



# **Machine Guarding**

## **Locate and Eliminate Hazards**

**LEARN  
& LIVE**



**Grain Handling Safety Coalition**



Zaloudek Grain Co., where Bryce Gannon and Tyler Zander, both 17 years old, each lost a leg after they were caught in an auger

A 53-year-old farm worker was killed when he became entangled in a grain bin auger...

A Fairmount man who was caught waist-deep in a grain auger has died...became entangled in the equipment after he was crawling over it.

A 28-year-old man was working on a farm and suffered injury when he stepped over a power take-off (PTO) shaft from which the safety guard had been removed. He caught his coat in the PTO shaft and was pulled into the machinery, resulting in the degloving of his genital and perineal regions

# ENTANGLEMENT HAZARDS and GUARDING



A farm owner/operator died of suffocation when his clothing became entangled in the machinery he was attempting to adjust. The PTO continued to turn strangulating him.



# OSHA Focus During LEP Grain Inspections

## 6 Areas

- Engulfment
- Slips, Trips & Falls
- Electrocution
- **Auger Entanglement**
- Combustible Dust Explosions
- Struck-by





# OSHA Standards

- **1910.212 – General requirements for all machines**
- 1910.213 – Woodworking machinery requirements
- 1910.214 – Cooperage machinery (wood barrels)
- **1910.215 – Abrasive wheel machinery**
- 1910.216 – Mills and Calendars (rubber/plastic)
- 1910.217 – Mechanical Power presses
- 1910.218 – Forging machines
- **1910.219 – Mechanical power-transmission**





- Identify Hazards
- “If it moves and can cause injury it must be guarded”

# Topics Covered

- ⚠ Machine Guarding Basics
- ⚠ Types of Machine Hazards
- ⚠ Different Types of Machine Guards
- ⚠ Identify Hazards & Corrective Actions
- ⚠ Summary





# Machine Guarding Basics

- Pinch Points (Nip Points)
- Wrap Points
- Pull-in Points
- Shear/Cutting Points

**Proper guarding of these hazards reduces exposure and injury to workers.**



# Pinch Points/Nip Points

## Examples



- Pulleys, belts, gears, chains, hinges
- Motor
  - Auger drive motors
- Elevator leg drive
- Truck gates



# Drag conveyor

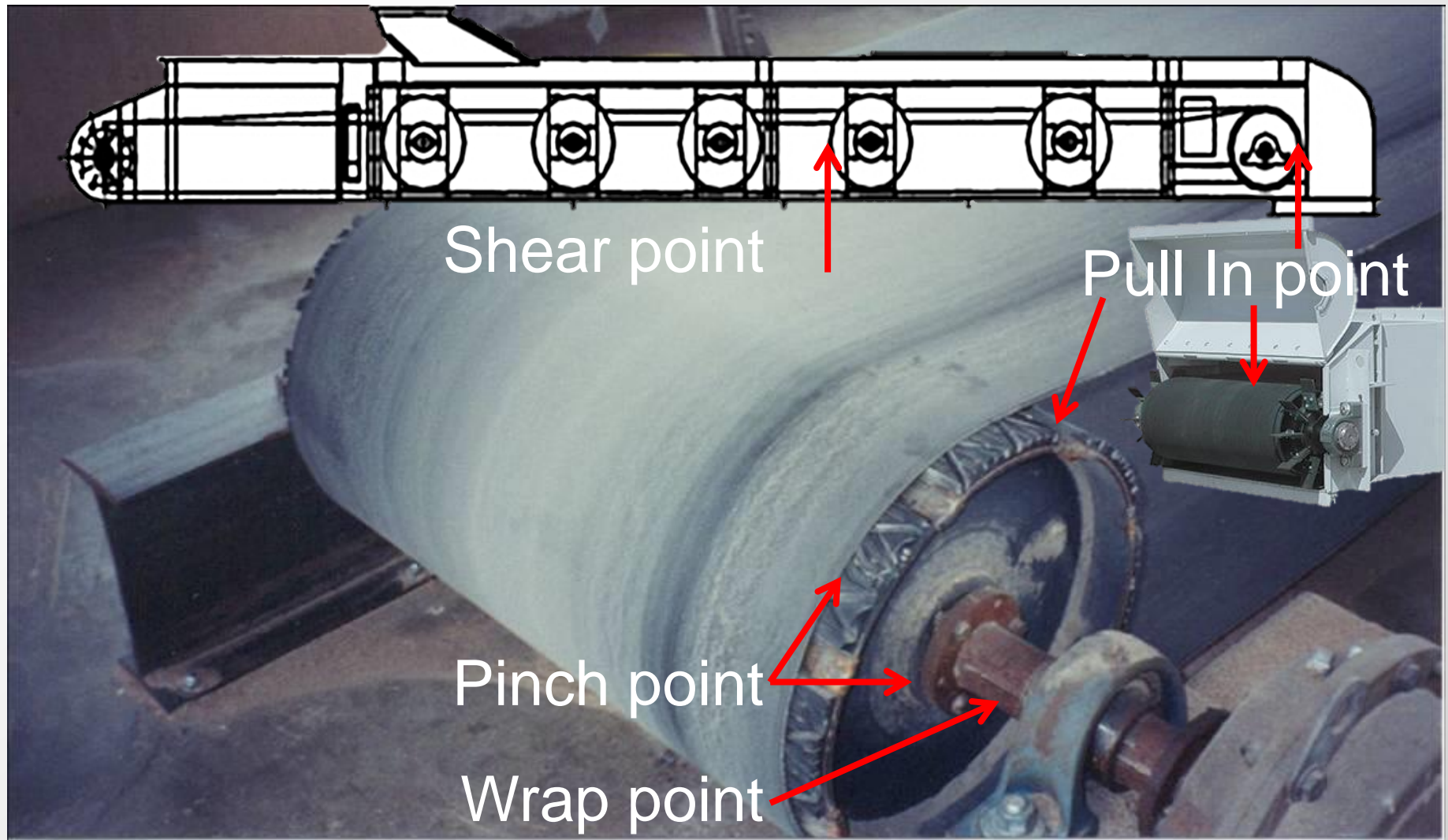
Pull In point  
Pinch point

Shear point





# Belt Conveyor

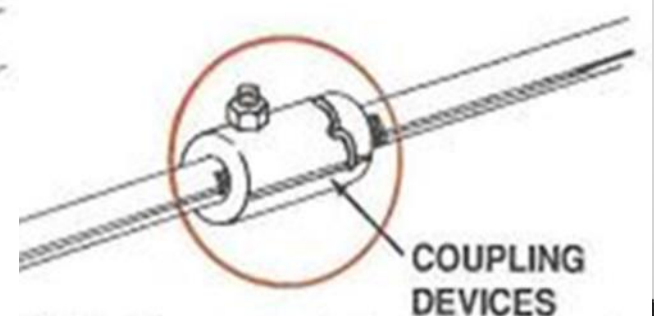
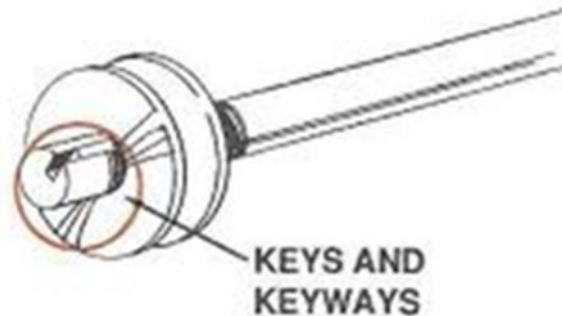
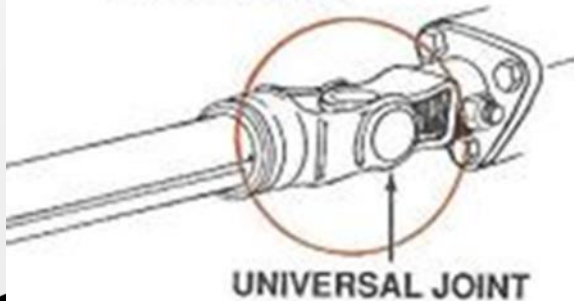
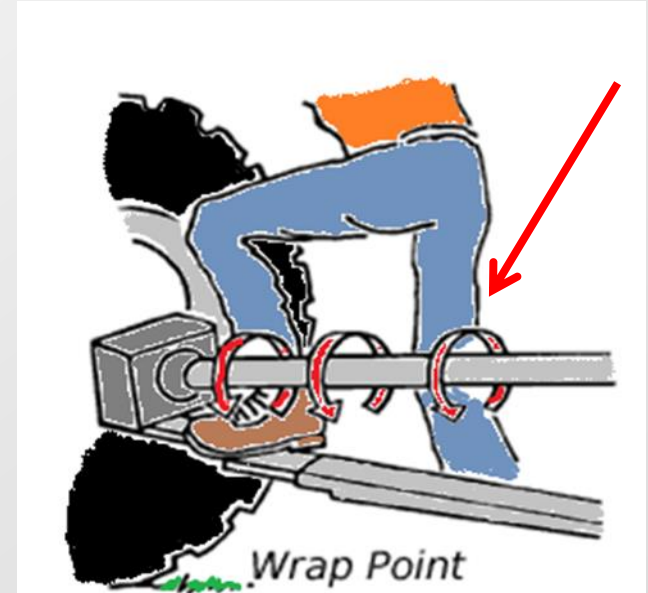


# Wrap Points

## Wraps in direction shaft turns

### Examples

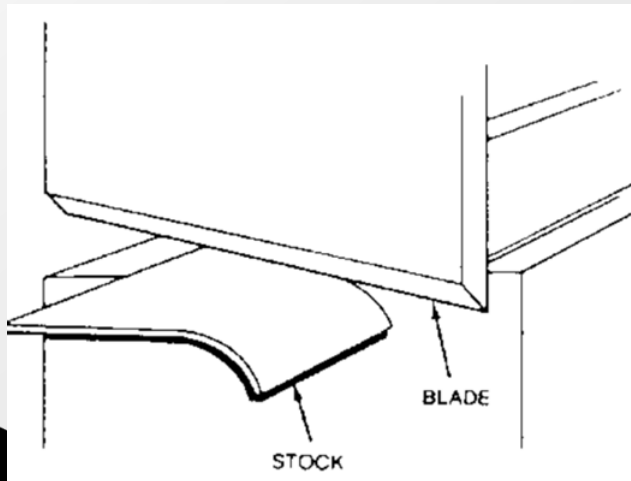
- PTO – prime example
- Augers
- Motor drive shafts
- Pulley attachments



