



Lunch Box Safety Webinar

Safety Over Sandwiches

July 9

Machine Guarding in Grain Handling Facilities

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Today's Discussion

- ▶ Hazardous Machine/Equipment Motions
- ▶ Hazardous Activities
- ▶ Hazard Analysis
- ▶ Machine Guards
- ▶ Conveyor Hazards/Guarding
- ▶ Rotating Shafts
- ▶ Mechanical Power Transmission Apparatus
- ▶ Shovel Pockets
- ▶ Trippers
- ▶ Drill Press
- ▶ Bench Grinder

Evaluation

- ▶ Are we compliant?
- ▶ Are we doing enough?
- ▶ Is there anything we can do to improve?



Hazardous Motions - Rotating

- ▶ Rotating motions generated by:
 - ▶ Rotating collars
 - ▶ Couplings
 - ▶ Clutches
 - ▶ Shafts and shaft ends
 - ▶ Spindles
- ▶ Rotating motions can grip clothing and force a worker's body into a dangerous location.

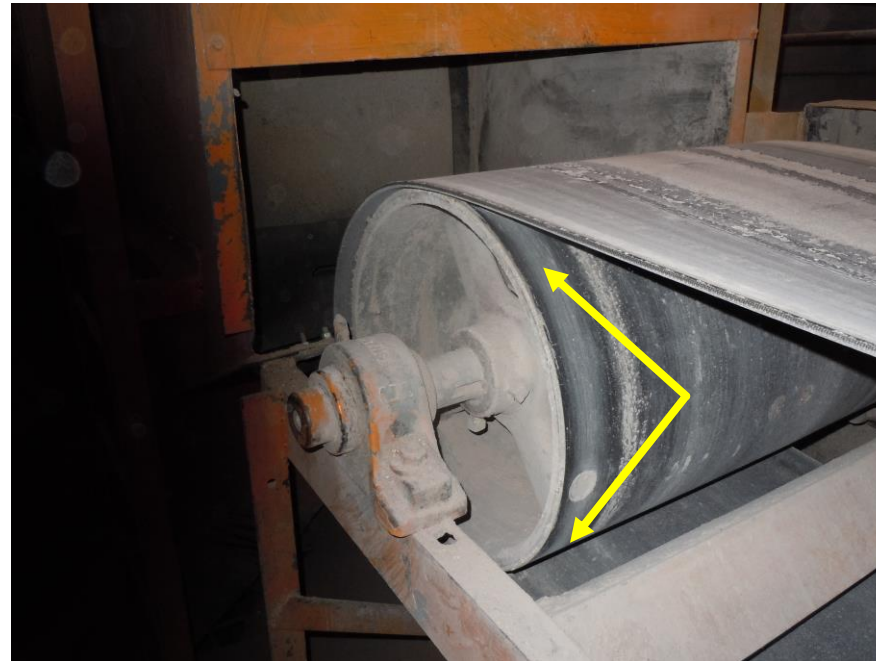


Hazardous Motions - Transversing/Reciprocating

- ▶ Back and forth or up and down motion that can strike or entrap a worker between moving parts and a fixed object.
- ▶ Straight or continuous line that may strike or catch an employee in a shear point created by a moving part and a fixed object.

Hazardous Motions - Inward Running Nip Points

- ▶ Also known as pinch points
- ▶ Two parts move together and at least one part moves in a circular motion.
- ▶ Occur whenever machine parts move toward each other or when one part moves past a stationary object
- ▶ Examples - gears, rollers, belt drives, pulleys.



