Tools - Hand and Power

- *29 CFR 1926 Subpart I*

Objectives

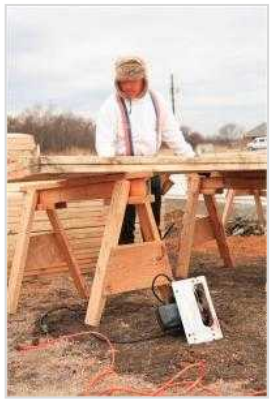
- In this course, we will discuss the following:
  - OSHA's minimum requirements for hand and power tools
  - Safe design, installation and use of tools
  - Hazard identification
  - Abatement methods

Subpart I: Tools – Hand and Power

- **1926.300** – General requirements
- **1926.301** – Hand tools
- **1926.302** – Power-operated hand tools
- **1926.303** – Abrasive wheels and tools

Subpart I: Tools – Hand and Power

- **1926.304** – Woodworking tools
- **1926.305** – Jacks: lever and ratchet, screw, and hydraulic
- **1926.306** – Air receivers
- **1926.307** – Mechanical power-transmission apparatus



Common Hand and Power Tools

Hand Tools	Power Tools
Hammers	Electric/air/powder
Saws	Drill motors
Chisels	Nailers/staplers
Shovels	Impact wrenches
Pry bars	Impact/roto hammers
Pliers	Jackhammers
Screwdrivers	Soil tampers/compactors
Wrenches	Grinders
Measuring tools	Bandsaws/block saws/table saws
	Powder actuated tools
	Concrete mix/vibrators

Basic Tool Safety Rules

- Maintain regularly
- Inspect before use
- Operate according to manufacturers recommendations
- Use appropriate PPE
- Use guards

General Requirements

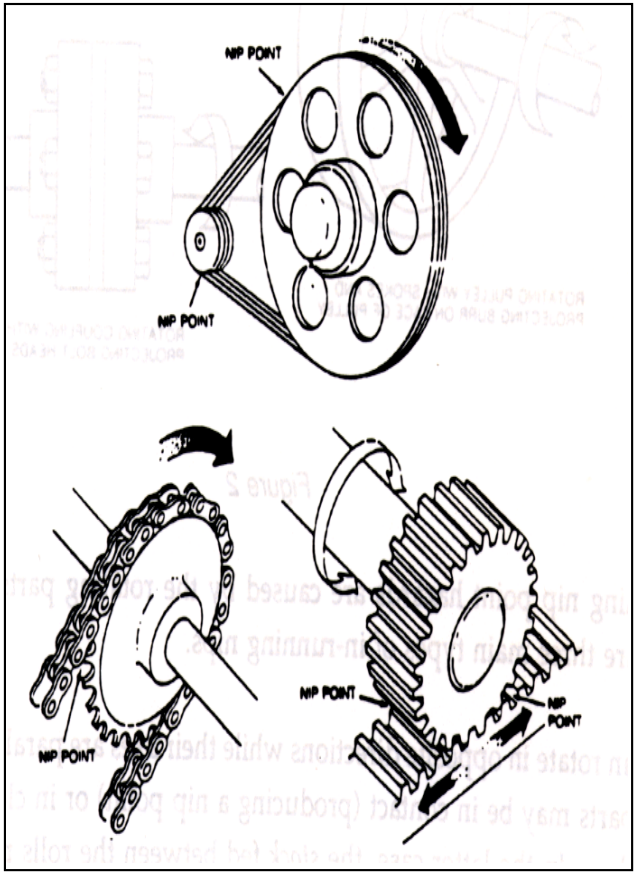
1926.300(a)

- All hand and power tools furnished by the employer or the employee must be maintained in a safe condition.

Guarding

1926.300(b)(2)

- Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, or other reciprocating, rotating or moving parts of equipment shall be guarded if such parts are exposed to contact by employees or otherwise create a hazard.



Guarding

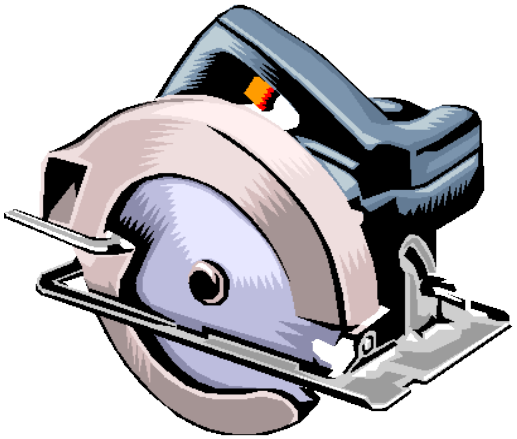
1926.300(b)(3)

- Guarding provided to protect employees from hazards created by:
  - Point of operation
  - Ingoing nip points
  - Rotating parts
  - Flying chips and sparks

Types of Guarding

1926.300(b)

