

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

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.



Introduction

The Entanglement Hazards module is part of a curriculum series that addresses hazards found in areas of grain handling facilities including grain bins and their surrounding area. It's purpose is to assist participants in identifying and abating hazards in the work place.



Disclaimers

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Employee Rights

Employees are entitled to safe and healthy working conditions which DO NOT pose a risk of serious harm.

Workers are entitled to be fairly compensated for all hours worked in accordance with the law.



Employer Responsibility

Employers have the responsibility to provide a safe workplace.

More information about employer & employee rights can be found at www.osha.com



Learning Objectives

At the end of this lesson, participants will be able to:

- Identify sources of entanglement found around grain handling environments.
- Explain the types and characteristics of hazards posed by PTOs and how to prevent them.



Learning Objectives (cont.)

- Recognize & explain machinery hazards that create entanglement risks and provide the best appropriate action(s) to avoid, prevent, or correct the hazards.
- Name the 2 most common causes of entanglement and main characteristics of their corrective action.



Module Topics

1. Common Sources of Entanglement Hazards
2. Identifying Hazards
3. Preventing and Correcting Hazards
4. Sweep Auger Issue & OSHA
5. Learning Objectives Review
6. Summary



What is a Hazard?

Something with the potential to cause harm.



Types of Hazards





Common Sources of Entanglement Hazards

Common Sources of Entanglement Hazards

- Common Machine Hazards
- Specific Hazards



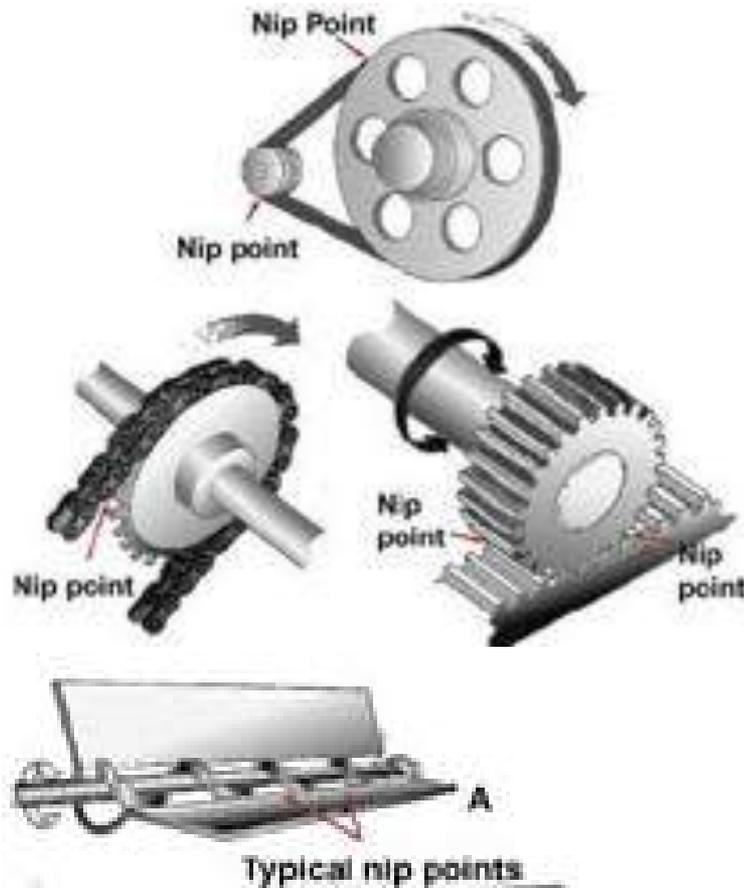
Common Machine Hazards

- 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



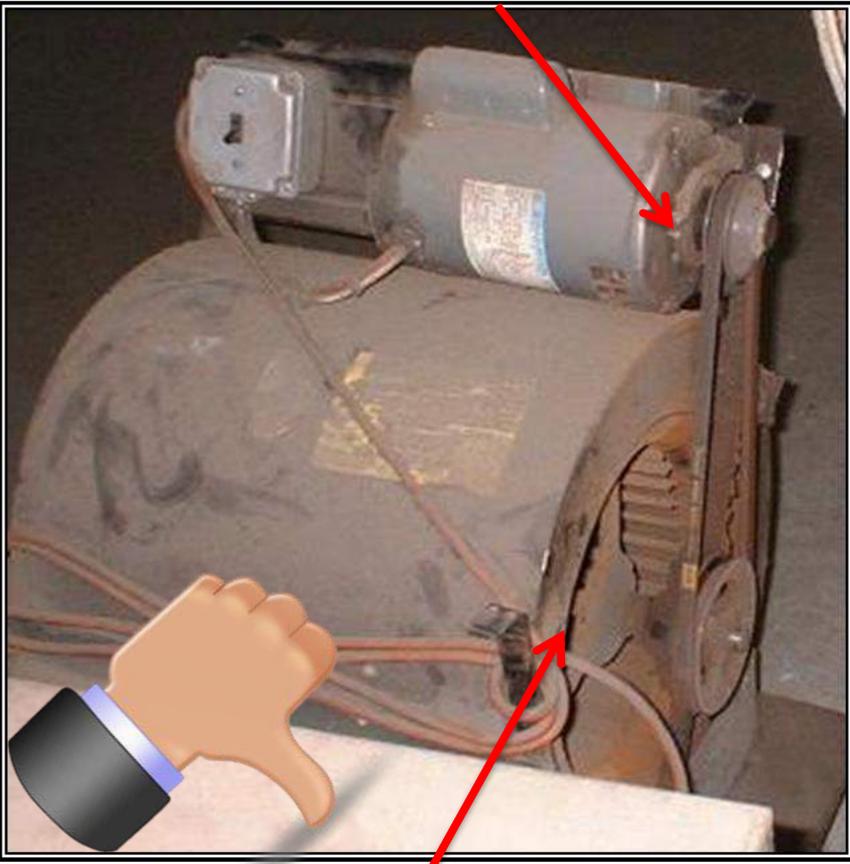
Examples:

- Elevator leg drive
- Motor
- Elevator leg belt
- Auger drive motors
- Sliding doors for bins
- Pulleys
- Belts
- Gears