Hazardous Activities

- ▶ Machine set-up
- ▶ Machine inspection
- ▶ Normal production
- ▶ Operations
- ▶ Clearing jams
- ▶ Cleaning a machine
- ▶ Lubricating machine parts
- ▶ Scheduled and unscheduled maintenance



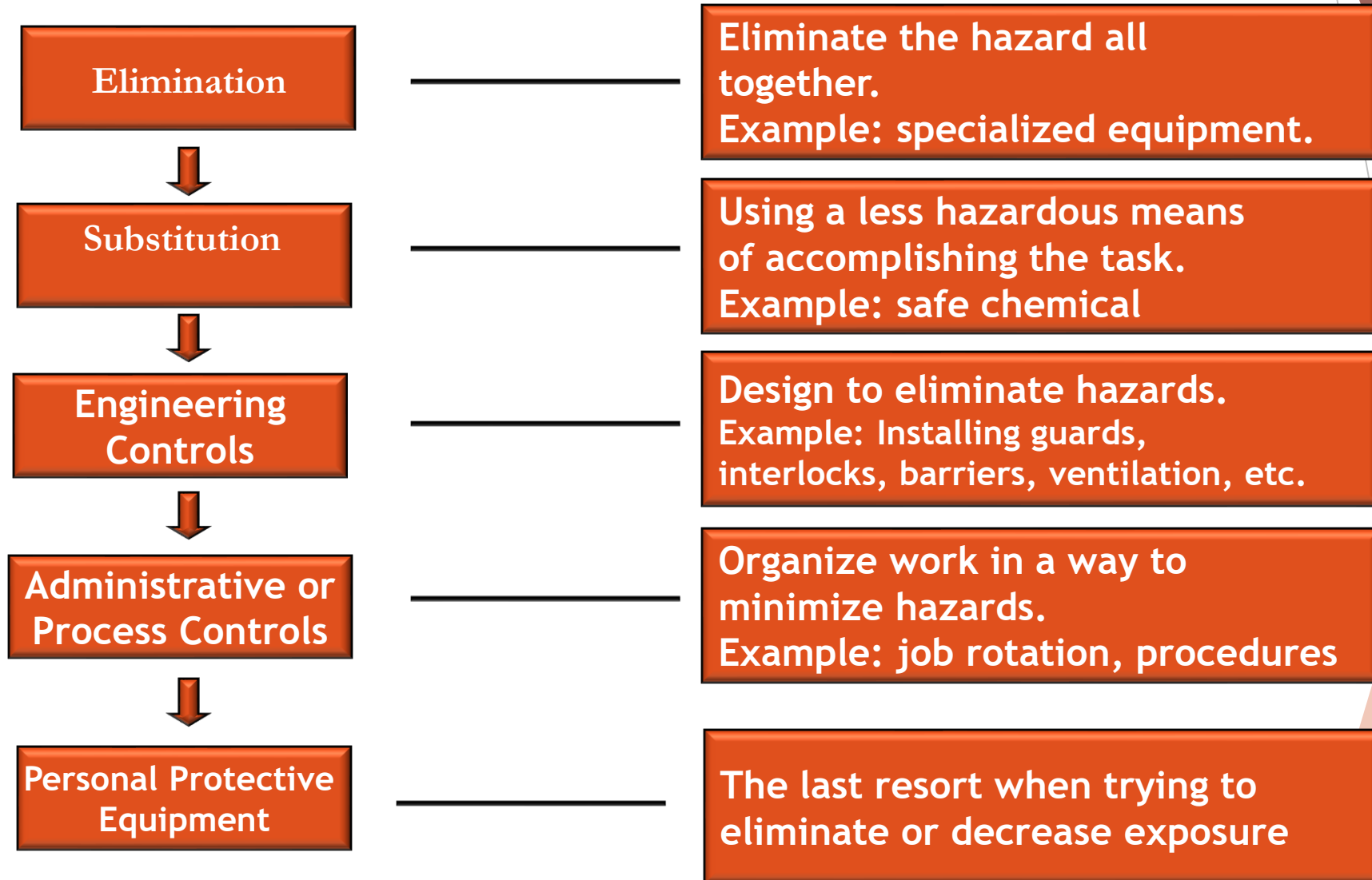
Several of these activities are considered servicing or maintenance requiring lockout tagout

Hazard Analysis

- ▶ Perform a hazard analysis (machine guarding analysis) at your location.
- ▶ Routinely
- ▶ During design process and after equipment installation
- ▶ Prior to each job or task
- ▶ Hazard analysis focuses on the relationship between the work, the task, tools, and the work environment.