- Fixed guards
- Interlocked guards
- Adjustable guards
- Self-adjusting guards



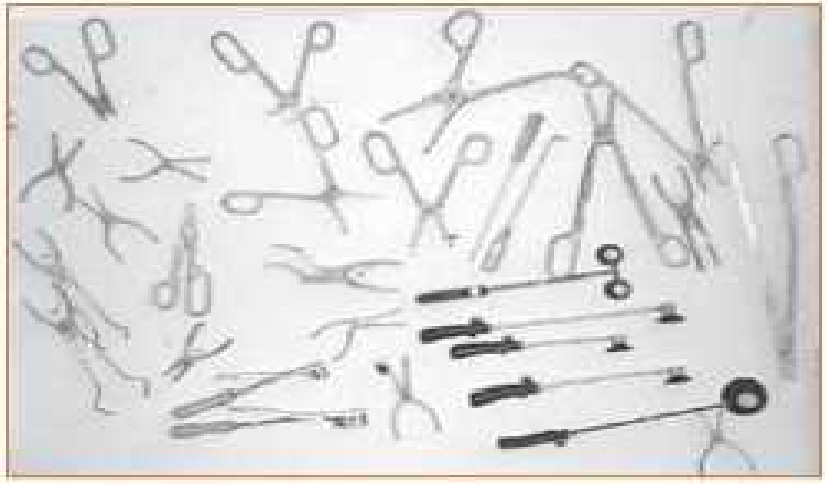
Point of Operation Guarding 1926.300(b)(4)

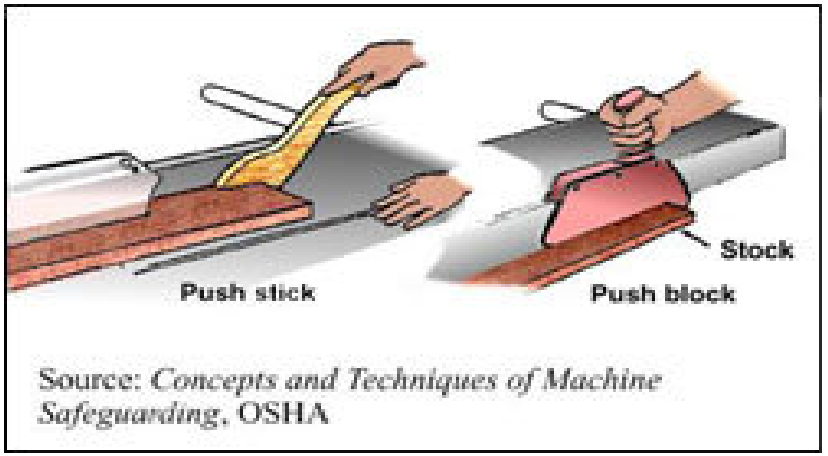
- **Point of operation**
  - Area on a machine where work is actually performed upon the material being processed
  - Shall be guarded

- Special handtools for placing and removing material shall be such as to permit easy handling of material without the operator placing a hand in the danger zone.

Miscellaneous Aids

- Holding tools
- Push stick or block
- Awareness barriers
- Shields





Source: *Concepts and Techniques of Machine Safeguarding*, OSHA

Exposure of Blades

1926.300(b)(5)

- Blades of fans less than 7 feet above floor must be guarded.
- Guard openings no larger than ½ inch.

Anchoring Fixed Machinery

1926.300(b)(6)

- Machines designed for fixed location must be anchored to prevent walking or moving.

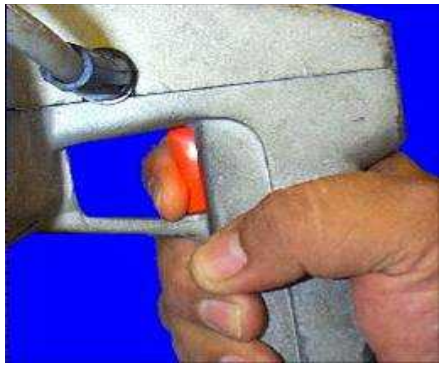
Personal Protective Equipment 1926.300(c)

- Employees exposed to the hazard of falling, flying, abrasive, and splashing objects, or exposed to harmful dusts, fumes, mists, vapors, or gases shall be provided with the personal protective equipment necessary to protect them from the hazard.

Switches

1926.300(d)

- **Positive “on-off” control**
  - Routers, planers, shears, scroll saws, laminate trimmers, jig saws, nibblers



- **Momentary contact “on-off” control**
  - Power drills, grinders, tappers, disc and belt sanders, reciprocating saws

- **Constant pressure switch**
  - Circular saw, chain saw, and percussion tools

Hand Tool Hazards

1926.301(a) - (d)

- Employers shall not issue or permit the use of unsafe hand tools.
- Wrenches shall not be used when jaws are sprung to the point that slippage occurs.
- Impact tools shall be kept free of mushroomed heads.
- Wooden handles shall be kept free of splinters or cracks and shall be kept tight in the tool.

Cracked handle

Mushroomed head

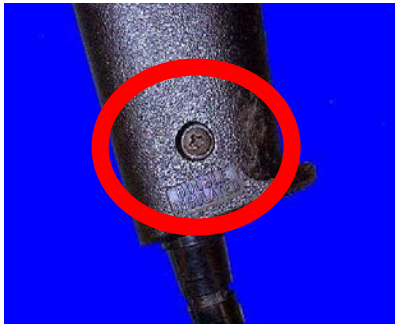
Power-Operated Hand Tools

1926.302(a)(1)

- To protect a worker from electrical shock, tools must:
  - Have a 3-wire cord plugged into a grounded receptacle
  - Be double-insulated

Plug with a grounding pin

Double-insulated markings



Power-Operated Hand Tools 1926.302(a)(2)

- The use of electric cords for hoisting or lowering tools shall not be permitted.

