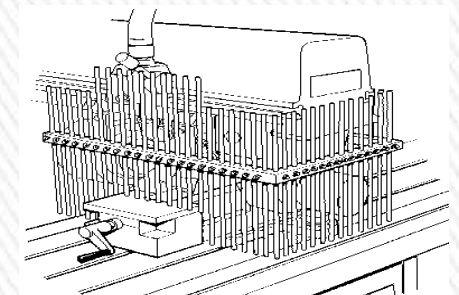
Disadvantages

No protection if removed

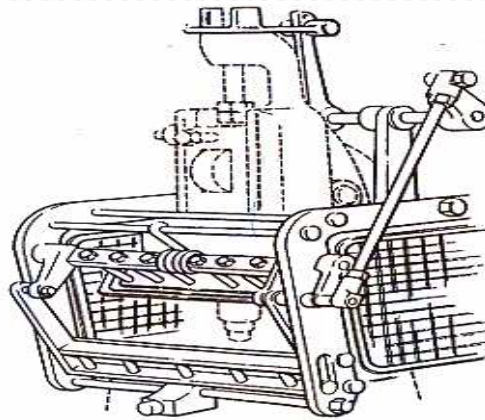
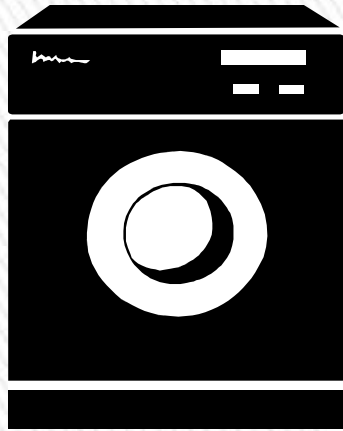
Requires a tool to remove

If solid hampers visual inspection

If solid may cause heat problems



Interlock Guards



Linked to machine controls

Will not operate until guard is closed

Guard cannot be opened or opening causes machine to stop



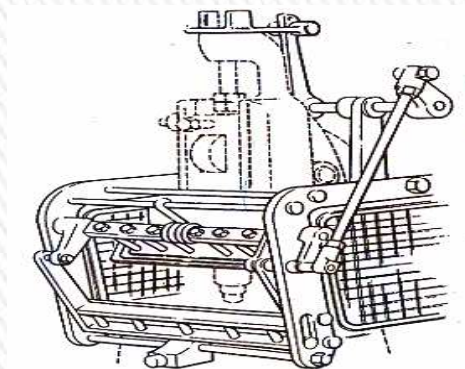
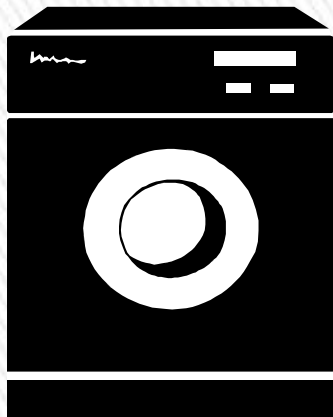
Interlock Guards