Hierarchy of Controls



Machine Guards

Types

Machine Guards

- ▶ Prevent injuries and fatalities
- ▶ Rule of thumb - any part, function or process that could cause injury should be safeguarded.
- ▶ Guard - barrier that prevents exposure to an identified hazard (hazard analysis).
 - ▶ Preferred method to protect employees.
 - ▶ Physical barrier that enclose dangerous machine parts and prevent workers from coming into contact with them.



General Requirements - All Machines

- ▶ 1910.212(a)(1) Types of guarding. One or more methods of machine guarding shall be provided to protect the operator and other employees in the machine area from hazards such as those created by point of operation, ingoing nip points, rotating parts, flying chips and sparks. Examples of guarding methods are-barrier guards, two-hand tripping devices, electronic safety devices, etc.
- ▶ 1910.212(a)(2) General requirements for machine guards. Guards shall be affixed to the machine where possible and secured elsewhere if for any reason attachment to the machine is not possible. The guard shall be such that it does not offer an accident hazard in itself.

Types of Guarding

- ▶ Fixed Guard
 - ▶ Barriers that do not allow workers to reach the dangerous area.
 - ▶ Permanently encloses the hazardous area or point of operation.
 - ▶ The **point of operation** is where work is performed on the material, such as cutting, shaping, boring, or forming of stock.



Types of Guarding

- ▶ Adjustable Guards
 - ▶ Barrier that adjusts for a variety of production operations
- ▶ Interlocking barrier guard
 - ▶ Shuts off or disengages power and prevents machine start-up when the guard is open.



Conveyors

Hazards

Conveyor Types

- ▶ Types of conveyors
 - ▶ Powered
 - ▶ Live roller
 - ▶ Screw
 - ▶ Drag
 - ▶ Belt



Conveyor Hazards

- ▶ Conveyor related injuries typically involve a worker's hands or fingers becoming caught in:
 - ▶ Nip points
 - ▶ Shear points
- ▶ Injuries typically occur during:
 - ▶ Cleaning
 - ▶ Freeing jammed material
 - ▶ Clothing becoming caught in a conveyor, which pulls employee into equipment

Conveyor Related Injuries

- ▶ Also caused by improperly guarded:
 - ▶ Gears.
 - ▶ sprockets and chain drives.
 - ▶ horizontal and vertical shafts.
 - ▶ Belts and pulleys.
 - ▶ Power transmission couplings.
- ▶ Workers can also be injured or killed underneath conveyors or in areas around lubrication fittings, tension adjusters and other equipment with hazardous energy sources.



Belt Conveyors

- ▶ Belt conveyor drive mechanisms, conveyance related equipment and the following belt conveyor areas are considered hazardous:
 - ▶ The conveyor take-up and discharge ends
 - ▶ Where the belt or chain enters or exit and in-running nip point
 - ▶ Where belts wrap around pulleys
 - ▶ Snub rollers where the belt changes direction such as take-ups
 - ▶ Where multiple conveyors are adjoined
 - ▶ On transfer or deflectors used with belt conveyors



Guarding Belt Conveyors

- ▶ Hazards associated with nip and shear points must be guarded
- ▶ Side guards can be installed to prevent employee contact with power transmission apparatus, in-going nip points and the conveying medium.
- ▶ Secondary safeguarding methods:
 - ▶ Use of standard railing or barrier fencing
 - ▶ Pre-start-up signals
 - ▶ Warning signs



Screw Conveyors



- ▶ Screw conveyors are troughs with a revolving longitudinal shaft on which a spiral or twisted plate is designed (corkscrew).
- ▶ Ingoing nip points exist between the revolving shaft and trough.
- ▶ The screw conveyor housing must completely enclose the moving elements of the conveyor.

Screw Conveyors

- ▶ Permanently affixed poly-carbonate shields can be installed for visibility.
- ▶ This allows the operator to inspect the operation.
- ▶ Feed loading and discharge points can usually be guarded with enclosures or grating over the opening that allow the passage of material without allowing entry of any part of a worker's body into moving parts.