# Shear/Cutting Points

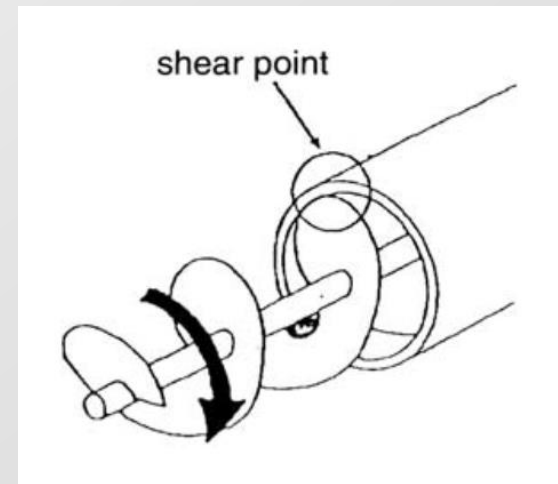
## Cutting Points

- Single object
- Cuts from force or speed
- Sickles, mower blades, windrower cutter bar



## Shear Points

- Two edges
- Cuts soft material
- Augers, Harvesters





# Accident Example

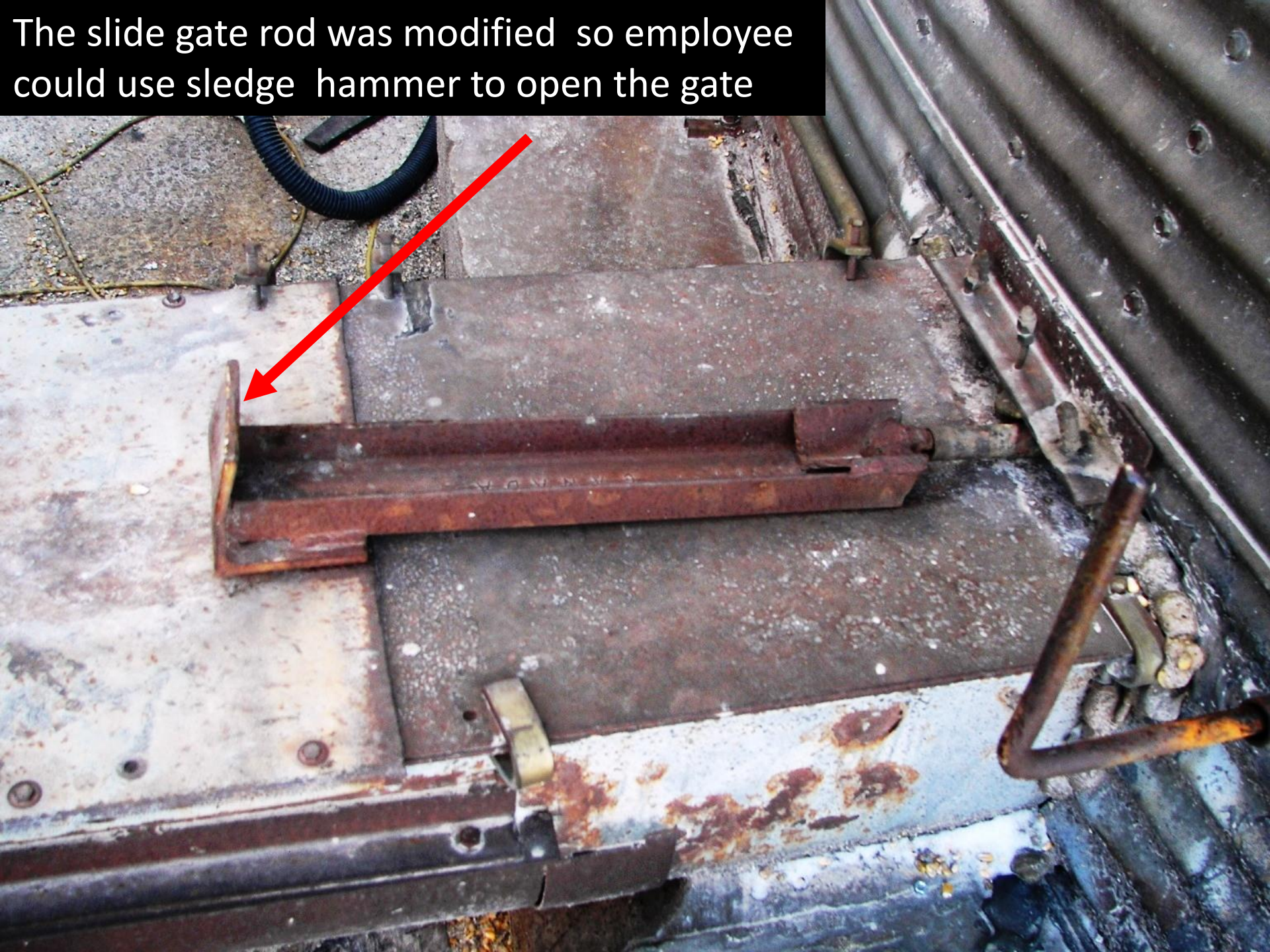
A tall, slender telecommunications tower with multiple cross-arms and antennas, situated on a rooftop against a blue sky with white clouds. The tower is the central focus, with its base resting on a dark, tiled roof. Several other smaller antennas and structures are visible on the roof in the background. The sky is a clear blue with scattered white clouds.

Employee was standing on top of the U tough screw conveyor attempting to open a slide gate.





The slide gate rod was modified so employee could use sledge hammer to open the gate

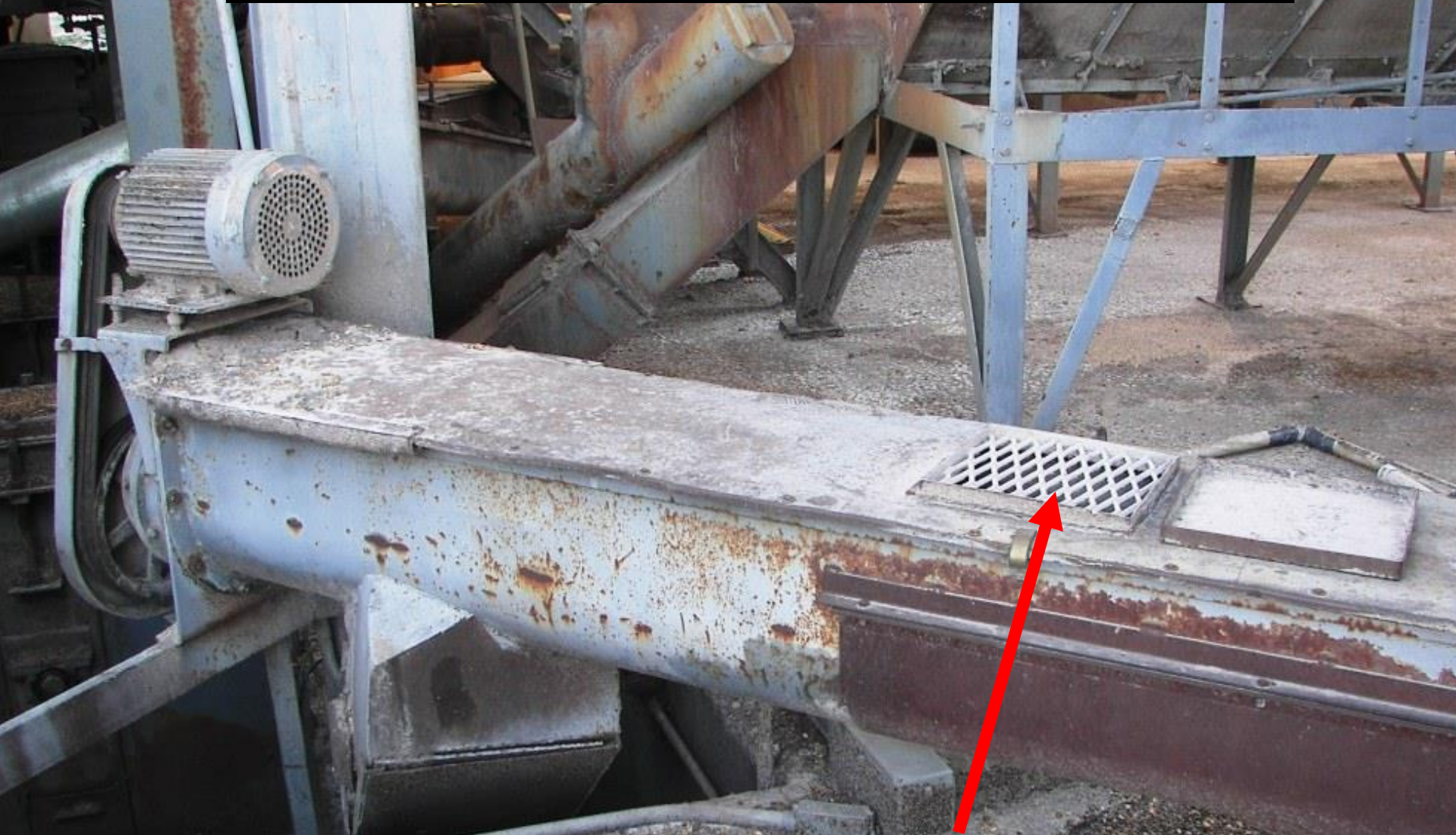




Slide gate moves the rods to clear any obstructions



Employee lost footing and stepped back into the running U trough auger and lost half of his foot.