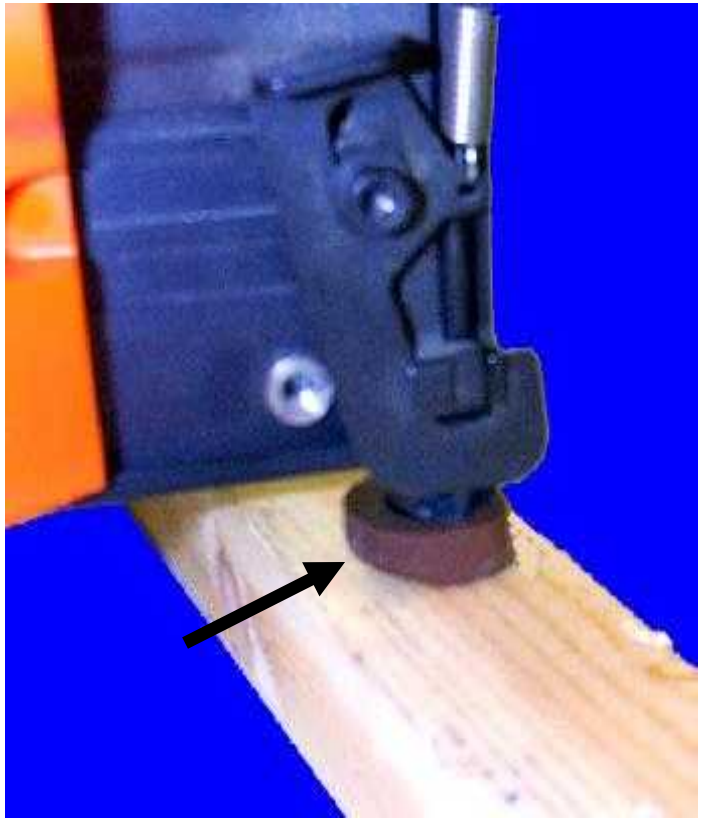
Power-Operated Hand Tools 1926.302(b)(1)

- **Pneumatic power tools**
  - Shall be secured to the hose or whip by some positive means to prevent the tool from becoming accidentally disconnected.

Wire used to secure hose

Power-Operated Hand Tools 1926.302(b)(3)

- **Pneumatic power tools**
  - Must have a safety device on the muzzle to prevent the tool from ejecting fasteners unless the muzzle is in contact with work surface.
    - » Covers tools operating at more than 100 p.s.i



Muzzle in contact with work surface

Power-Operated Hand Tools 1926.302(b)(4)

- **Compressed air** must not be used for cleaning
  - **Exception**
    - » Where reduced to less than 30 p.s.i. with effective chip guarding and PPE

Power-Operated Hand Tools 1926.302(b)(8)

- **Airless spray guns**
  - Operating at 1,000 p.s.i. or more must be equipped with an automatic or visible manual safety device.
  - Safety device prevents pulling trigger until manually released.

Power-Operated Hand Tools 1926.302(b)(10)

- **Abrasive blast cleaning nozzles**
  - Must be equipped with operating valve which must be held open manually.

Figure 8. Worker performing abrasive blasting in an area with poor natural ventilation. The area was somewhat below ground level in sloping terrain. The dust exposure is obscuring the view of the abrasive blasting.

Power-Operated Hand Tools 1926.302(c)(1)

- Fuel powered tools must be stopped while being refueled, serviced, or maintained.

- Fuel must be transported, handled, and stored in accordance with subpart F.

Powder-Actuated Tools

1926.302(e)

- User must be trained.
- Test tool each day before loading to ensure the safety devices are working properly.
- Any tool found not in proper working order, or that develops a defect during use, shall be immediately removed from service.
- Wear suitable ear, eye, and face protection.

Powder-Actuated Tools

1926.302(e)

- Don’t use in explosive or flammable atmosphere.
- Tools shall not be loaded until just prior to intended firing time.

Figure 1 – High-velocity ‘Powder Actuated Tools’

Figure 2 – Low-velocity ‘Powder Actuated Tools’

Powder-Actuated Tools

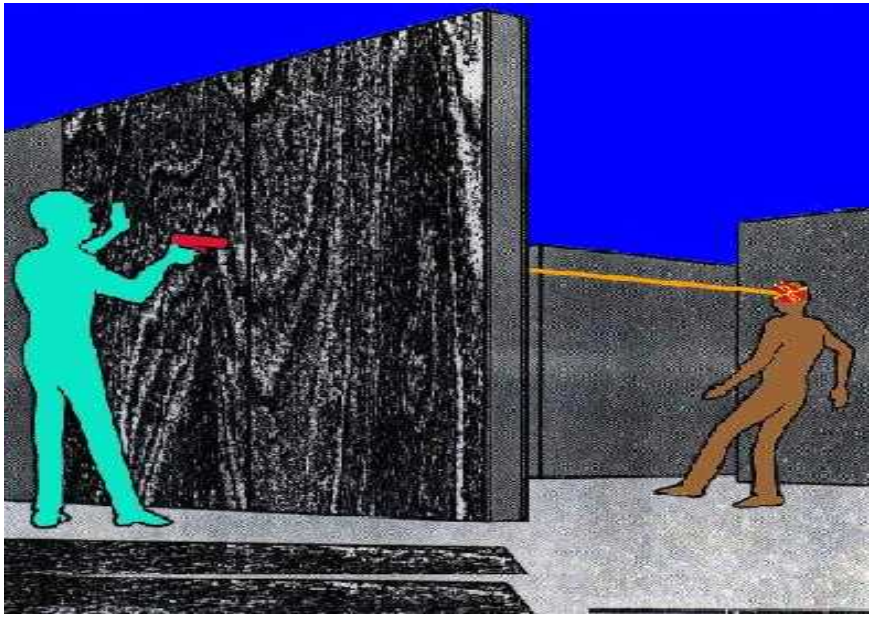
1926.302(e)

- Keep hands clear of the barrel end.
- Never point the tool at anyone.
- Use with the correct shield, guard, or attachment recommended by manufacturer.
- Loaded tools shall not be left unattended.