Drag Conveyors

- ▶ In running nip points occur when a chain contacts the sprocket
- ▶ Workers can be injured when hands and fingers come in contact with nip points on drag conveyors.
- ▶ Drag conveyors should be fully enclosed
- ▶ Permanently affixed grids or polycarbonate shields can be installed to inspect the operation.



Roller conveyors

- ▶ Used to move materials on a series of parallel rollers that are powered or gravity fed.
- ▶ Powered rollers can snag or pull hands, hair, fingers, and clothing into the area between the stationary components of the conveyor.



Roller conveyors

- ▶ In-running nip points exist between:
 - ▶ Drive chain and sprockets
 - ▶ The belt and carrier rollers
 - ▶ At terminals, drives, take-ups idlers and snub rollers
- ▶ When feasible, should have permanent barrier guards, that can be adjusted when necessary to protect the employee from nip and shear points.



Rotating Shafts

- ▶ Rotating shaft or shaft ends can grip clothing or otherwise force a body part into a dangerous location.
- ▶ Even smooth rotating shafts can be dangerous
- ▶ Of particular concern are shafts with projections, such as screws or burrs, that can grab loose clothing and pull a worker into the rotating part.
- ▶ 1910.219(c)(4)(ii) Unused keyways shall be filled up or covered.



Rotating Shaft Guarding

- ▶ All exposed parts of horizontal shafts seven feet or less from the walking or working surface should be protected by a stationary casing that encloses the sides and top or sides and bottom of the shafting.
- ▶ Projecting shaft ends must have smooth edges and not project more than one half the diameter of the shaft unless guarded by non-rotating caps or safety sleeves.