Expanded metal was not on covering the inspection door at the time of the accident



Expanded metal cover was added after the accident





# Types of Machine Hazards

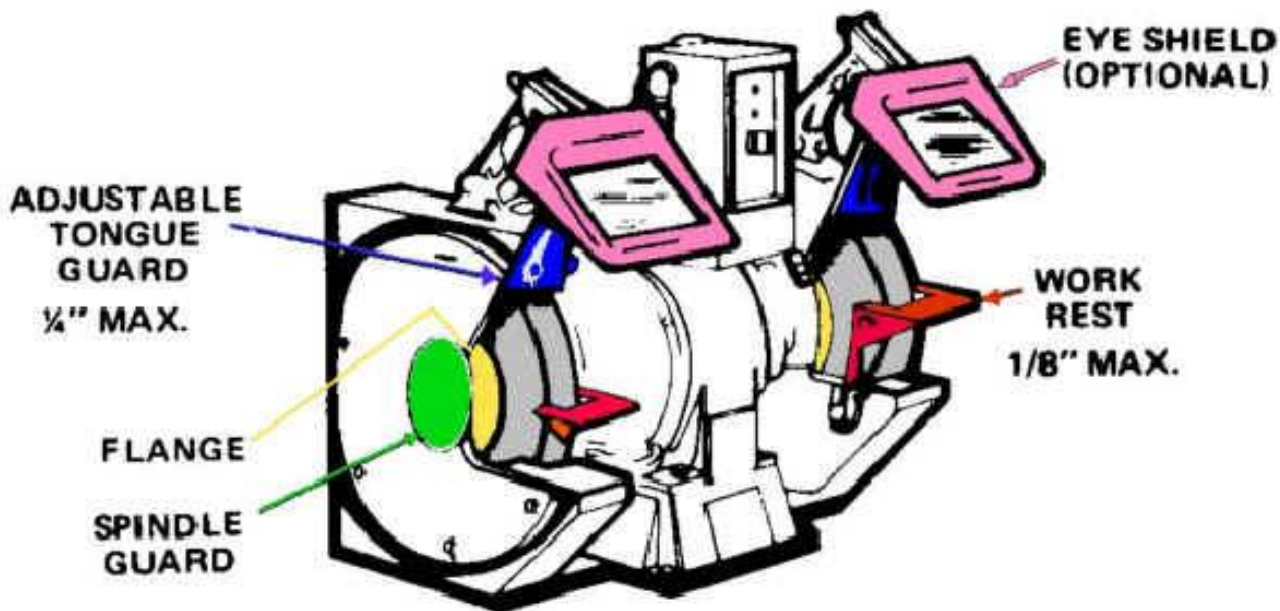
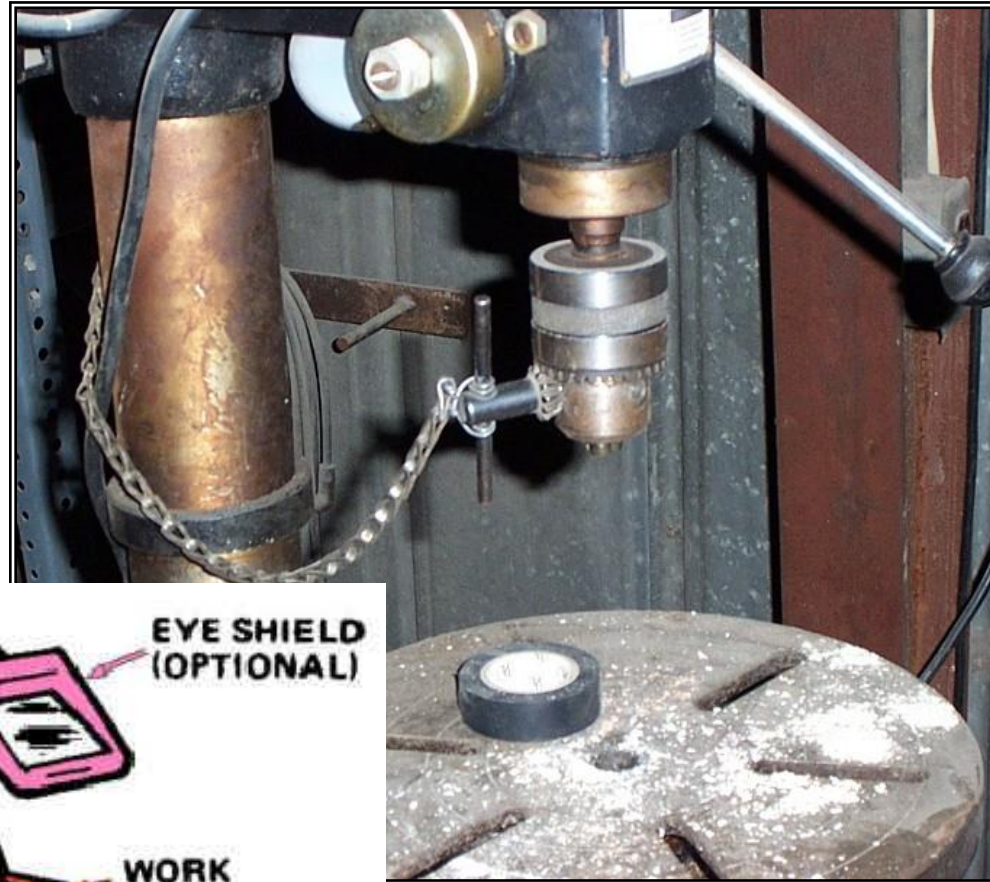
The background of the slide features a tall, white communication tower with several antennas and a platform at the top. The tower is set against a blue sky with scattered white clouds. In the foreground, the dark, tiled roofs of buildings are visible, partially obscured by the tower's structure.

# Types of Machine Hazards

- Point of operation hazards
- Power transmission hazards
- Any moving part/Misc. hazards



# Point of Operation Hazards



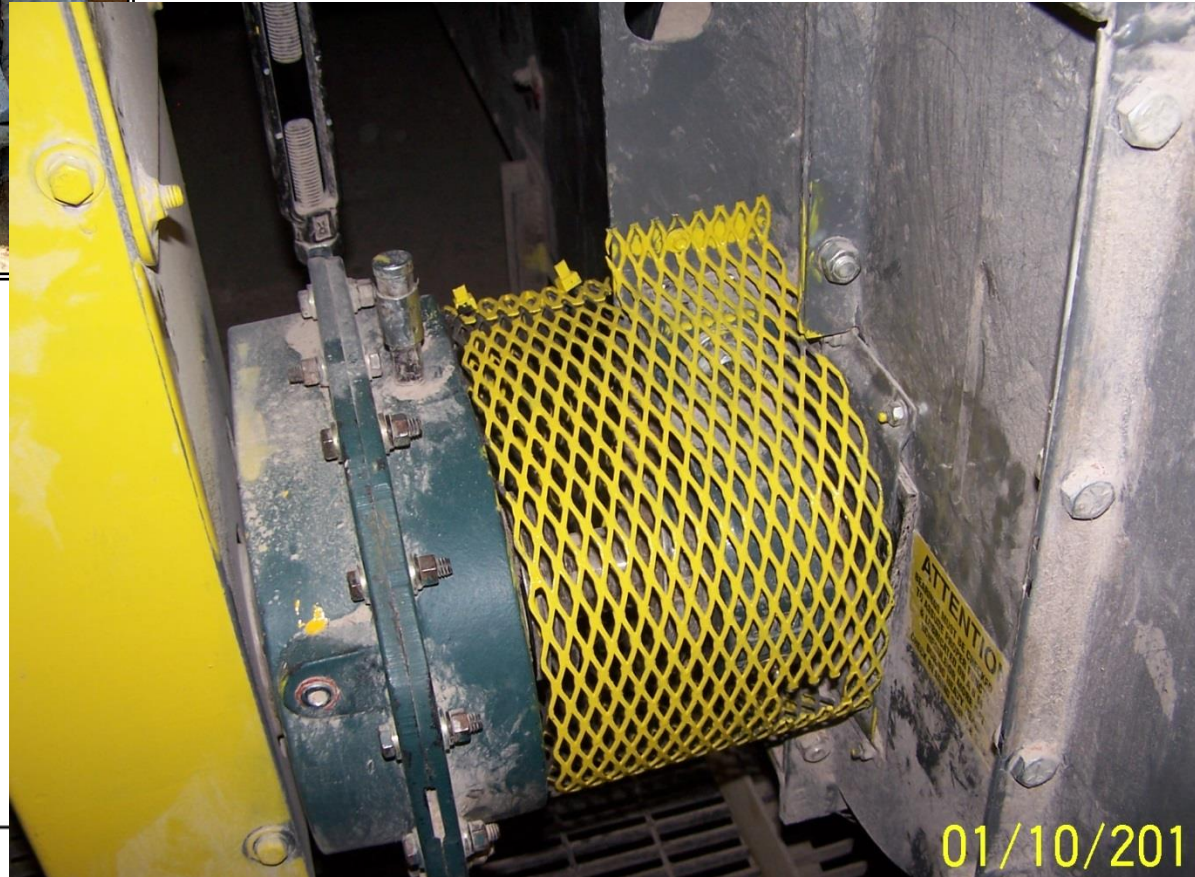
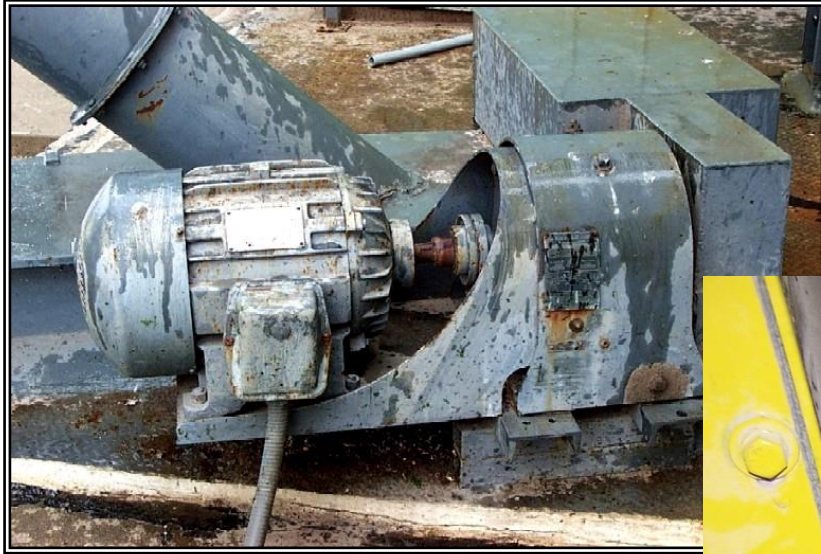