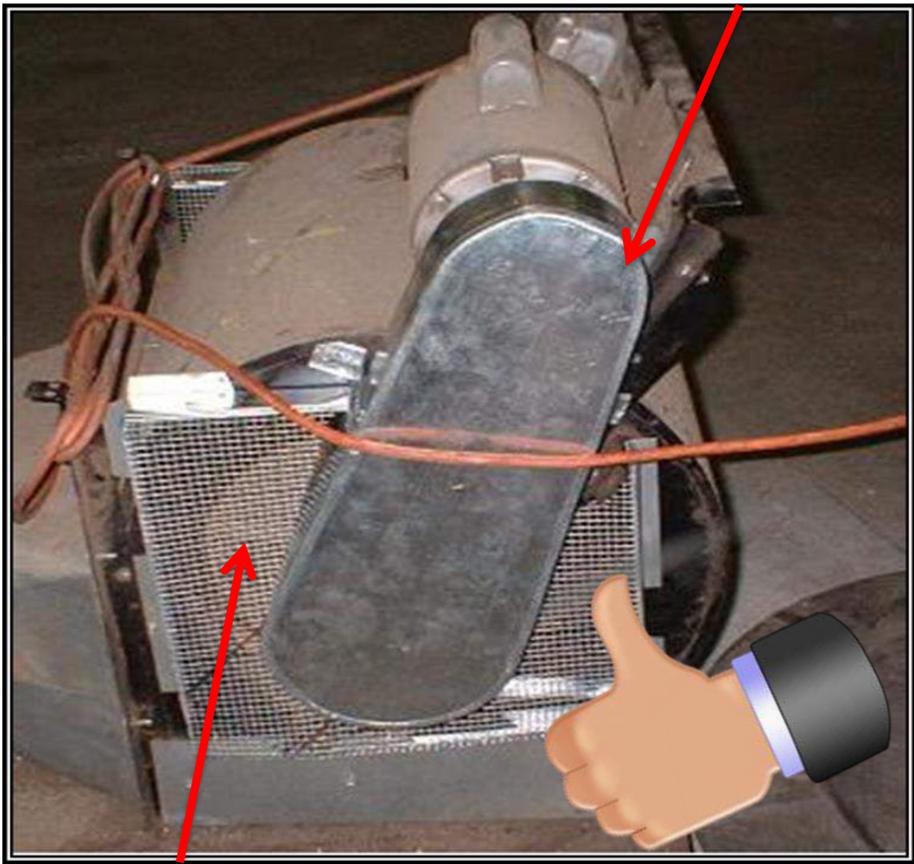
Unguarded/Guarded Pinch Points

Exposed belt turns clockwise



Fan is exposed

Belt is no longer exposed



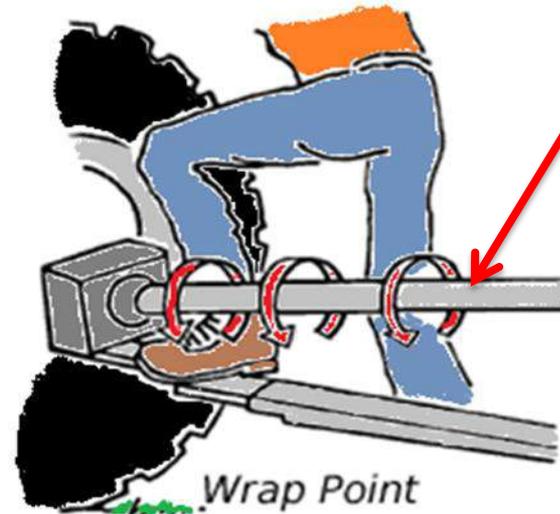
Fan is no longer exposed



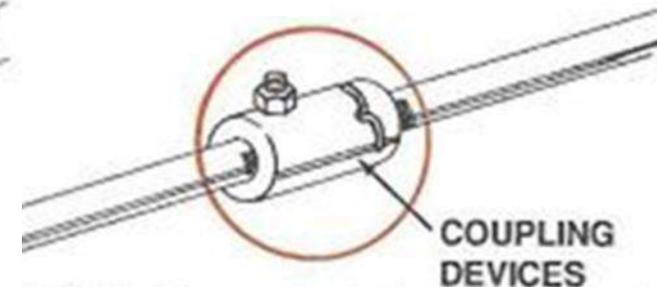
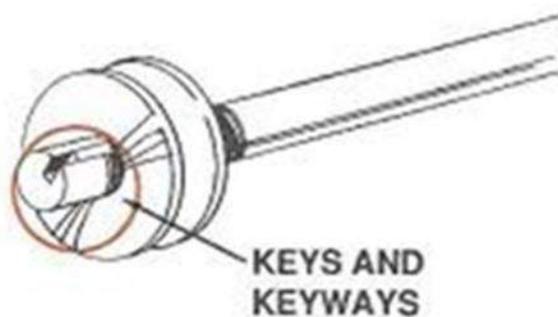
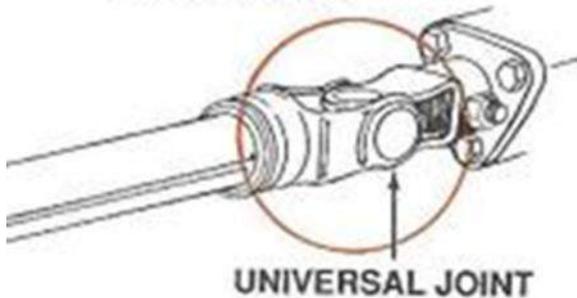
Wrap Points

Examples:

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



Wraps in direction shaft is turning



Wrap Hazard

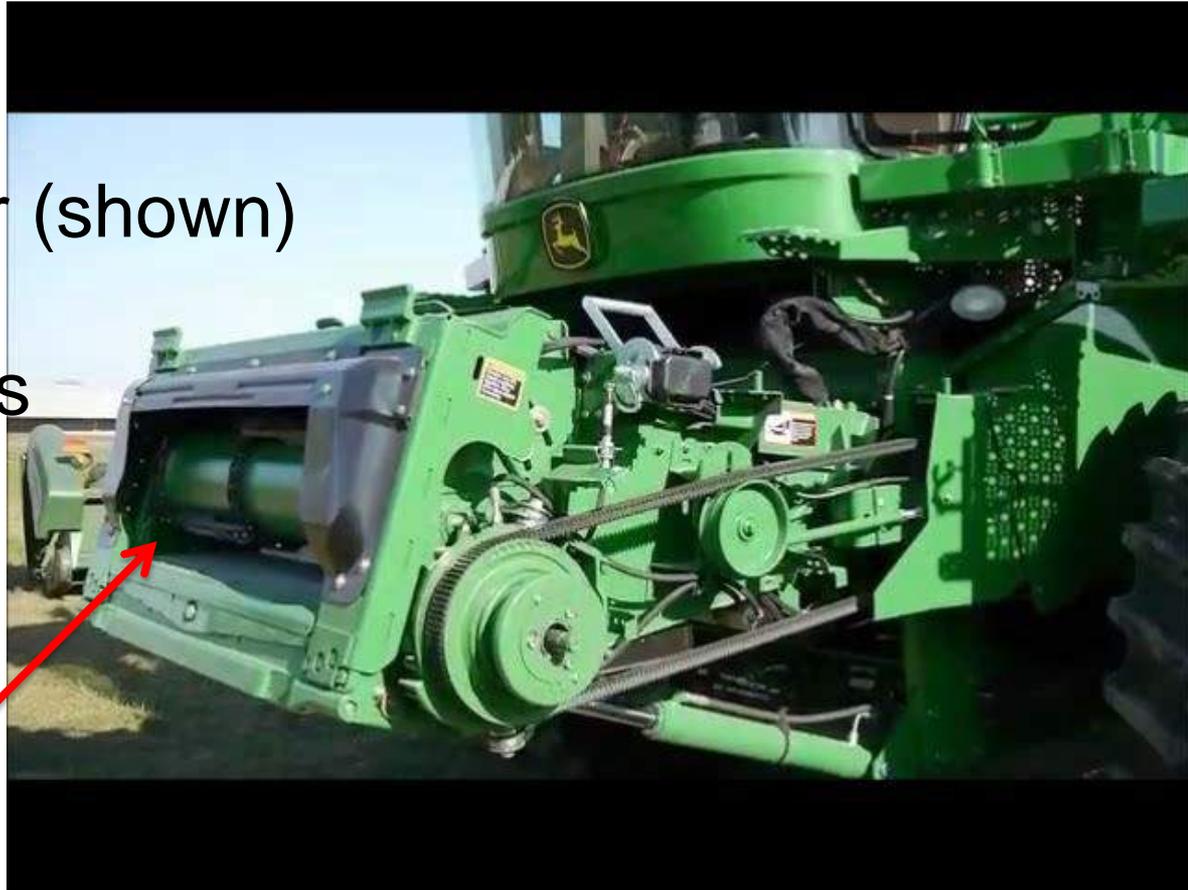