Fatal Fact

- Employee killed when struck in head by a nail fired from a powder actuated tool.

- Tool operator was attempting to anchor a plywood form in preparation for pouring a concrete wall.



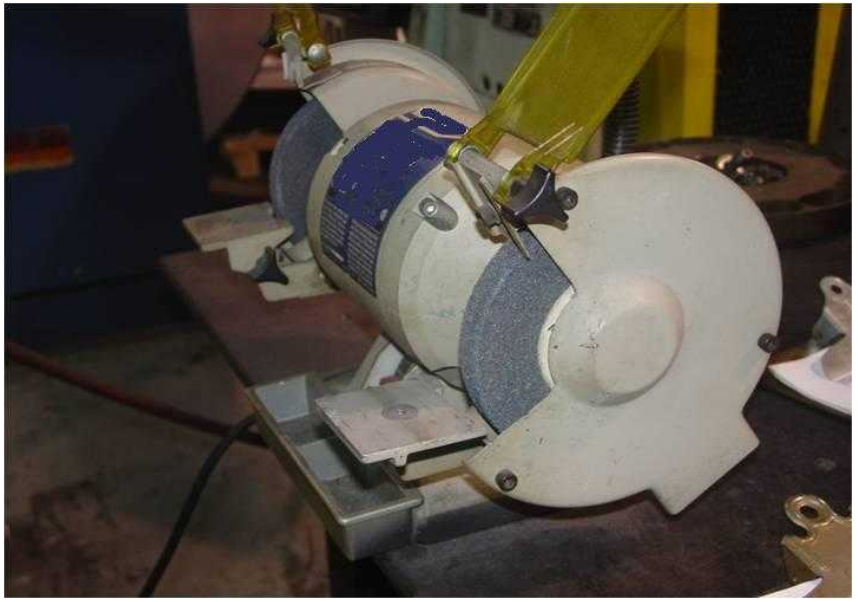
Abrasive Wheel Machinery

1926.300(b)(7)

- The distance between the wheel periphery and the adjustable tongue shall not exceed ¼ inch.

Abrasive Wheels and Tools 1926.303(b)(1)-(2)

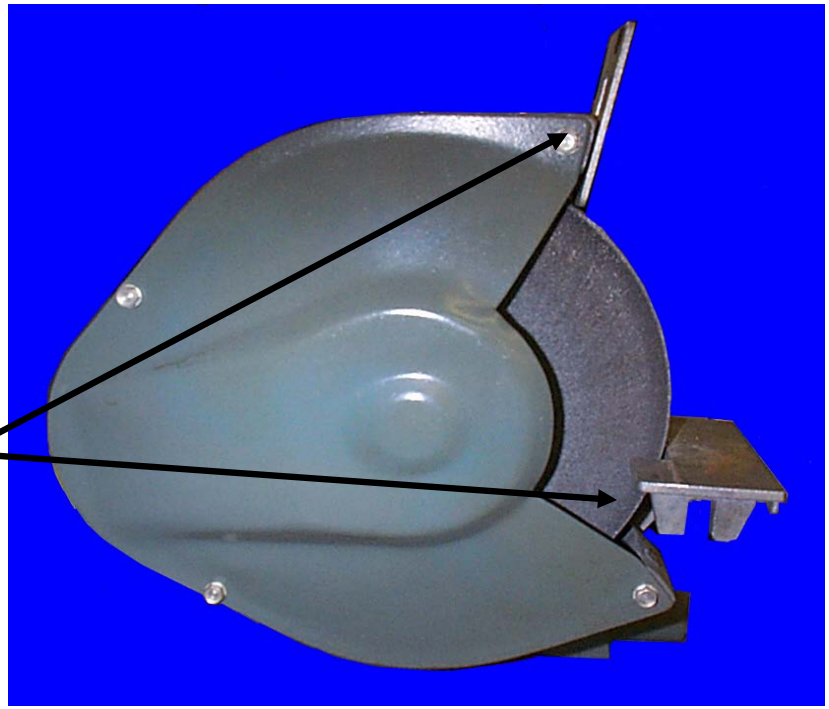
- Abrasive wheels shall be used only on machines provided with safety guards.
- Wheel safety guards cover the spindle end, nut and flange projections.



Use of Abrasive Wheels

1926.303(c)(1)