# Power Transmission Hazards





# Power Transmission Hazards cont.



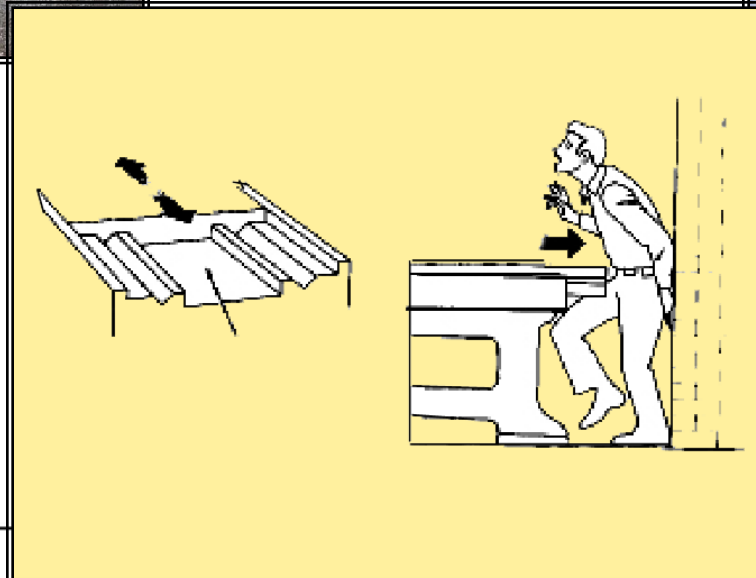
01/10/201

# Power Transmission Hazards





# Moving Parts/Other



# Types of Machine Guards



# Types of Machine Guards

## Fixed Guards

- Permanent fixtures
- Should always be the first choice
- Should be secured/tool tight
- No “wing nuts”





# Types of Machine Guards

## Interlocked Guards

- When guards are off of machines, it won't activate; or
- When interlock is disengaged machine does not work
- Not a substitute for LockOut Tagout



# Manlift Limit Switch is Interlocked Guard

Limit switch must not be bypassed



# Types of Machine Guards

## Adjustable Guards

- Similar to fixed
- Require operator to adjust to protect themselves





# Types of Machine Guards

## Self Adjusting

- Provides a barrier which moves according to the size of the stock entering the danger area



Employee had wallet in front pocket.  
Circular saw guard was jammed open.  
Saw blade cut the workers wallet



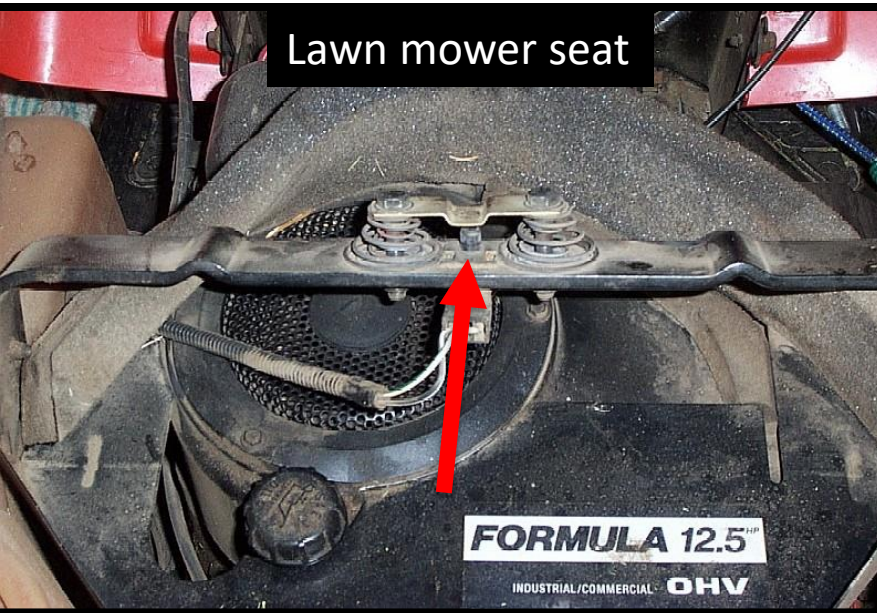


# Guarding Devices

- Only used when guards are not feasible
- Photo Electric
- A Two Hand Trips
- Pressure Sensing
- Guarding by Location



# Pressure Sensing





# Guarding by location

- Prevents access to a hazard
- Physical barrier



Not enough of a barrier to protect workers



The background of the slide is a faded, high-angle photograph of a telecommunications tower. The tower is a lattice structure with a central vertical mast and several diagonal bracing legs. It is situated on a roof, with other rooftops and satellite dishes visible in the lower portion of the frame. The sky is blue with scattered white clouds. The title text is overlaid in the center of the image.

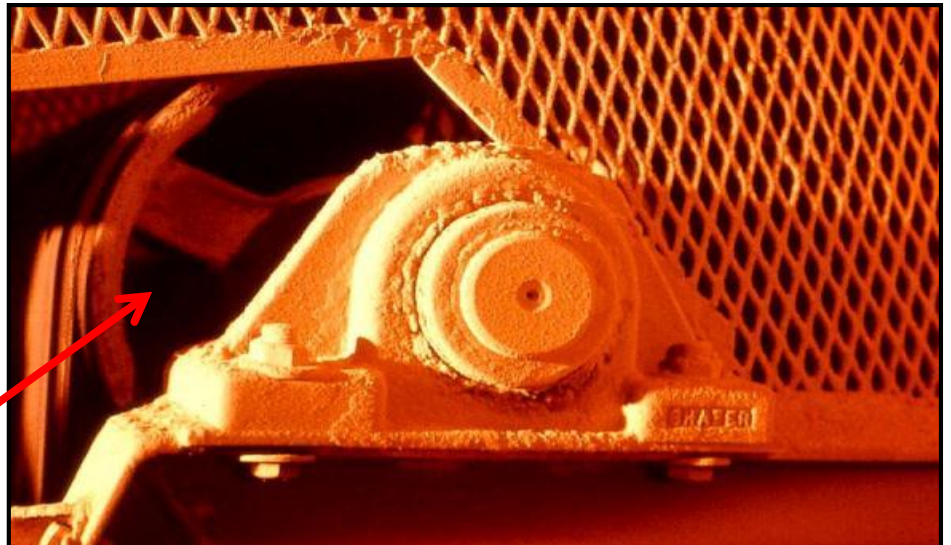
# Identifying Hazards & Corrective Actions



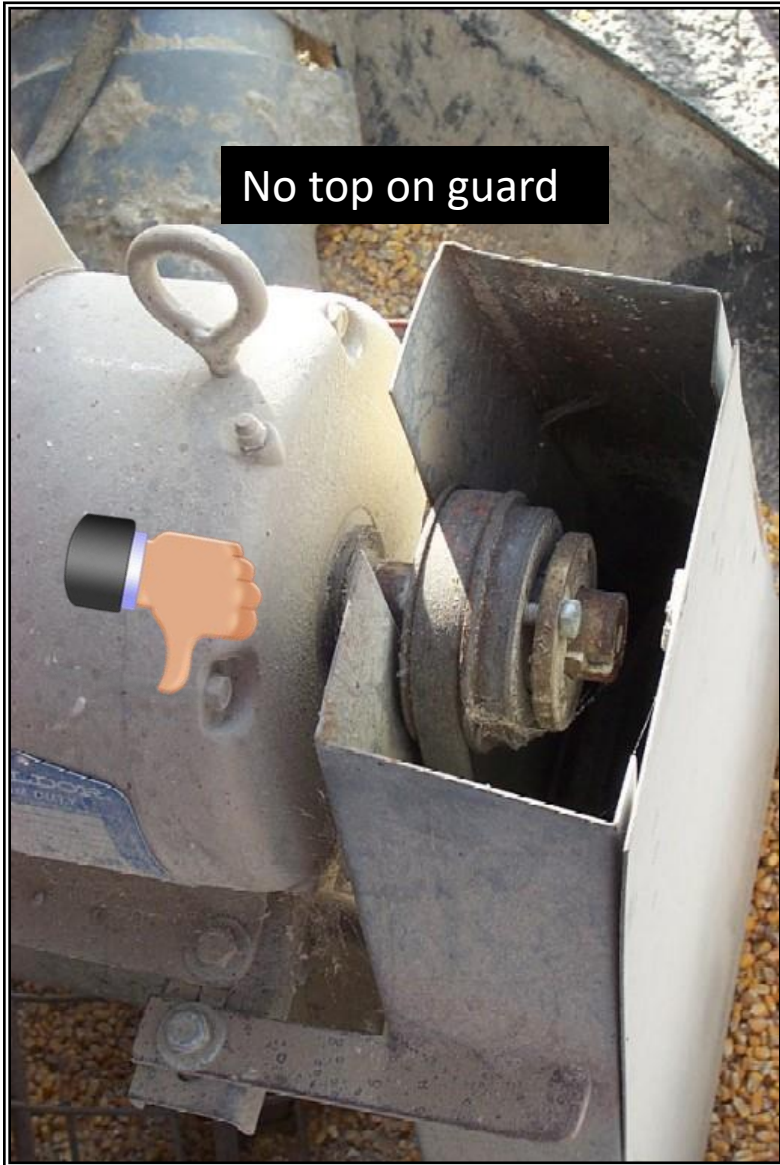
# Guard Requirements

Guards should follow the “AUTO” Principle.