Advantages

Convenient for access

Give flexibility of design

A time delay can be built in



Disadvantages

More complex

Difficult to inspect

Difficult to maintain

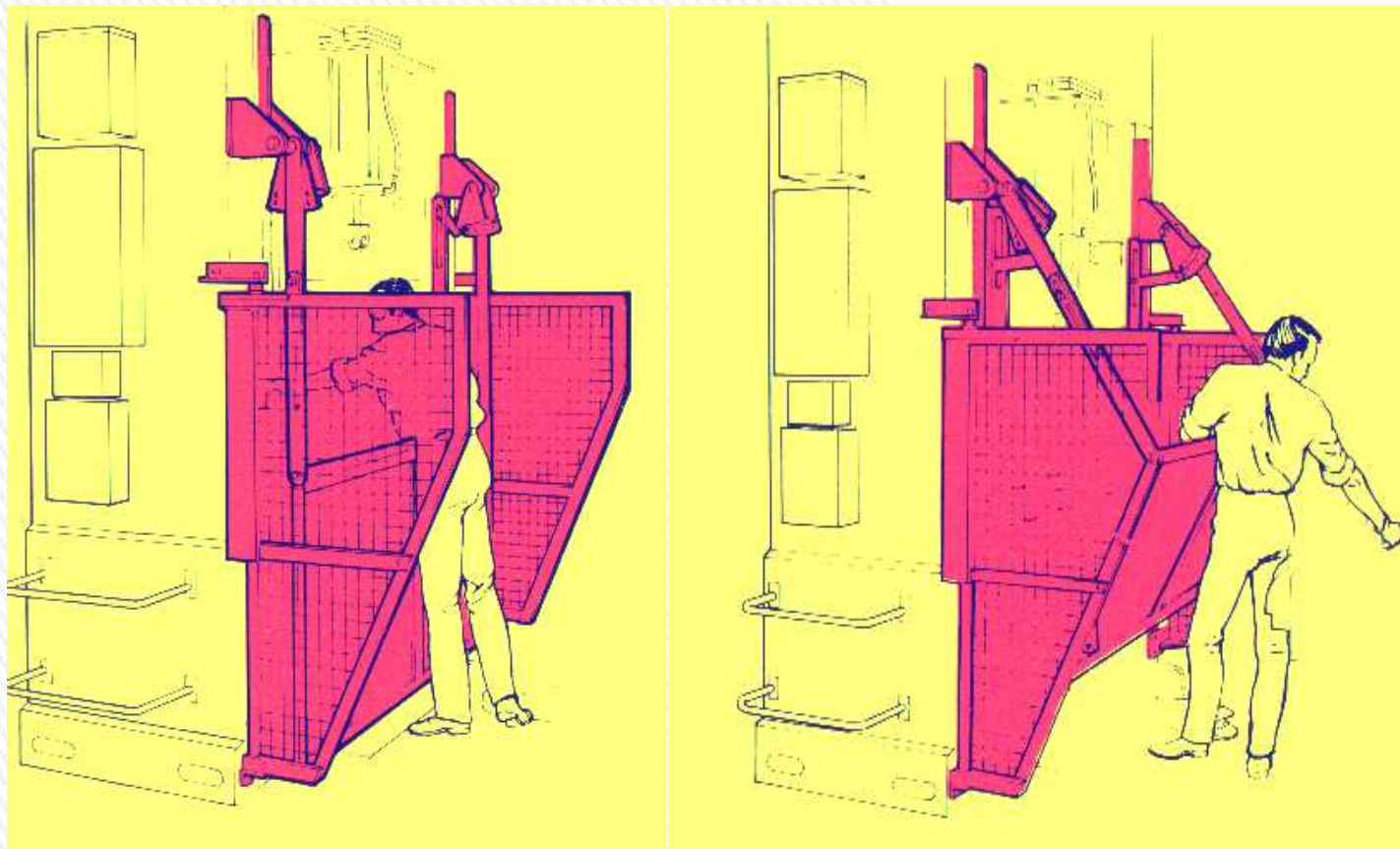
Subject to wear

Subject to operator abuse

If Gate operator can gain entry

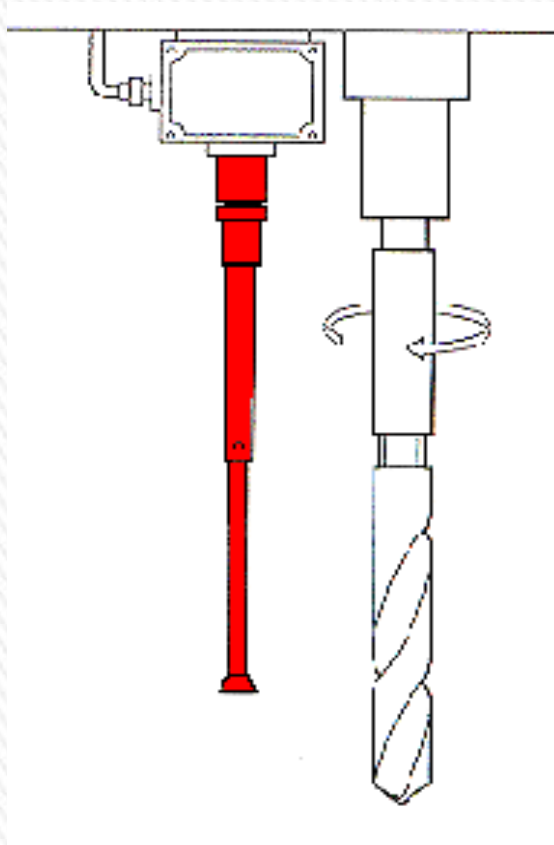


Automatic/Pushaway Guard



Removes person from hazard

Trip Guards (Safety Devices)