Pull-in Points

Examples:

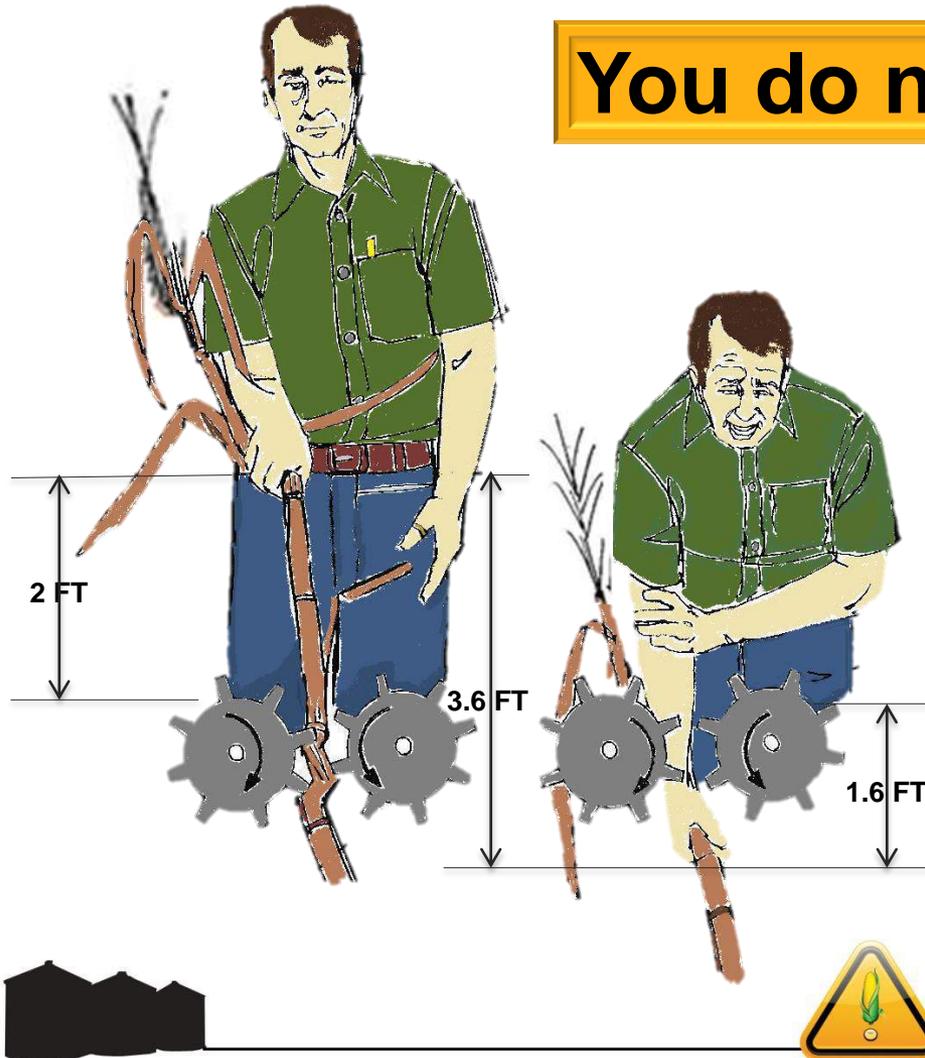
- Forage Harvester (shown)
- Crop Harvesters
- Combine Headers
- Windrow pickups
- Grinders