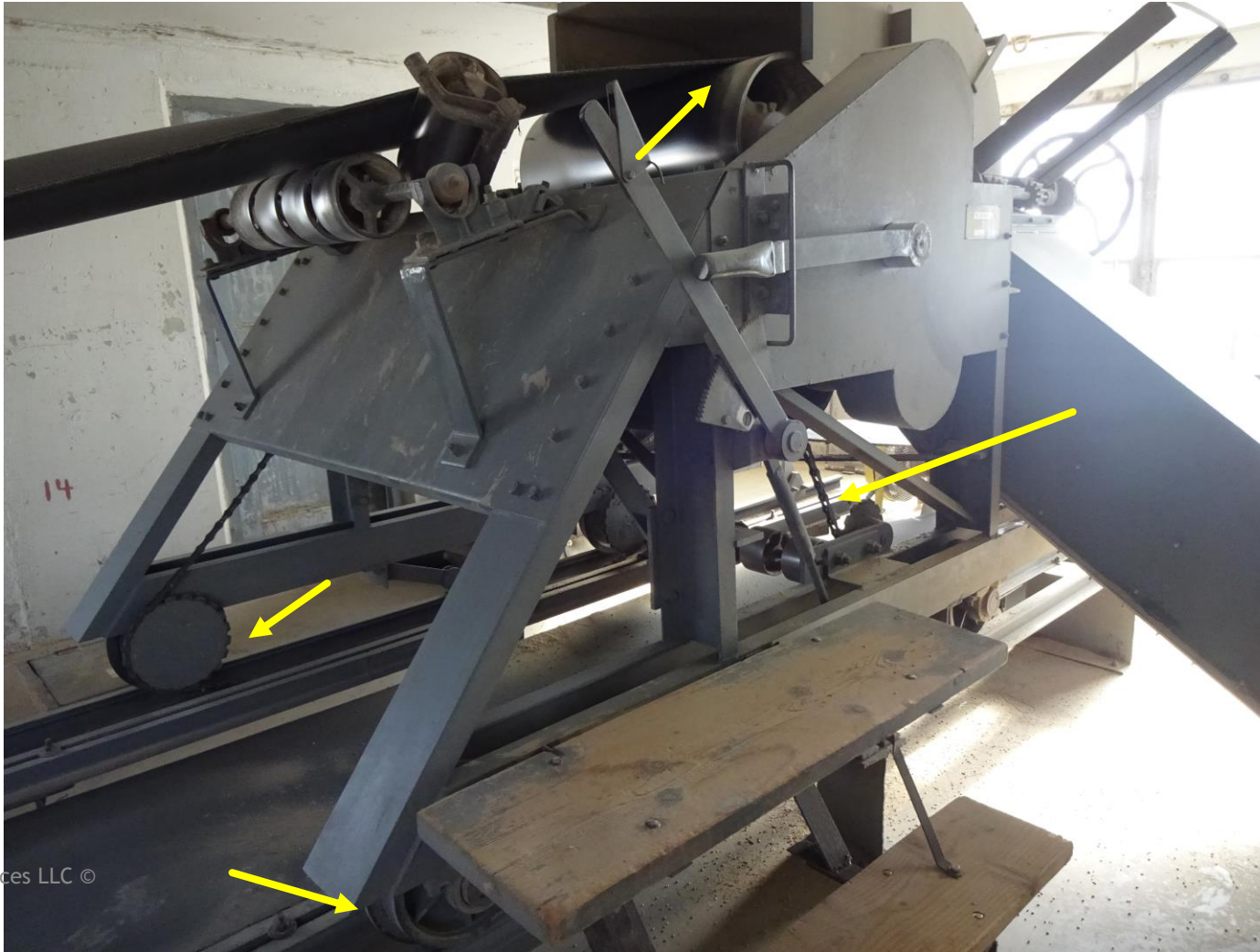


Mechanical Power Transmission Apparatus Guarding

- ▶ Common type of mechanical power transmission apparatus is the V-belt.
- ▶ Often used to power conveyors, bucket elevator legs, and similar types of equipment.
- ▶ Need to be guarded to prevent workers from the nip points where the belt travels toward the drive wheel.
- ▶ The guard should fully encapsulate the v-belt drive assembly on the top, bottom and both sides.



Tripper Hazards



Tripper Guarding





Fan Blades

1910.212(a)(5) Exposure of blades. When the periphery of the blades of a fan is less than seven (7) feet above the floor or working level, the blades shall be guarded. The guard shall have openings no larger than one-half (1/2) inch.

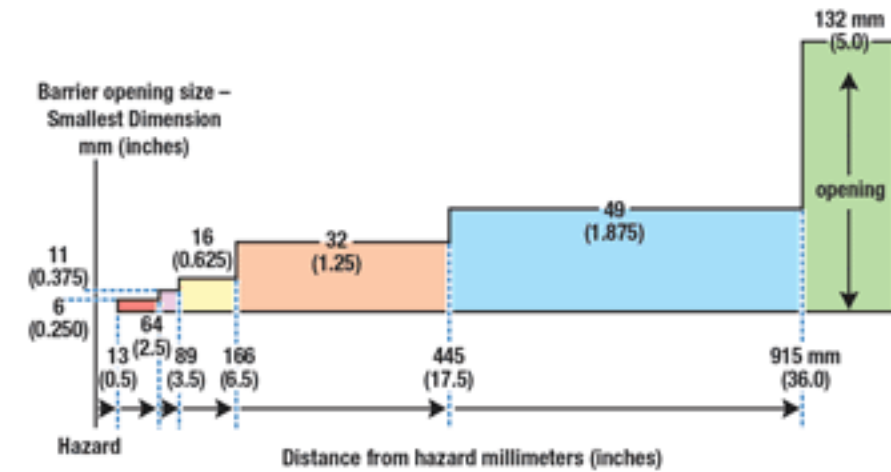
Drill Press

- ▶ 1910.212(a)(1) Types of guarding. One or more methods of machine guarding shall be provided to protect the operator and other employees in the machine area from hazards such as those created by point of operation, ingoing nip points, rotating parts, flying chips and sparks.