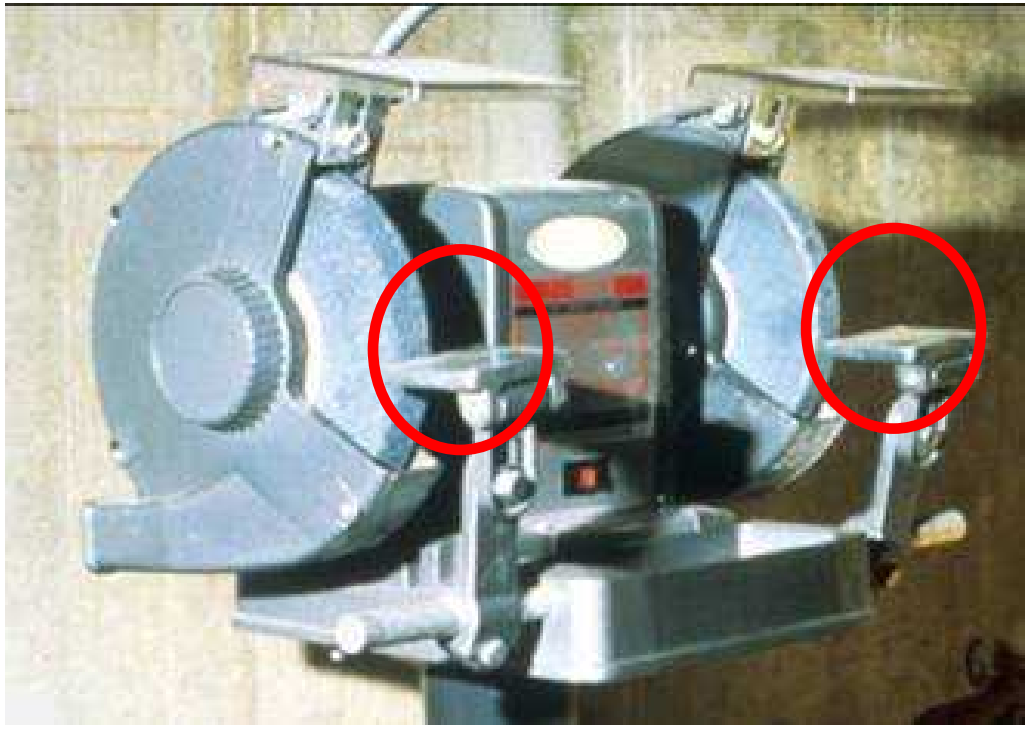
- **Floor and bench-mounted grinders**
  - The angular exposure of the grinding wheel periphery and sides for safety guards used on machines should not exceed 90 degrees or ¼ of the periphery.

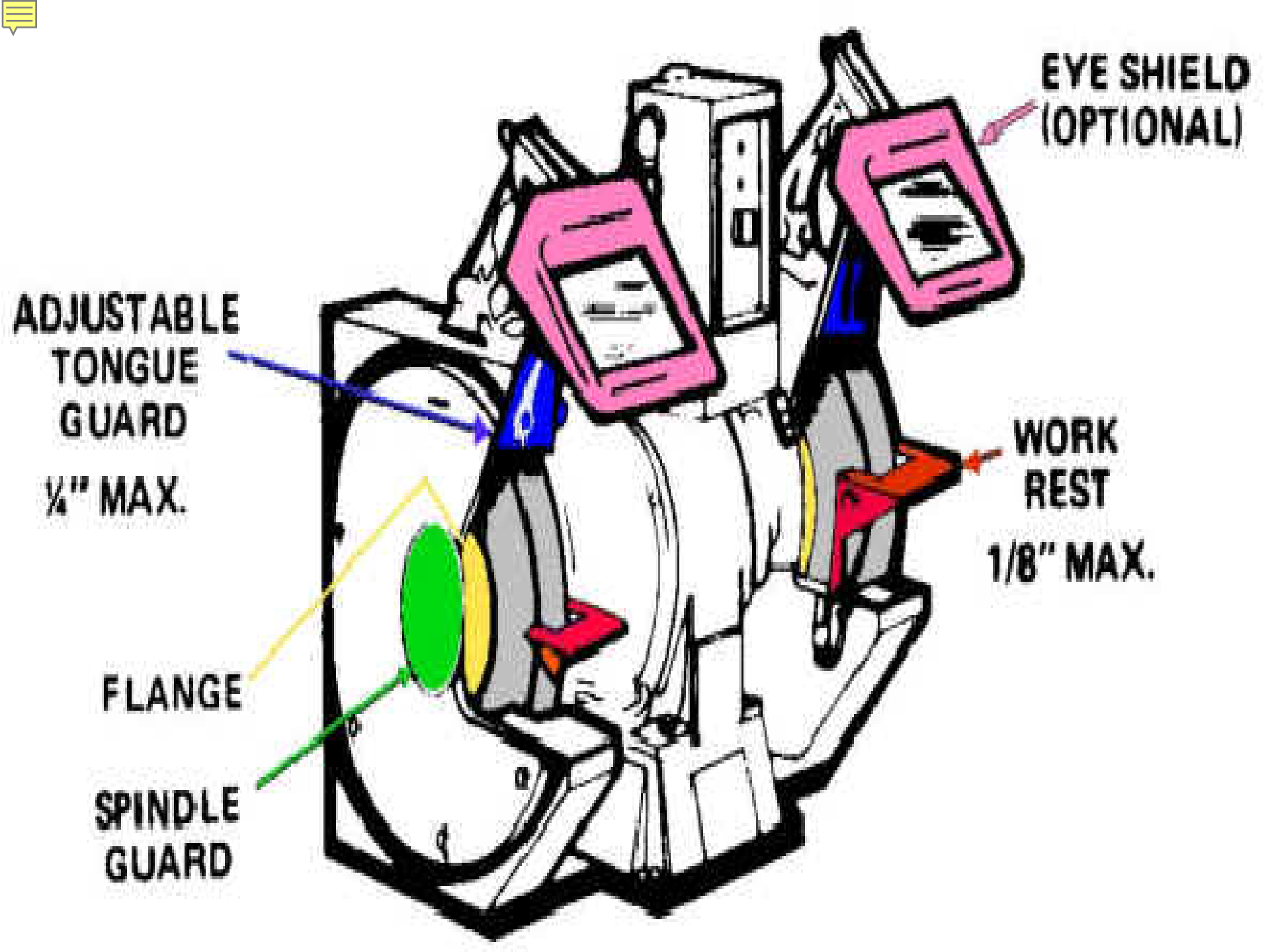


Use of Abrasive Wheels

1926.303(c)(2)

- Work rests must be adjusted closely to the wheel with a maximum opening of ⅛ inch.