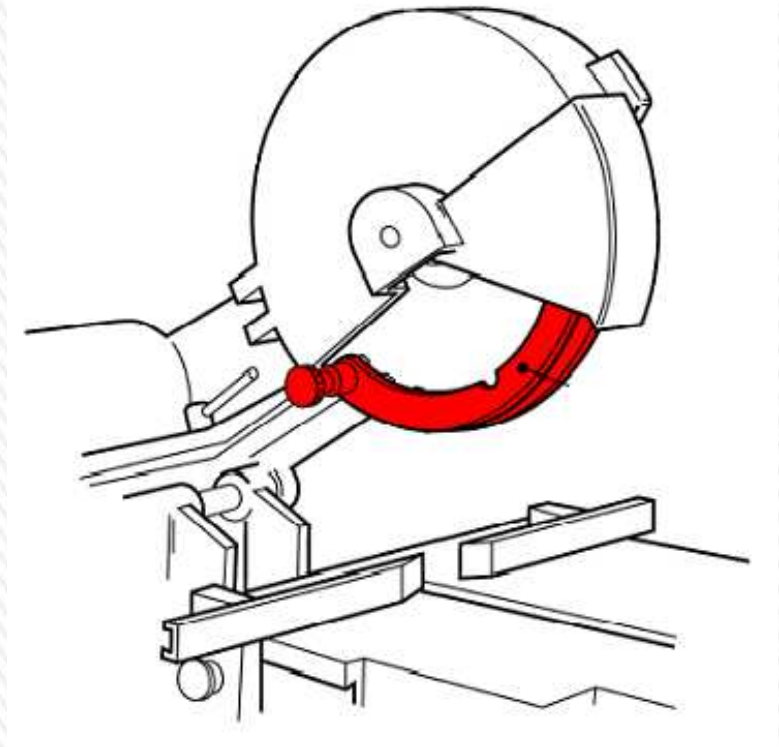
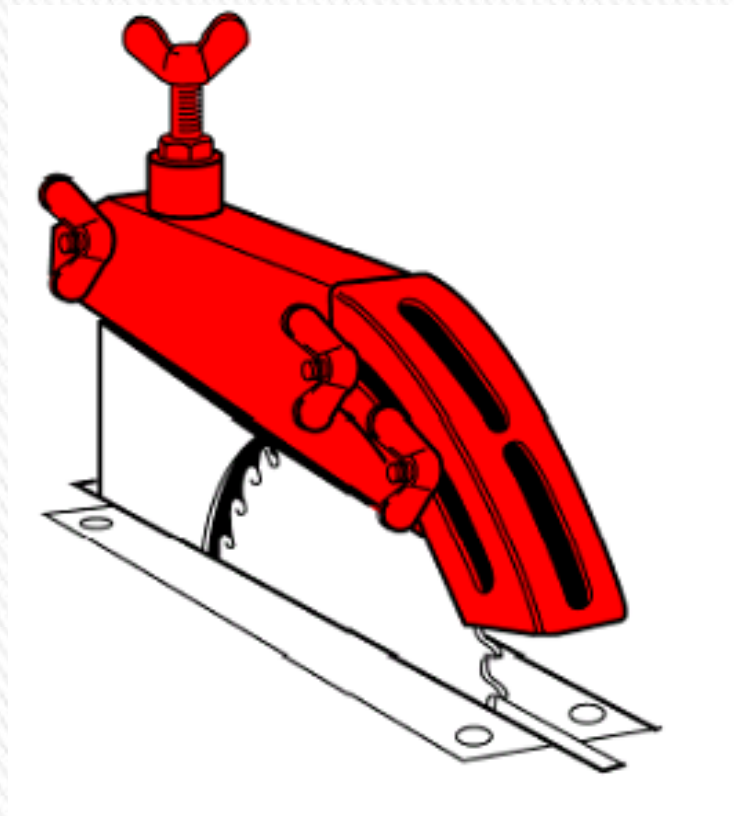
Trip device for drilling machine