**A**round  
**U**nder  
**T**hrough  
**O**ver



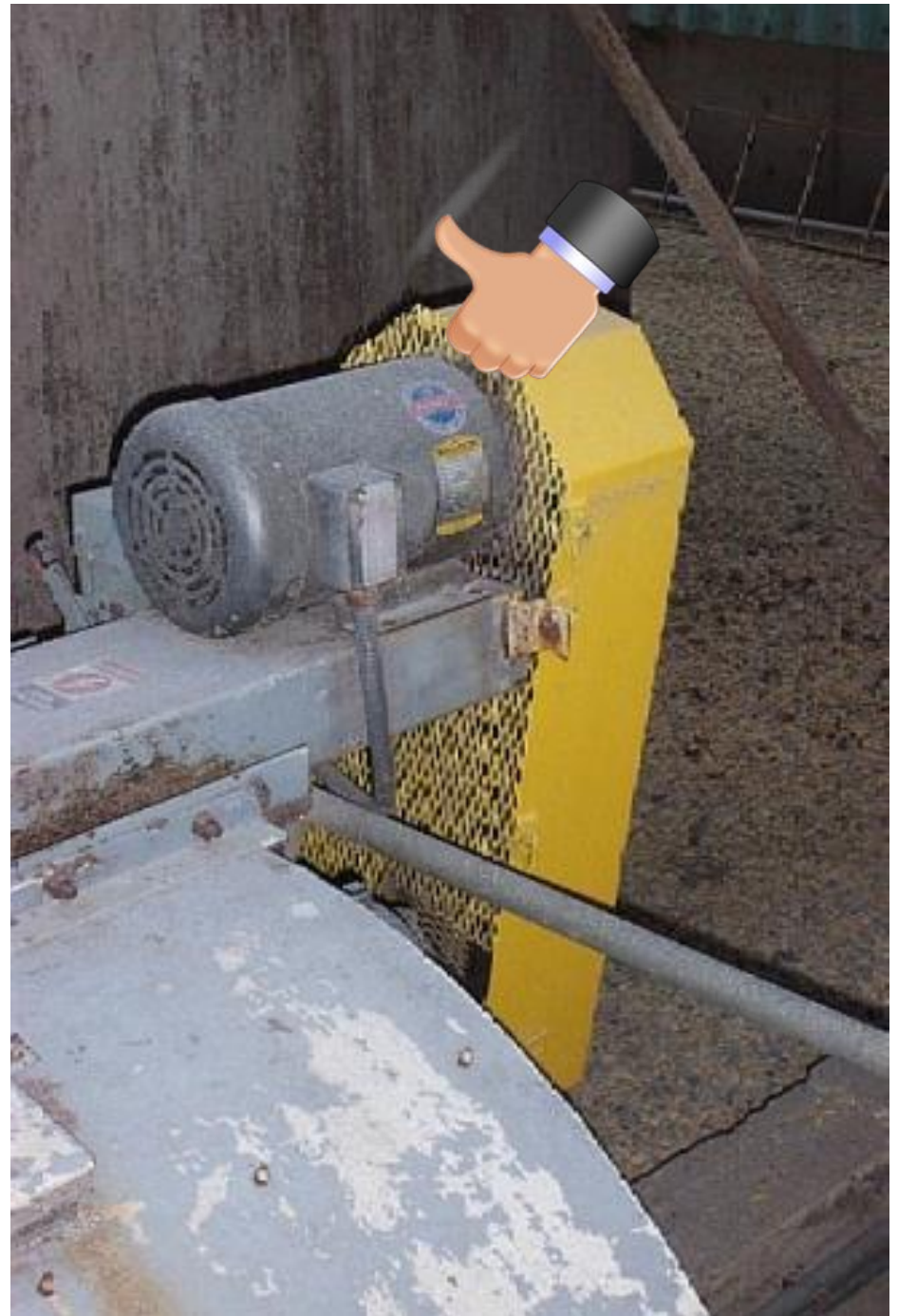
# Machine Guarding Problem Areas





# 6-Sided Guard

- Top
- Bottom
- Front
- Back
- Right Side
- Left Side



# Sub Part O

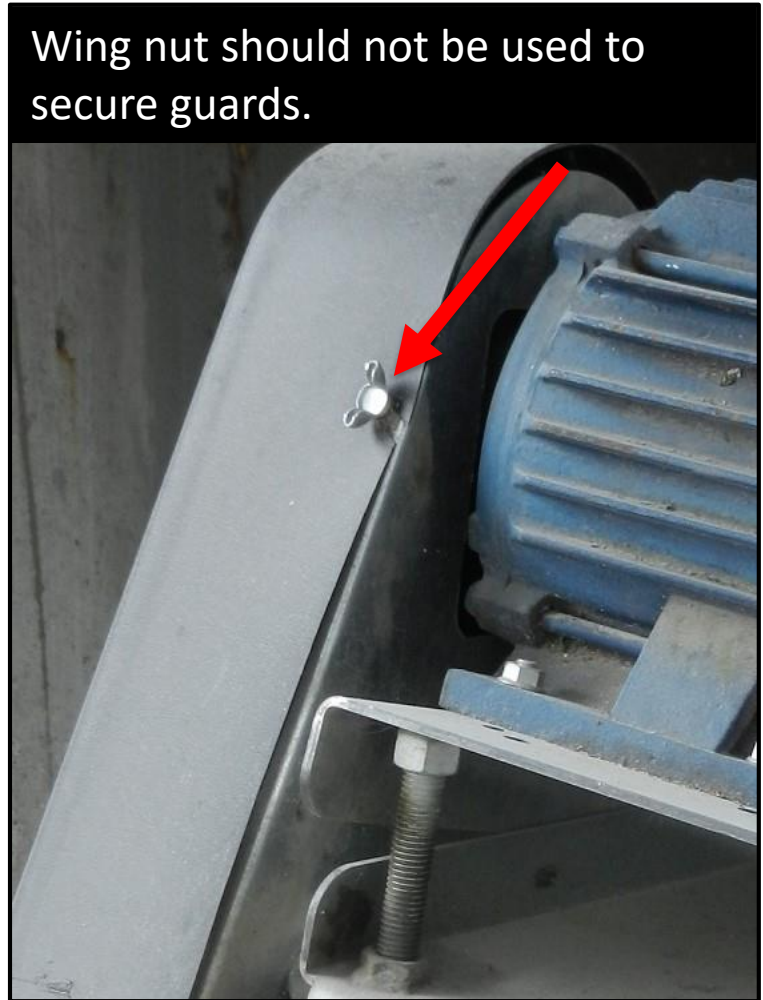


Distance Between Protective Covering and Moving Parts of Equipment	Maximum Vertical Opening (Horizontal Openings are Unlimited)
½ to 1 ½ inches	¼ inches
1 ½ to 2 ½ inches	⅜ inches
2 ½ to 3 ½ inches	½ inches
3 ½ to 5 ½ inches	⅝ inches
5 ½ to 6 ½ inches	¾ inches
6 ½ to 7 ½ inches	⅞ inches
7 ½ to 12 ½ inches	1 ¼ inches
12 ½ to 15 ½ inches	1 ½ inches
15 ½ to 17 ½ inches	1 ⅞ inches
17 ½ to 31 ½ inches	2 ⅞ inches
31 ½ inches to less than 7 feet	6 inches
More than 7 feet	Protective covering not required

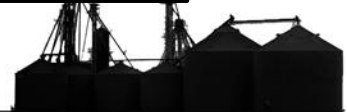




# Machine Guarding Problem Areas



# Machine Guarding Problem Areas





Corrected guard openings



# Projecting Shaft Ends

29 C.F.R., § 1910.219(c)(4)(i)  
provides:

Projecting shaft ends shall present a smooth edge and end and shall not project more than **one-half the diameter** of the shaft unless guarded by non rotating caps or safety sleeves