Operating point -
catches object &
drags it in.



Pull-in Points

You do not have time to react!

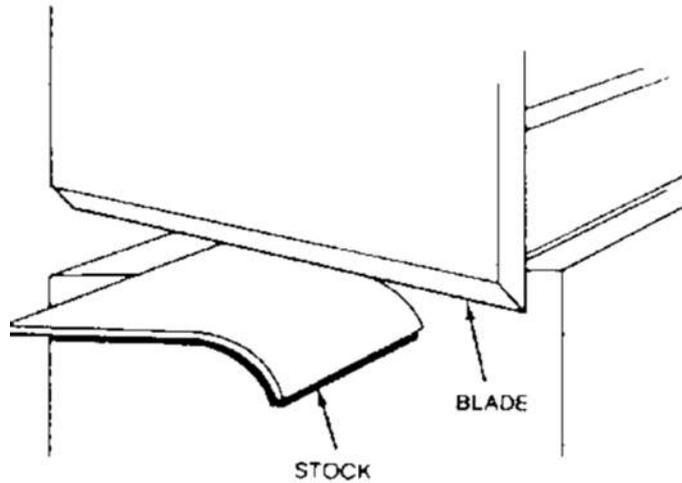


Takes only 3/10 second to react when stalk begins to pull through.

Stalk & hand will travel 3.6 feet before he can react.

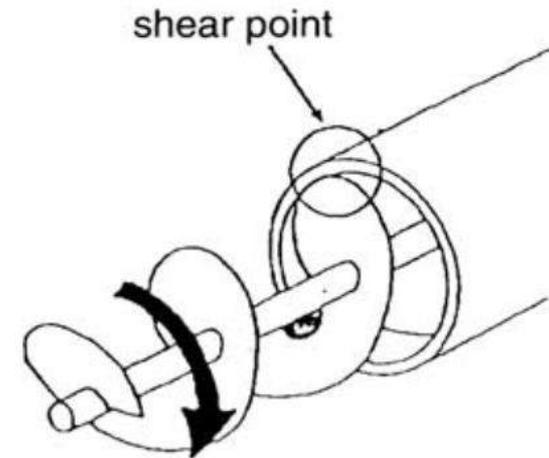


Shear/Cutting Points



■ Cutting points

- Single object
- Cuts from force or speed
- Sickles, Mower blades, Windrower cutter bar



■ Shear points

- Two edges
- Cuts soft material
- Augers, Harvesters



Hazard Reminders

Shear or Cutting Points

Hazards exist due to a cutting force.

Object moves rapidly - not always visible.

Easy to forget equipment is operational.

Cannot easily be guarded or protected.