EYE SHIELD
(OPTIONAL)
ADJUSTABLE
TONGUE
GUARD
¼" MAX.
WORK
REST
1/8" MAX.
FLANGE
SPINDLE
GUARD

Use of Abrasive Wheels

1926.303(c)(5)

- Vertical portable grinders must have safety guard on tool with a maximum exposure angle of 180 degrees.

Use of Abrasive Wheels

1926.303(c)(5)

- Install the proper type guard located so as to be between the operator and the wheel during use.

- Guard adjusted to deflect broken pieces of wheel away from operator.

Use of Abrasive Wheels

1926.303(c)(7)

- All abrasive wheels must be closely inspected and ring-tested before mounting to ensure that they are free from cracks and defects.

Use of Abrasive Wheels

1926.303(c)(8)

- Ensure the spindle speed does not exceed the maximum speed marked on the wheel.
- Grinding wheels must fit freely on the spindle.
- Tighten the spindle nut only enough to hold the wheel in place.

Maximum R.P.M.

Woodworking Tools

1926.304(a)

- Fixed power driven woodworking tools must be provided with a disconnect switch.
- Switch can either be locked or tagged in the off position.

Woodworking Tools

1926.304(d)

- **Portable circular saws**
  - Must be equipped with guards above and below the base plate or shoe.
  - The upper and lower guard must cover the saw to the depth of the teeth.

Woodworking Tools

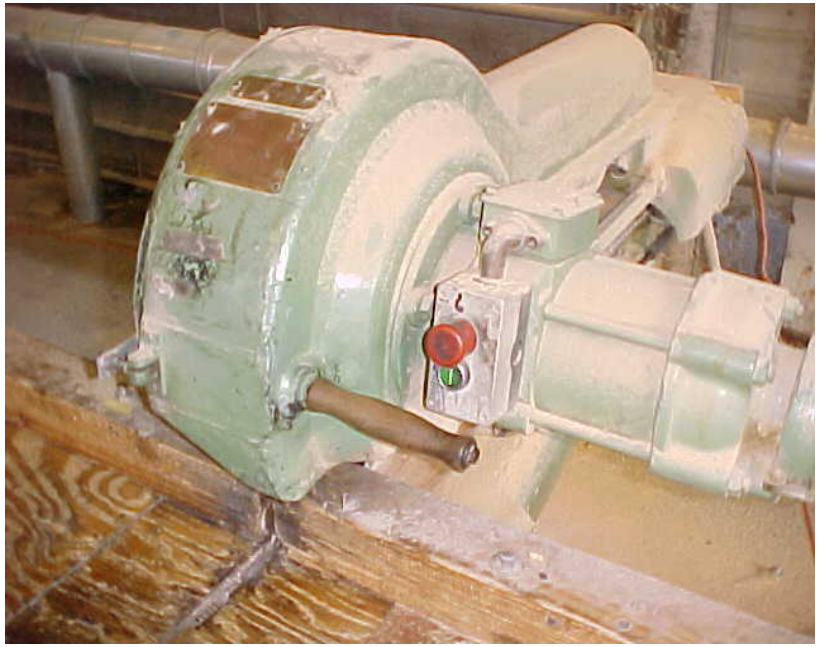
1926.304(d)

- **Portable circular saws**
  - The lower guard must automatically return to the covering position over the blade teeth when tool is withdrawn from the work.

Woodworking Tools

1926.304(f)

- **Portable circular saws**
  - Mechanical or electrical power control provided for operator to cut off power.
  - Located on machine where operator does not have to leave his position at the point of operation.



Woodworking Tools

1926.304(f)

- **Jointers**
  - Hand-fed jointer with horizontal cutting head must have an automatic guard.
    - » Must cover the working side of the fence or gage.
    - » Automatically adjust and cover the unused portion of the head.

No guard

Woodworking Tools

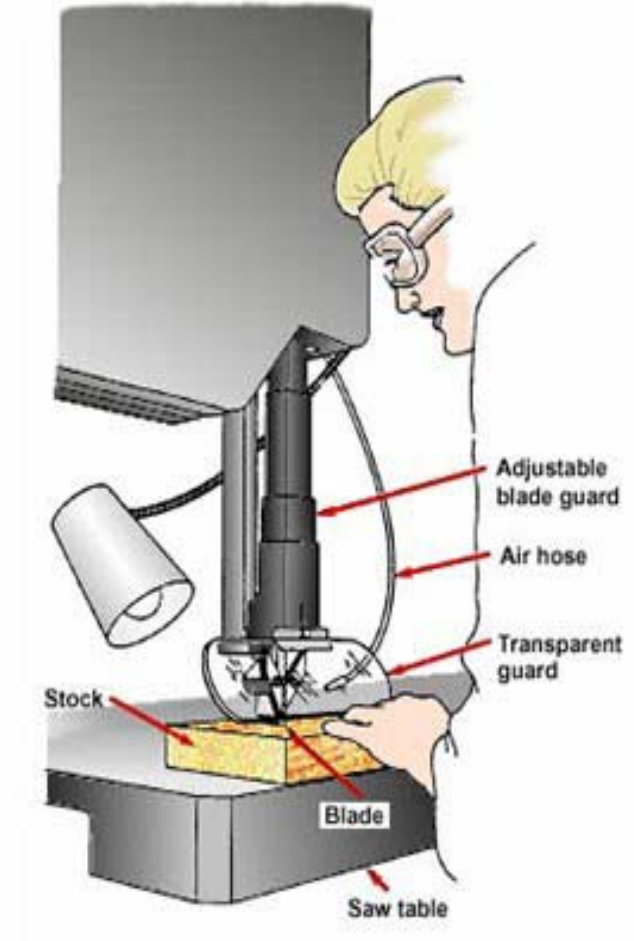
1926.304(f)

- **Hand-fed jointers**
  - With horizontal cutting head must have a guard
  - Must cover the section of head back of the gage or fence

Woodworking Tools

1926.304(f)

- **Bandsaws and band resaws**
  - All portions of saw blade must be enclosed or guarded *except* working portion between guide rollers and the table.
  - Bandsaw wheels must be fully encased.