# Projecting Shaft Guards

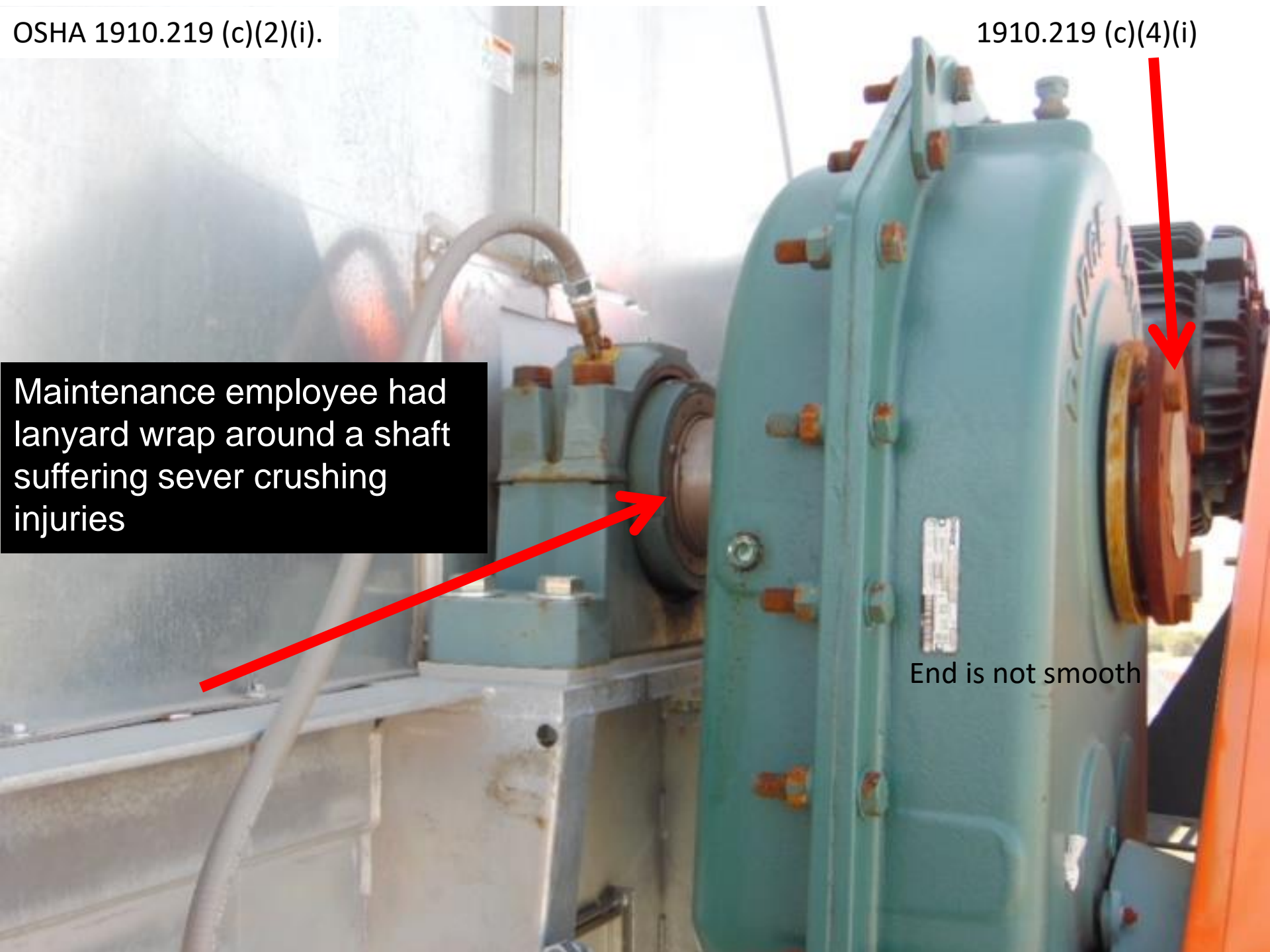


OSHA 1910.219 (c)(2)(i).

1910.219 (c)(4)(i)

Maintenance employee had  
lanyard wrap around a shaft  
suffering sever crushing  
injuries

End is not smooth





# Machine Guarding Problem Areas



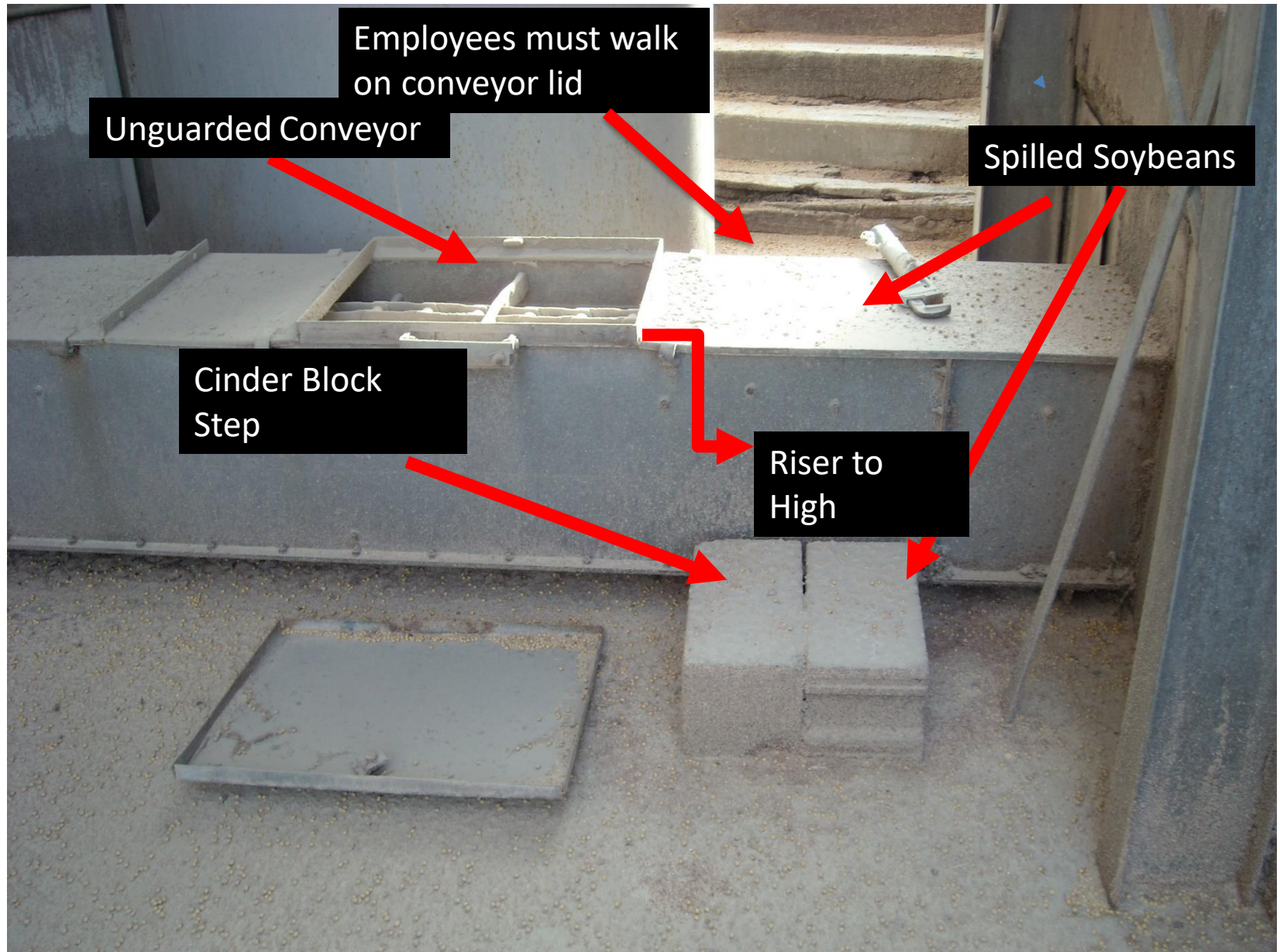
# Machine Guarding Problem Areas

Do not operate conveyors with the covers off or add expanded metal guard





# Machine Guarding Problem Areas





# Machine Guarding Problem Areas

Covers need to be in place or expanded metal must protect the opening.



Expanded metal must comply with OSHA Subpart O





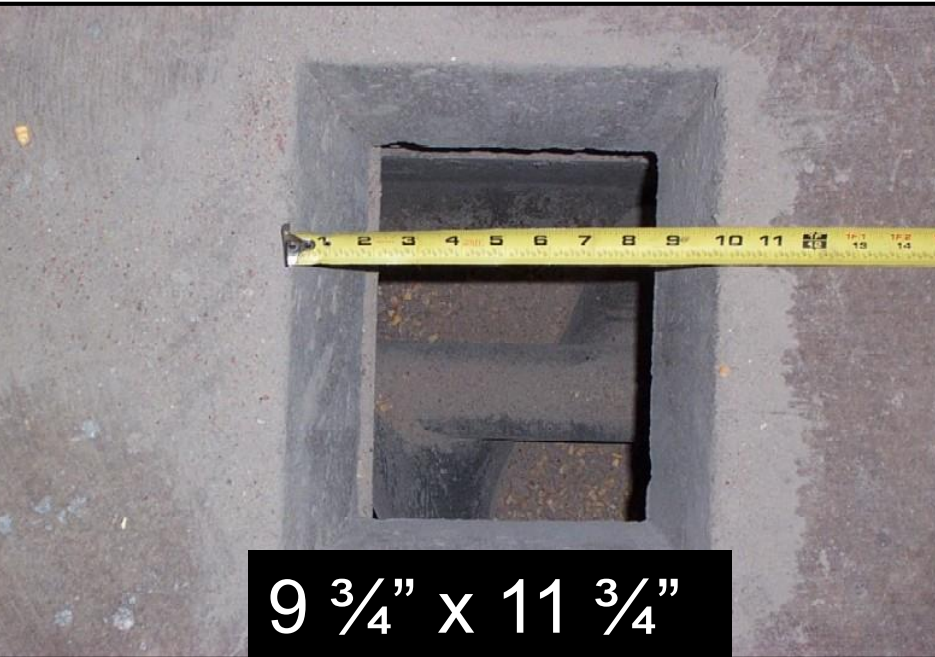
# Incident Example



- Employee – sweeping grain to reclaim hole.
- Stepped over sump.
- Turned around.
- Stepped directly into the reclaim hole.
- Reclaim hole had no guard.
- LOST leg from mid-calf.