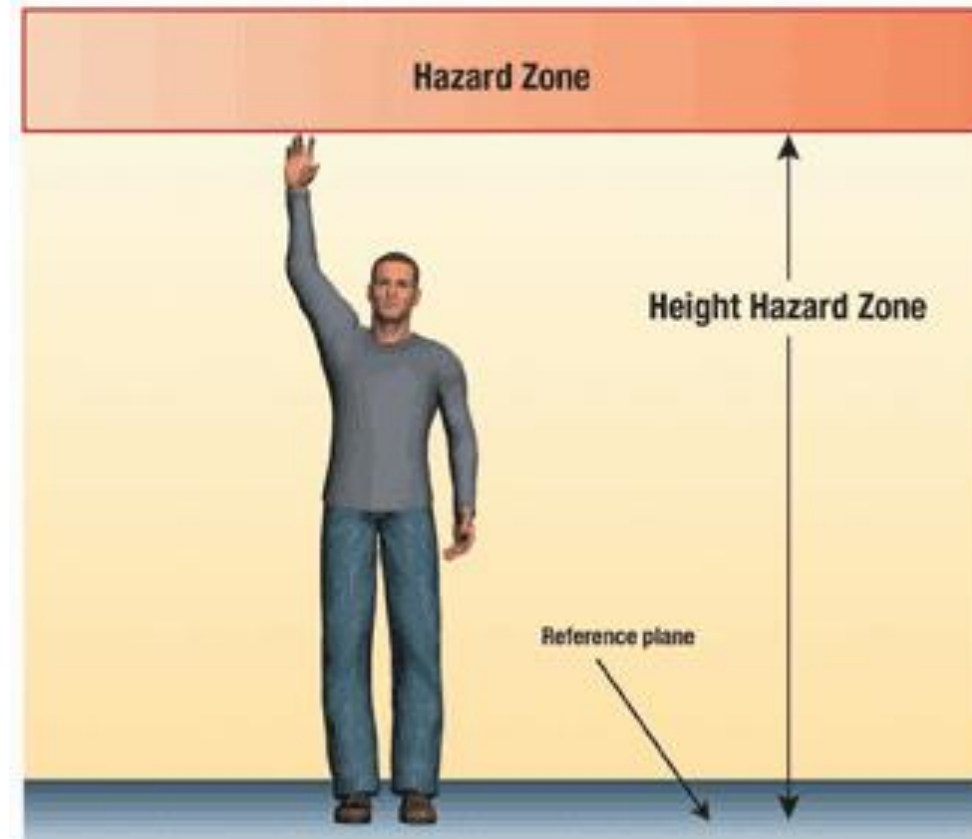


Bucket Elevator Legs





ANSI standard distance for barrier guards



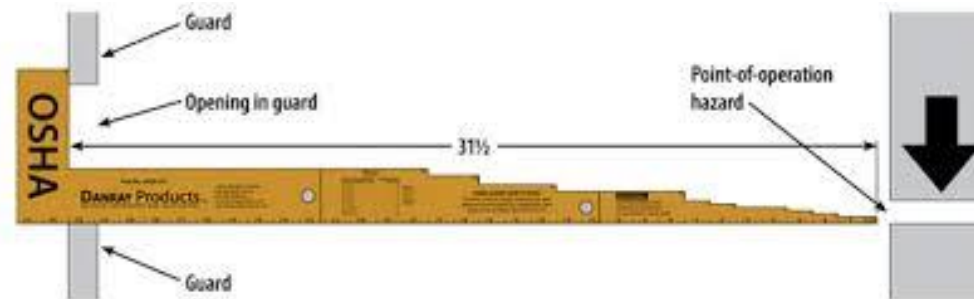
Height of Hazard Zone

OSHA GUARD-OPENING REQUIREMENTS

The maximum permissible opening for guards as required by OSHA 29 CFR 1910.217 for mechanical power presses is as follows:

Distance of Opening From Point-of-Operation Hazard (Inches)	Maximum Width of Opening (Inches)
1/2 to 1 1/2	1/4
1 1/2 to 2 1/2	3/8
2 1/2 to 3 1/2	1/2
3 1/2 to 5 1/2	5/8
5 1/2 to 6 1/2	3/4
6 1/2 to 7 1/2	7/8
7 1/2 to 12 1/2	1 1/4
12 1/2 to 15 1/2	1 1/2
15 1/2 to 17 1/2	1 7/8
17 1/2 to 31 1/2	2 1/8
Over 31 1/2	6