Woodworking Tools

1926.304(g)(1)

- **Radial saws**
  - Guard to prevent the operator from coming in contact with the rotating blade.

Woodworking Tools

1926.304(g)(1)

- **Radial saws**
  - Lower portion of blade must be guarded on both sides.
    - » Guarded to the full diameter of the blade.
    - » Will adjust itself to the thickness of the stock.

Woodworking Tools

1926.304(i)(1)

- **Hand-fed ripsaws**
  - Provided with a hood guard.
  - Hood must completely enclose portion of saw blade above the table.
  - Mounting must be strong enough to resist any reasonable side thrust.

Woodworking Tools

1926.304(i)(1)

- **Hand-fed ripsaws**
  - Hood guard must automatically adjust itself to thickness of material being cut.
  - Remain in contact with material.

Woodworking Tools

Jacks

1926.305(a)(1)

- The manufacturer's rated capacity must be marked on all jacks and must not be exceeded.

- All jacks must have a positive stop to prevent overtravel.

Jacks

1926.305(c), (d)(1)(i)

- **Operation**
  - Base on a firm, level surface
  - Where possibility of slippage
    - » Use wood block between cap and load
    - » Crib, block, or secure load after it is raised

Jacks

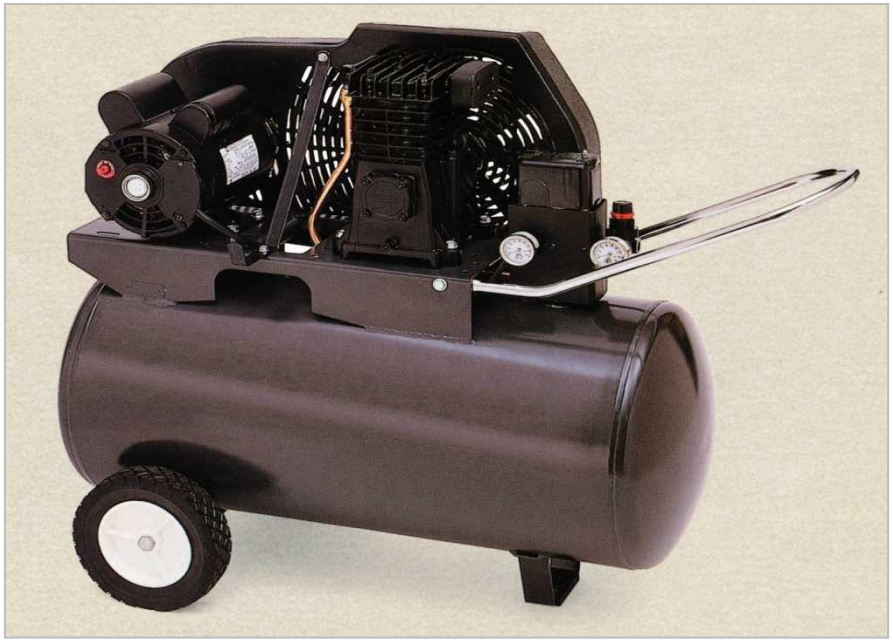
1926.305(d)(1)(iii)-(vi)

- **Maintenance**
  - Properly lubricate and inspect at regular intervals.
  - Repair or replacement parts shall be examined for possible defects.
  - Defective jacks removed from service until repaired.

Air Receivers

1926.306(a)(2)

- Air receiver must be constructed in accordance with A.S.M.E. Boiler and Pressure Code Section VIII – 1968.



Air Receivers

1926.306(b)(1)

- Installed so that all drains, handholds, and manholes are easily accessible.

Air Receivers

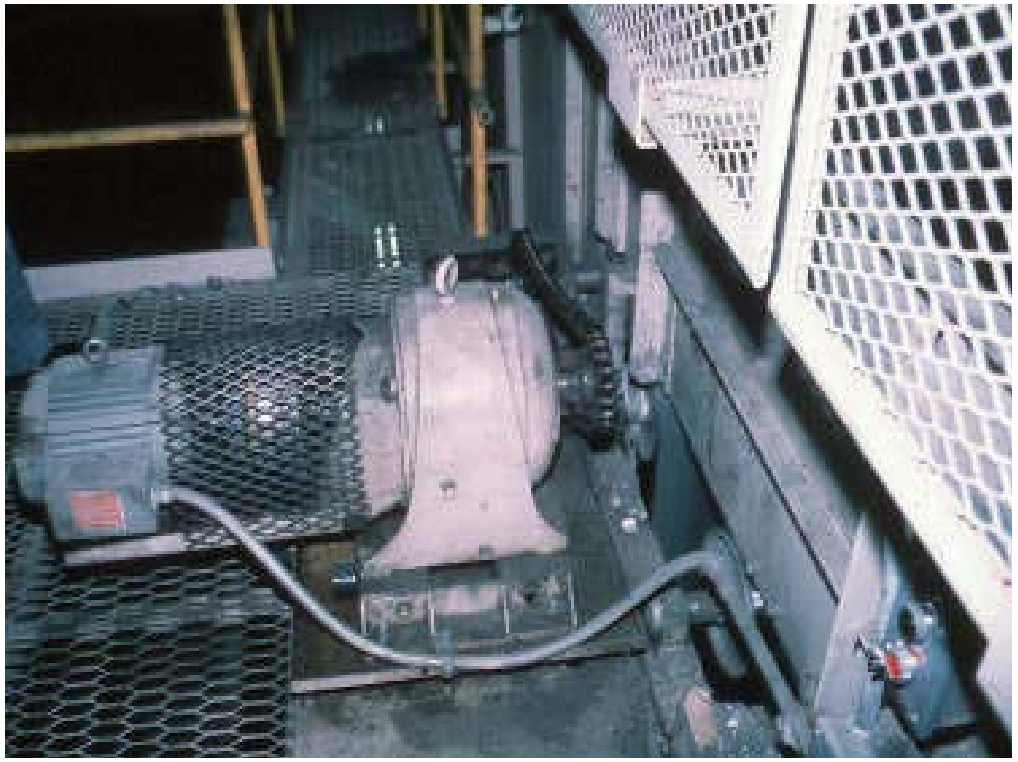
1926.306(b)(3)(i)-(iv)