# Incident Example



Actual sump hole



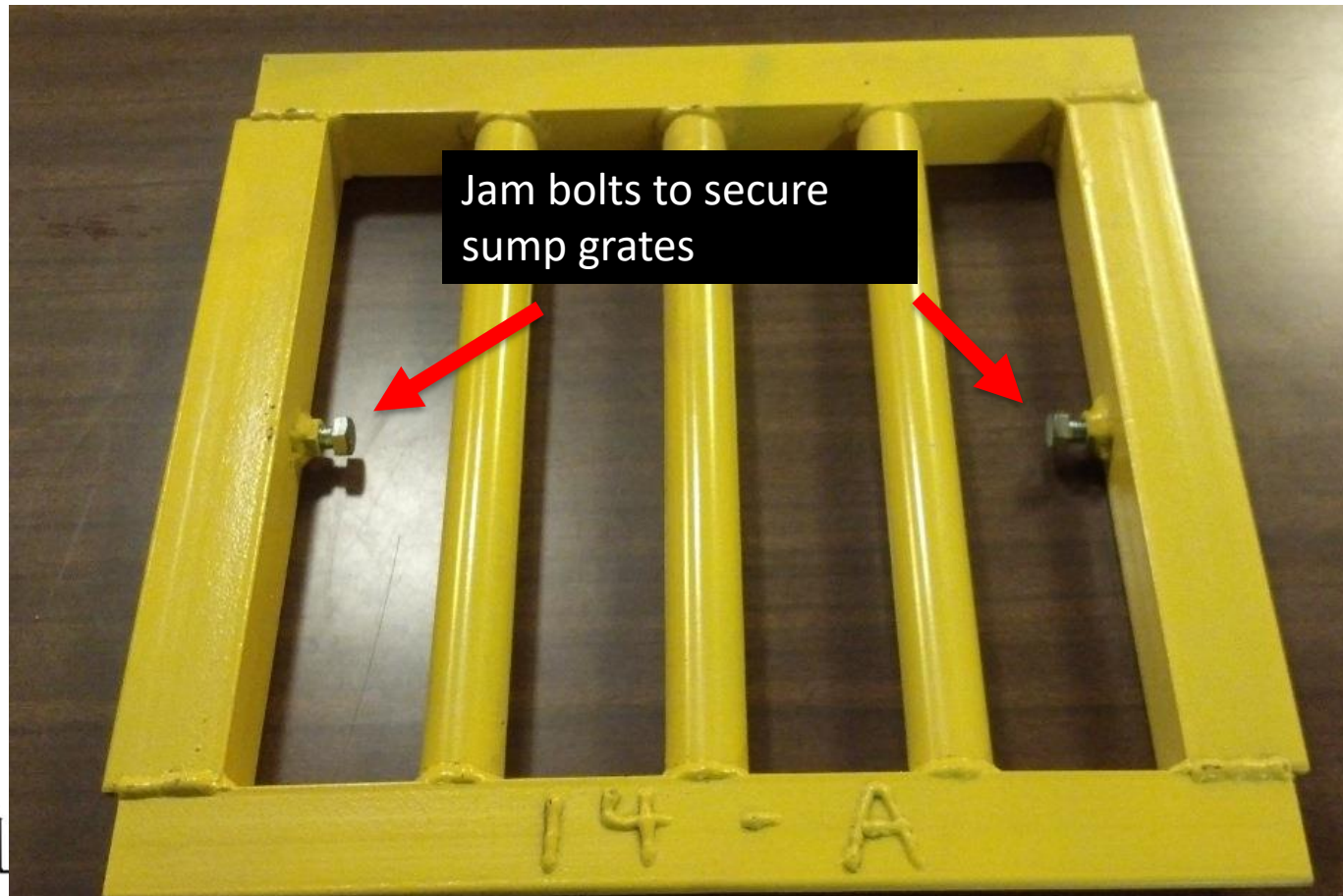
Actual boot found in bin.





# Sump Hole Guarding

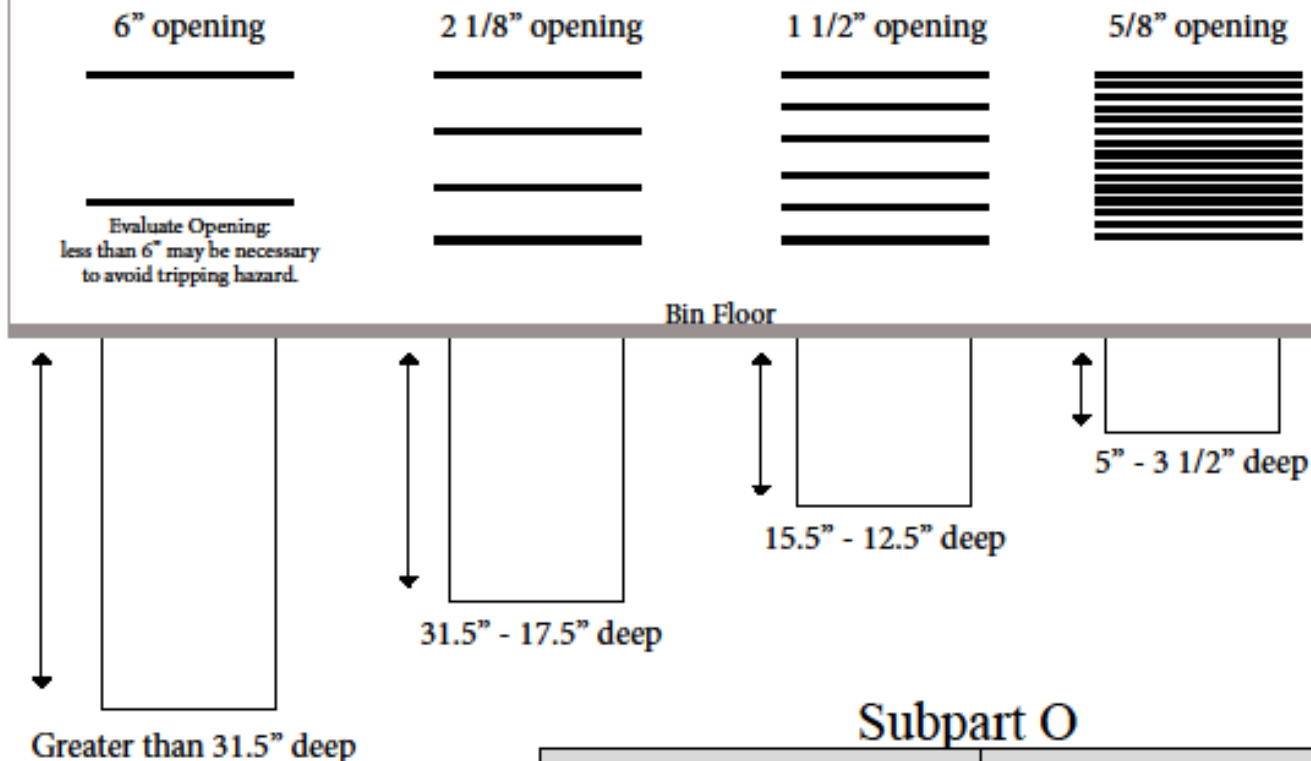
- Sump Grates/Guards in place & secured before sweep operation



# Sump Opening Guard Guidelines

According to 29 CFR 1910 Subpart O machinery and machine guarding.

Four examples of sump guards based on distance from grain floor to auger flights or conveyor paddle.



Distance between Protective Covering and Moving Parts of Equipment

Maximum vertical opening (Horizontal openings are unlimited)

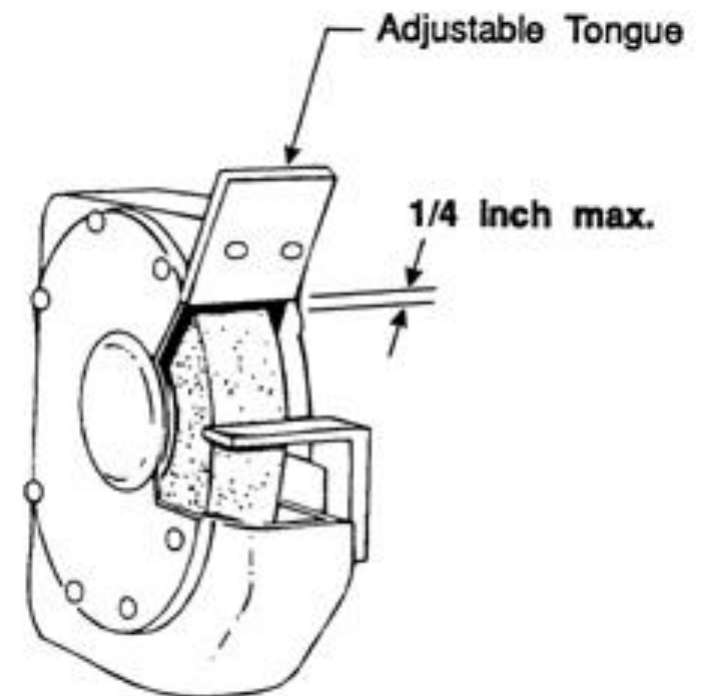
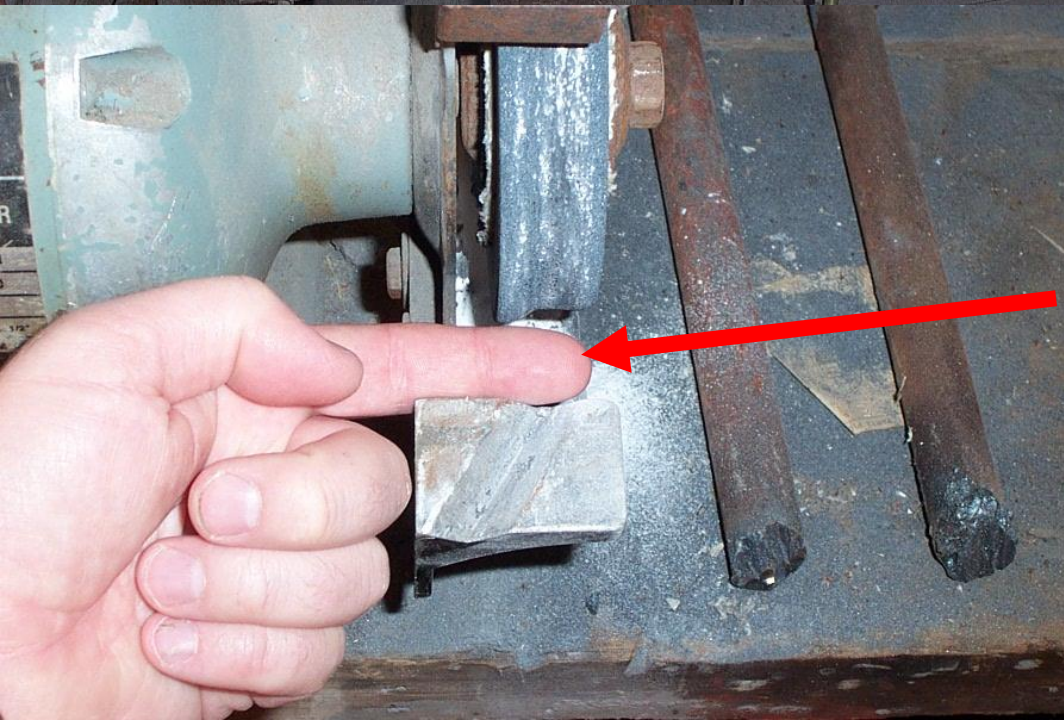
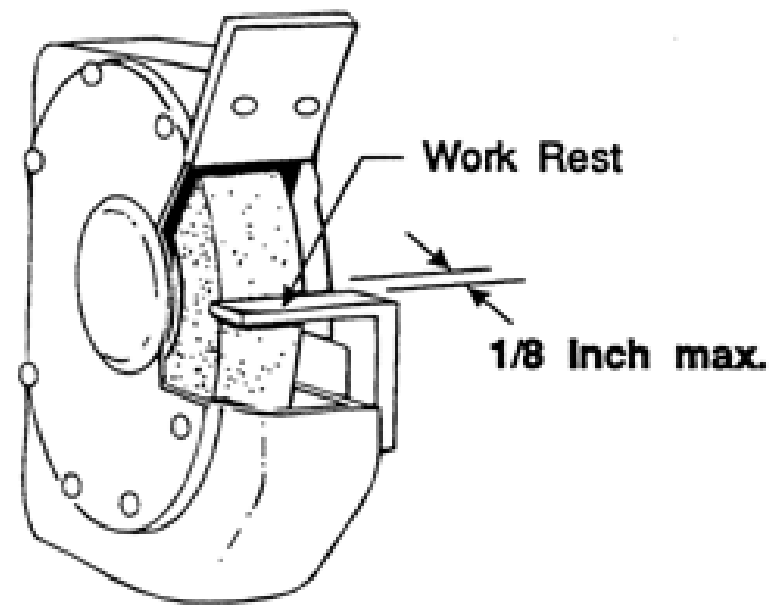