Danger of thrown objects



Specific Hazards

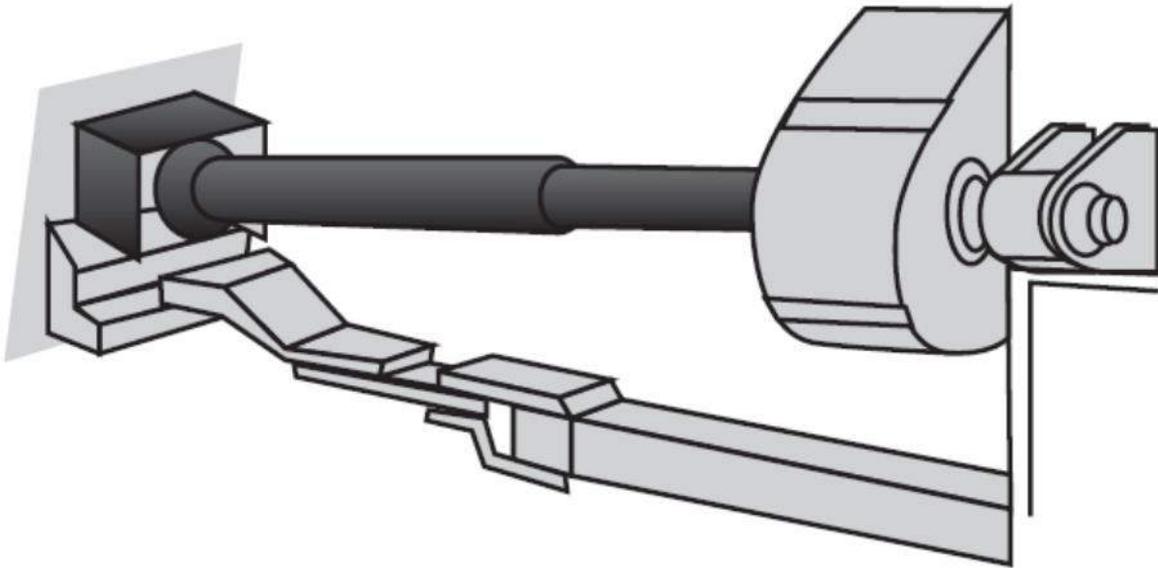
- PTOs
- Conveyors
- Elevator Legs
- Sweep Augers

NEVER reach over or around rotating parts!



Power Takeoff (PTO) Hazards

PTO (shafts) are among the oldest and most common machinery hazards.



Ensure PTO drivelines are fully shielded.



Reduce PTO injuries & deaths

NEVER attempt to step over rotating PTO drivelines.

NEVER operate tractor controls from the rear.

Stay well clear of rotating PTO drives.

KEEP long hair pulled back.

NEVER wear loose, baggy clothes around PTOs.

Bind, tuck, cut -laces, cords, ties, flaps, loose threads.

Avoid jewelry – bind, tuck, hide.



Power Take Off (PTO) Drives Demonstration



Reaction Time

Time between when a stimulus occurs and when you respond.

Factors which affect Reaction Time:

- Sleep deprivation
- Age
- General health or physical limitations
- Medication



Group Exercise



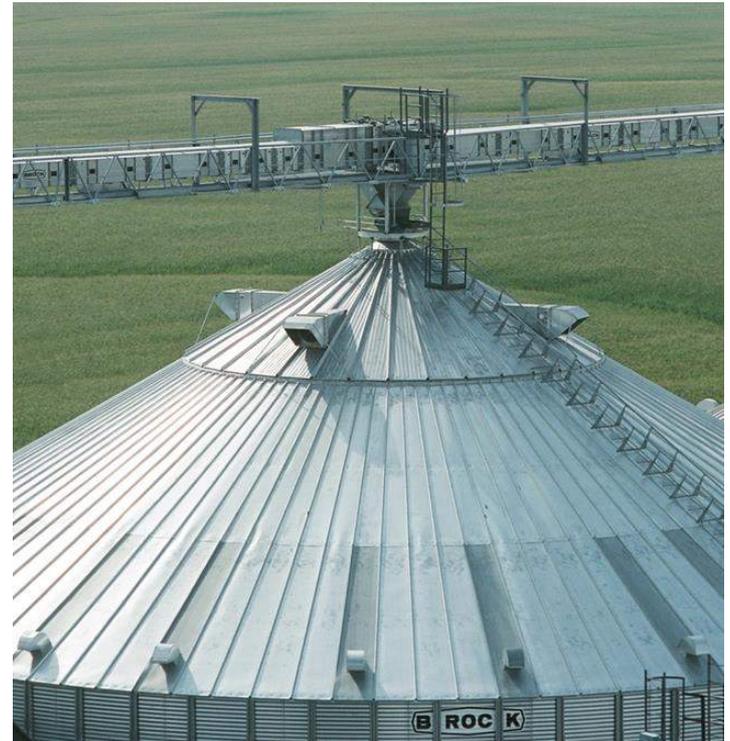
Table 1: Lapsed Time vs Distance Traveled*