- Must be equipped with an indicating pressure gage and at least one spring-loaded safety valve.
- Safety valves must be tested frequently and at regular intervals to determine operating condition.

Mechanical Power - Transmission Apparatus

1926.307(c)(2)(i)

- Exposed parts of horizontal shafting (7) feet or less from floor or working platform must be guarded.



Mechanical Power - Transmission Apparatus

Location where victim became caught.

Mechanical Power – Transmission Apparatus

1926.307(c)(4)(i)

- Must not project more than ½ the diameter of the shaft or unless guarded by nonrotating caps or safety sleeves.

Mechanical Power – Transmission Apparatus

1926.307(d)(1)

- Any parts of pulleys which are (7) feet or less from floor or working platform shall be guarded.

Mechanical Power – Transmission Apparatus

1926.307(e)(1)(i)

- Where both runs of horizontal belts are 7 feet or less from floor level
  - Guard must extend at least 15 inches above the belt.
- Horizontal belt with both runs 42 inches or less from floor must be fully enclosed.

Mechanical Power – Transmission Apparatus

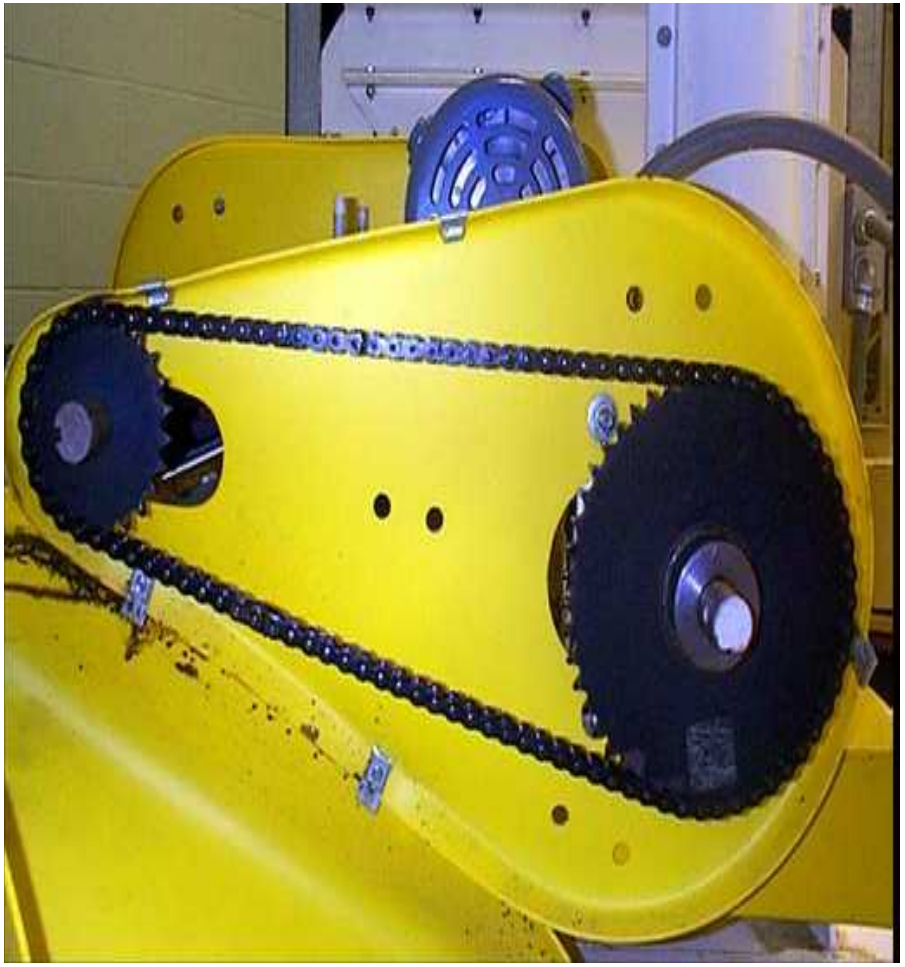
1926.307(e)(3)

- Vertical and inclined belts less than 7 feet above floor or platform must be guarded.

Mechanical Power – Transmission Apparatus

1926.307(f)(3)

- All sprocket wheels and chains shall be enclosed unless more than 7 feet above floor or platform.



Summary

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- Safe design, installation and use of tools
- Hazard identification
- Abatement methods

Thank You For Attending!

Final Questions?