Safety Trip Wire



Adjustable Guards



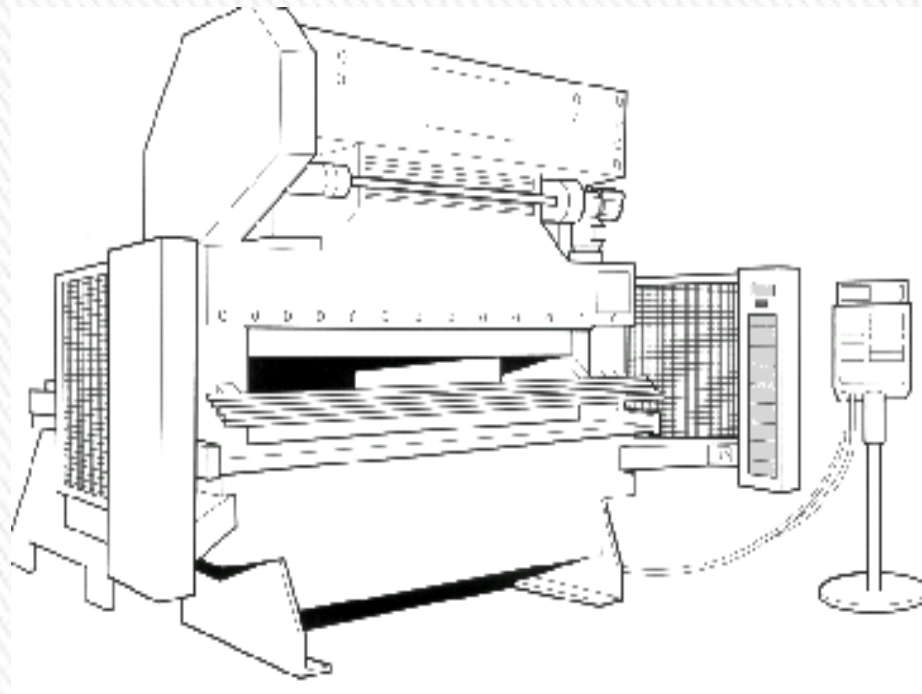
Self Adjusting Guards



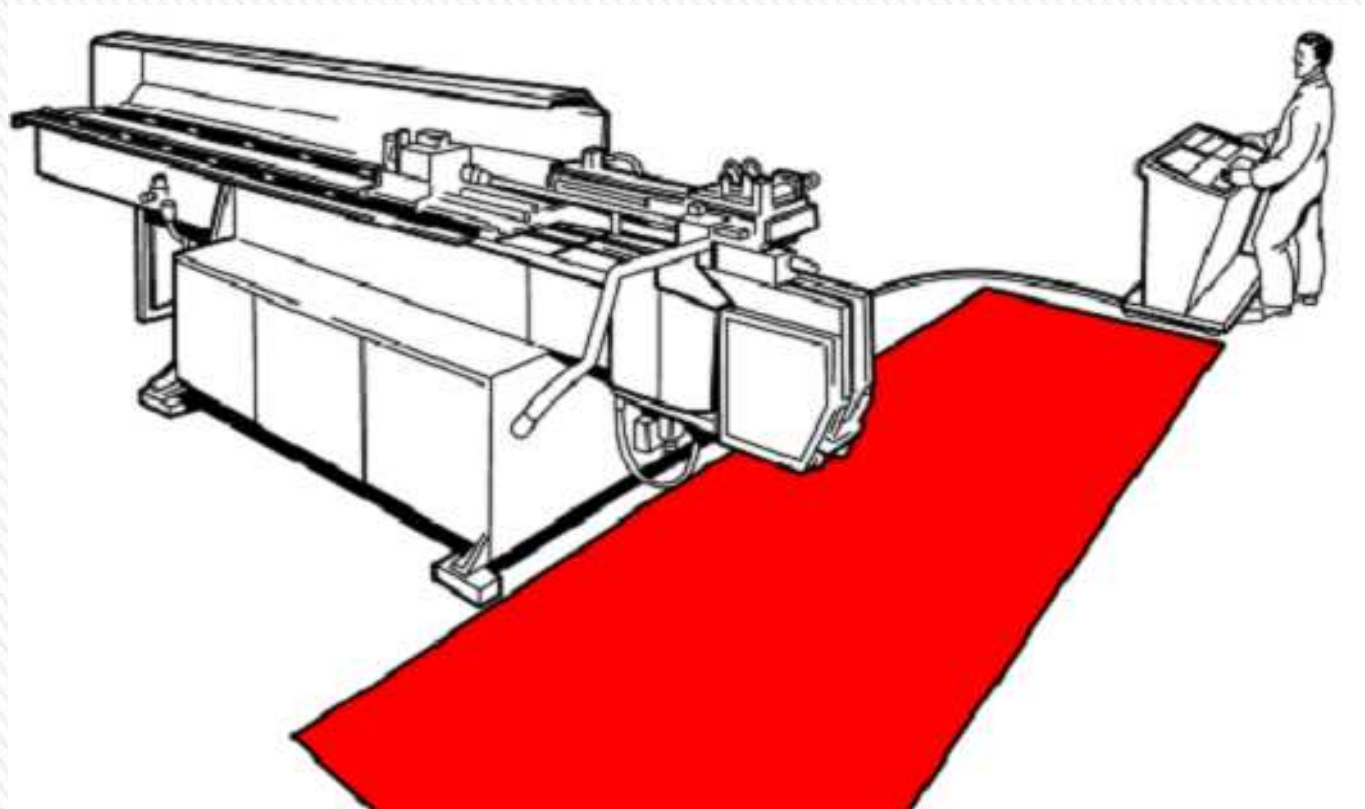
Two Hand Control Device



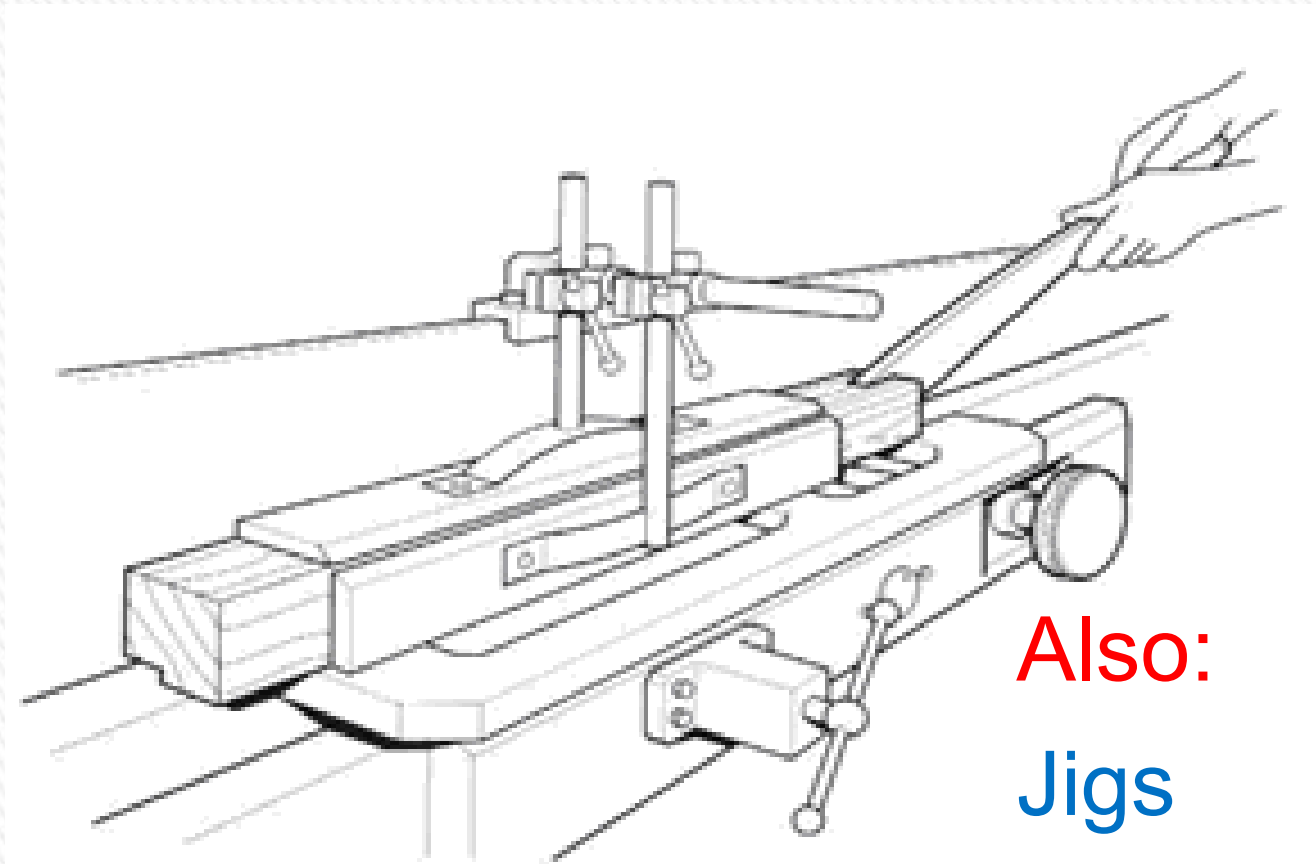
Photo-Electric Guards



Pressure Sensitive Pads



Other Protection Appliances



Push Stick

Also:

Jigs

Holders



Other Machinery

Office Machinery

Photocopiers/Shredders



Manufacturing/Maintenance Machinery

Grinders/Pedestal drills



Agricultural/Horticultural

Strimmers/Mowers



Retail Machinery

Compactors/Checkout conveyors



Construction Machinery

Bench top circular saws Cement mixers



Office Machinery Common Hazards



Common Hazards:

Electrical

Ergonomic

Noise

Stability



Office Machinery

Other Hazards



Other Hazards

Photocopiers	Document Shredders