# Machine Guarding Problem Areas





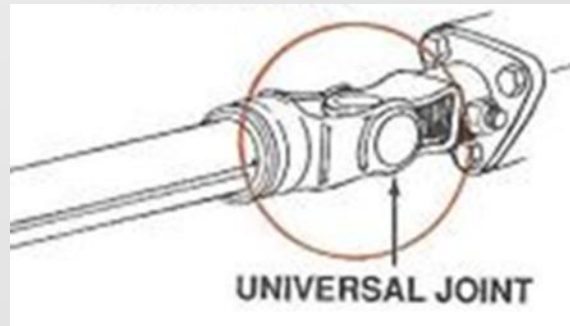
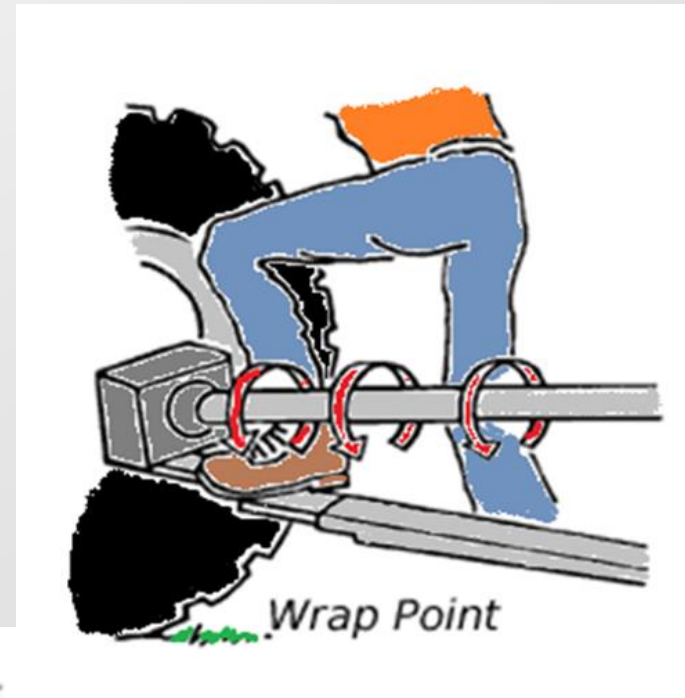
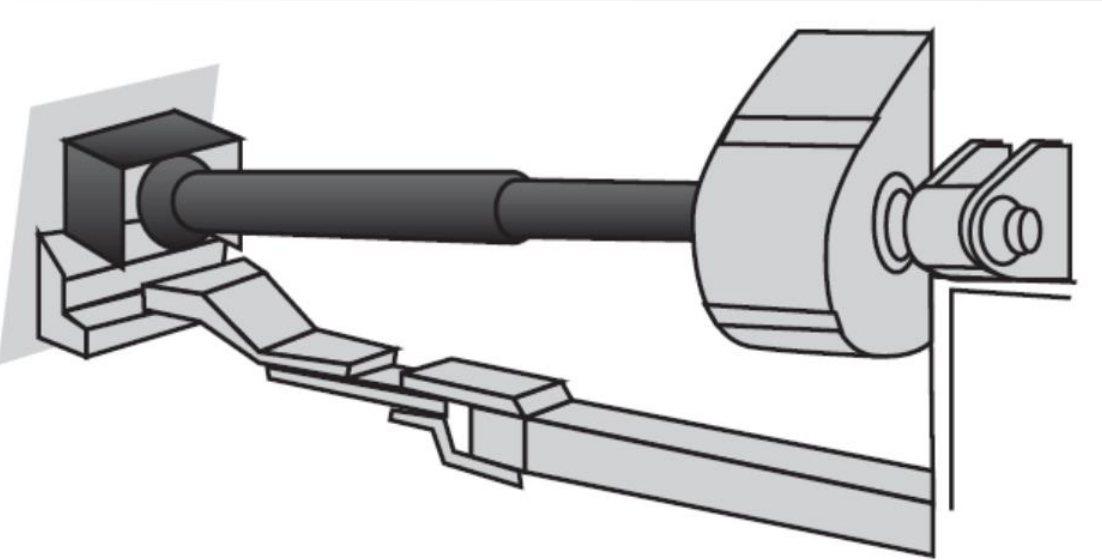
No tool rest





# Power Takeoff (PTO) Hazards

**Ensure PTO drivelines are fully shielded.**



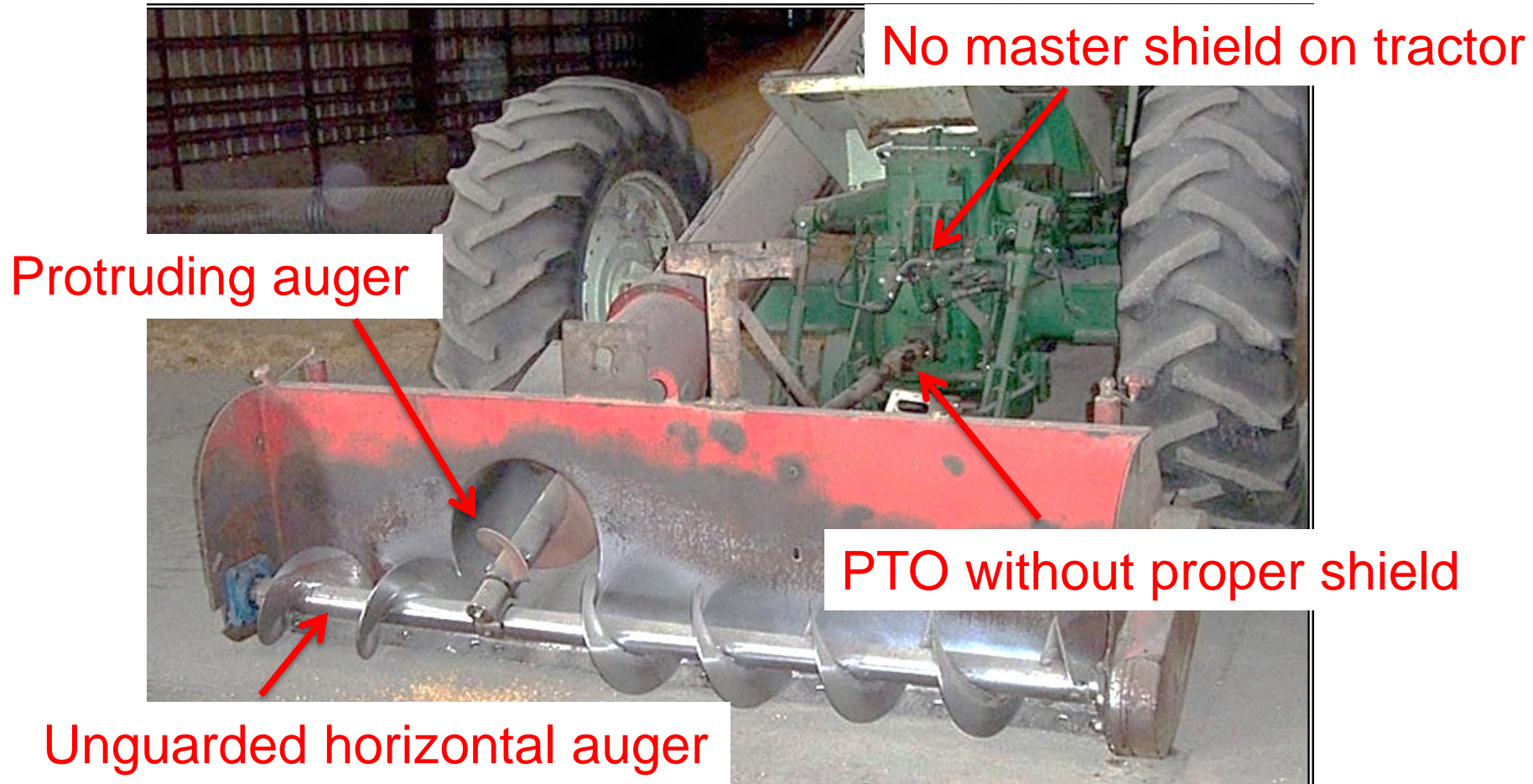


PTO shield is damaged and needs replaced.





# Tractor Mounted Conveyor -Auger





Employee lost ends of 3 fingers because the v-belt guard was off and not LOTO





# Lock Out/Tag Out/Try Out

- Controls energy sources
  - De-energize, isolate **ALL** power sources
- Prevents unexpected start-up
- When to LOTO
  - Before maintenance or service
  - **Guards removed**
  - Before bin entry



# No “Grand Fathering” with Machine Guarding





# Conclusion

- “If it moves and cause injury it must be guarded”



# Questions?