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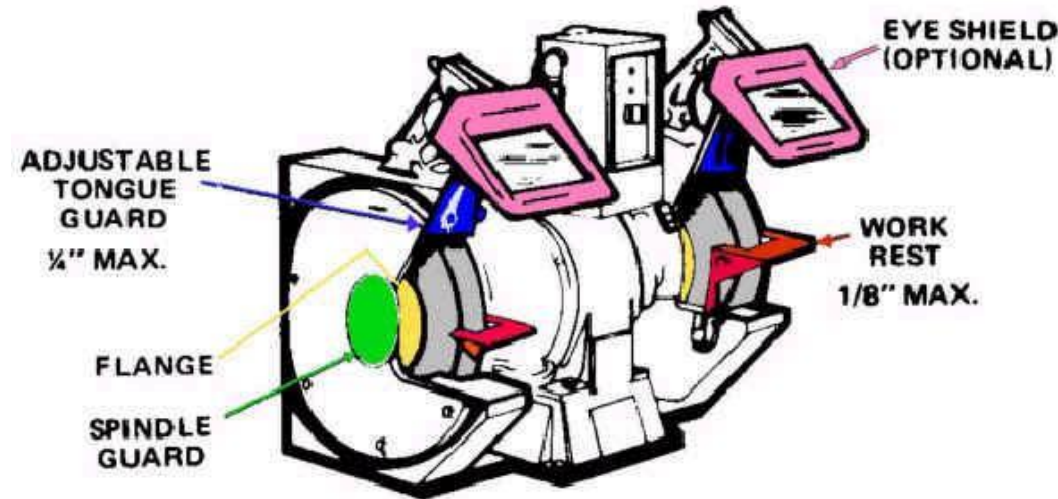
Bench Grinders

- ▶ Have caused numerous injuries and fatalities
- ▶ Grinding wheel can turn at 4,000 rotations per minute
- ▶ If wheel disintegrates shrapnel can travel at 125 mph
- ▶ If grinder guard are missing or improperly installed the shrapnel can strike the operator



Bench Grinder

- ▶ Work rest must be used to support work
- ▶ Work rest must be kept adjusted close to the wheel with a maximum opening of 1/8 inch to prevent the work from being jammed between the wheel and the rest which can cause breakage.
- ▶ The adjustable tongue or the end of the peripheral member at the top shall never exceed 1/4 inch.



Anchoring Equipment

- ▶ 1910.212(b) Anchoring fixed machinery. Machines designed for a fixed location shall be securely anchored to prevent walking or moving.



Applicable OSHA/ANSI Standards

- ▶ 1910.212 - General requirements for all machines.
- ▶ 1910.215 - Abrasive wheel machinery.
- ▶ 1910.217 - Mechanical power presses.
- ▶ 1910.217 App A - Mandatory requirements for certification/validation of safety systems for presence sensing device initiation of mechanical power presses
- ▶ 1910.217 App B - Nonmandatory guidelines for certification/validation of safety systems for presence sensing device initiation of mechanical power presses
- ▶ 1910.217 App C - Mandatory requirements for OSHA recognition of third-party validation organizations for the PSDI standard
- ▶ 1910.217 App D - Nonmandatory supplementary information
- ▶ 1910.219 - Mechanical power-transmission apparatus.
- ▶ 1910.242 - Hand and portable powered tools and equipment, general.
- ▶ 1910.243 - Guarding of portable powered tools.
- ▶ 1910.244 - Other portable tools and equipment.

- ▶ “Safeguarding Equipment and Protecting Employers from Amputations” Small Business Safety and Health Management Series OSHA 3170 2007.

- ▶ ANSI B11 - Machine Guarding

Resources

- ▶ Supervisor Talking Points
- ▶ Quiz

Evaluation

- ▶ Are we compliant?
- ▶ Are we doing enough?
- ▶ Is there anything we can do to improve?

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Questions?

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