<i>Drawing in to rollers</i>	<i>Drawing in to cutters</i>
<i>Traps in moving parts</i>	<i>Contact with cutters</i>
Chemicals	Dust
Light	
Heat	

Manufacturing/Maintenance Machinery

Common Hazards

Electricity

Ergonomics

Dust

Stability of machine

Manual handling



Bench-Top Grinder



Pedestal Drill

Manufacturing/Maintenance Machinery



Other Hazards



Bench top grinder	Pedestal Drill
<i>Contact with rotating wheel</i>	<i>Entanglement</i>
<i>Drawing in to trap</i>	<i>Contact (Stabbing/puncture)</i>
<i>Ejection of parts of wheel</i>	<i>Impact (work piece)</i>
<i>Fire and sparks</i>	<i>Cutting from swarf</i>
<i>Vibration</i>	<i>Ejection (Drill/Material)</i>
<i>Noise</i>	

Agricultural/Horticultural Machinery

Common Hazards:

- 1) Biological
- 2) Chemical
- 3) Electricity
- 4) Fire/explosion
- 5) Fumes
- 6) Ergonomics
- 7) Manual Handling
- 8) Noise
- 9) Vibration
- 10) Ejection of materials



Agricultural/Horticultural Machinery



Other Hazards

Cylinder Mower	Strimmer/Chainsaw
<i>Contact with rotating blades</i>	<i>Contact with cutter/saw</i>
<i>Entanglement in blades</i>	<i>Entanglement cutter/saw</i>

Hazards when used on roadside verges:

Struck by vehicles

Vehicle fumes:



Retail Machinery



Waste Compactor



Checkout Conveyor

Common Hazards:

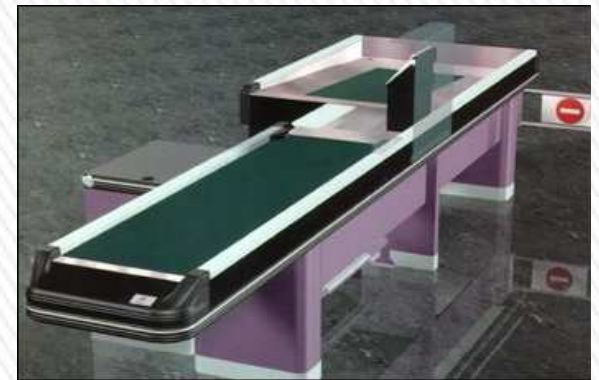
Electricity

Ergonomics

Manual Handling



Retail Machinery



Other hazards

Waste Compactor	Checkout Conveyor
<i>Impact</i>	<i>Drawing in traps</i>
<i>Crushing</i>	Non-Ionising Radiation
Biological infection	



Construction Machinery



Circular Saw



Cement Mixer

Common Hazards:

Dust

Electricity

Stability of machine

Ergonomics

Trapping

Noise

Manual Handling



Construction Machinery



Other Hazards

Cement Mixer	Circular Saw
<i>Entanglement</i>	<i>Drawing in</i>
Chemicals	Contact
	<i>Ejection of materials</i>
	Vibration



Hand-held Tools

Misuse:

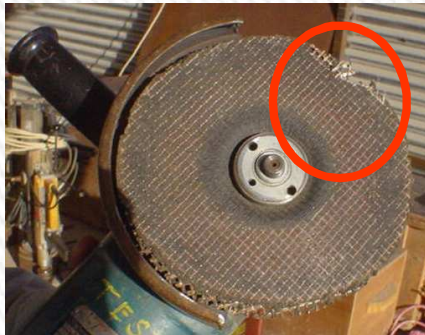
Using screw driver as chisel

Using flat screwdriver to remove Phillips screw

Using too large a chisel



Portable Power Tools



Mechanical Hazards:

Entanglement

Cutting

Abrasions

Ejected materials

Non-mechanical Hazards:

Dust

Electricity

Ergonomics

Manual Handling

Noise

Vibration



Portable Power Tools



Precautions:

Do not carry tool by cord

Never pull the cord to disconnect

Keep cord away from heat

Disconnect when not in use

Keep observers at safe distance

Secure work with clamps

Avoid accidental starting

Use RCDs on electrical tools

Maintain good footing and balance

Wear appropriate PPE

Inspect and maintain tools

Report defects and remove faulty tools



Deadly Maintenance:

Conclusions

- 1) Safe working procedures should be planned
- 2) Personnel should receive training
- 3) Suitable safety equipment to be provided
- 4) Management organisation
- 5) Adequate resources



Areas of Maintenance

- 1) **Planned, scheduled, maintenance**
- 2) **Breakdown, emergency maintenance**



Maintenance Hazards

- Entry into vessels, confined spaces/machines
- Hot work which may cause fire or explosion
- Construction work such as work on roofs or in excavations
- Cutting into pipework carrying hazardous substances
- Mechanical or electrical work requiring isolation of power or fuel supplies
- Work on plant, boilers etc. which must be effectively cut off from possible entry of fumes, gas, liquids or steam

Machinery Hazards

- Unintentional starting of machinery
- Release of stored energy
- Movement due to gravity
- Residual high or low pressure
- Restricted access/egress
- Residues e.g. Toxic, Flammables, Corrosives
- Mechanical hazards
- Heat or cold
- Biological hazards



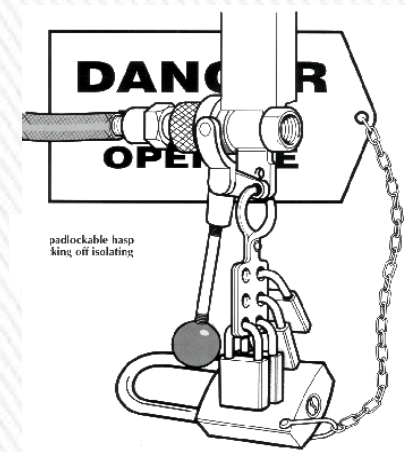
Factors to Consider prior to Maintenance

- Location of equipment
- Capable of being isolated?
- Can stored energy be dissipated?
- Can we segregate?
- Is there safe access and egress?
- Is PPE required?
- Are personnel trained?
- Are there heat or cold problems?
- Are there chemical residues?
- Are there biological hazards?

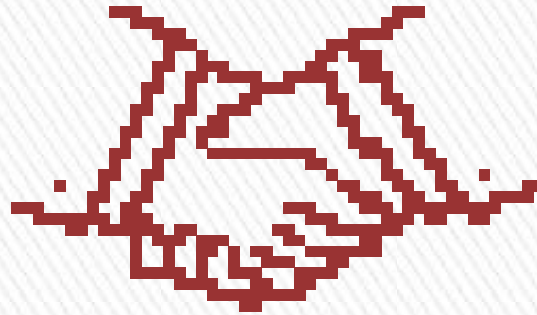


Controlling Machinery Hazards

- Isolate electrical power
- Permit to work
- Isolate pipelines
- Release loads
- Allow hot machinery to cool
- Provide adequate lighting
- means of access
- Provide suitable PPE
- Provide barriers
- Ventilate work area
- Adequate supervision



Best Regards



» Khaled Ismail