540 RPM		1000 RPM		
Time lapsed in seconds (100's)	Revolutions turned	Distance Traveled (ft)	Revolutions Turned	Distance Traveled (ft)
0.15	2.3	1.8	4.2	3.3
0.33	3.0	2.4	5.5	4.4
0.40	3.6	2.8	6.7	5.2
0.50	4.5	3.5	8.3	6.5
0.50	4.5	3.5	8.3	6.5
0.70	6.3	4.9	11.7	9.2
0.80	7.2	5.7	13.3	10.5
1.00	9.0	7.1	16.7	13.1
1.50	13.5	10.6	25.0	17.6
3.00	27.0	21.2	50.0	39.3
5.00	45.0	35.3	83.3	65.5
10.00	90.0	70.7	166.7	130.9
60.00	540.0	424.1	1000.0	785.4

*Based on relationship of Tractor PTO with a shield/shaft diameter of 3 inches.



Conveyors



Types

- Tractor Mounted
 - Belt
 - Auger
- Screw
- Drag (en mass)
- Belt

- Primary mechanism to move grain



Tractor Mounted Conveyor-Belt

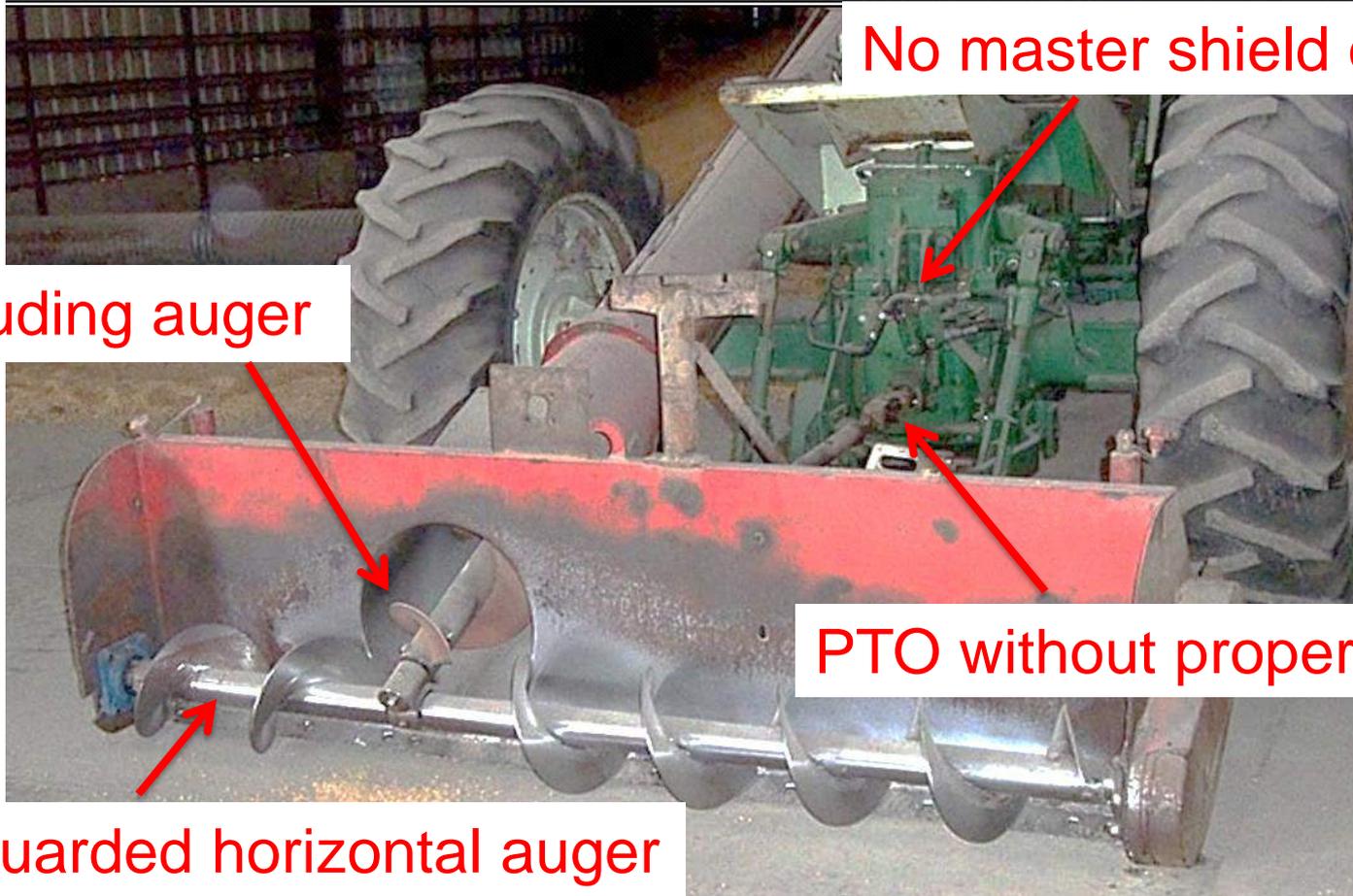
Uses a
PTO



Has
Multiple
Types
of
Hazards



Tractor Mounted Conveyor - Auger



No master shield on tractor

Protruding auger

PTO without proper shield

Unguarded horizontal auger



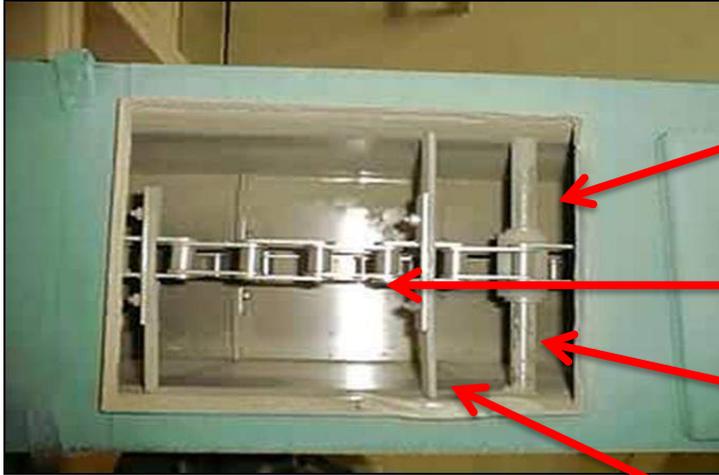
U-trough Screw Conveyor



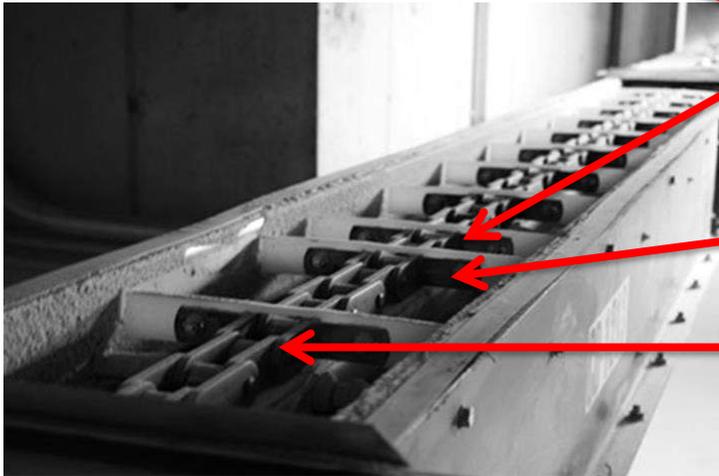
- “*Flighting*” - rotating helical screw blade
- Enclosed in tube or U-shape trough (cover across top of U)
- Moves liquid or granular material
- Stationary
- Auger (screw) much larger than portable ones



Drag Conveyor



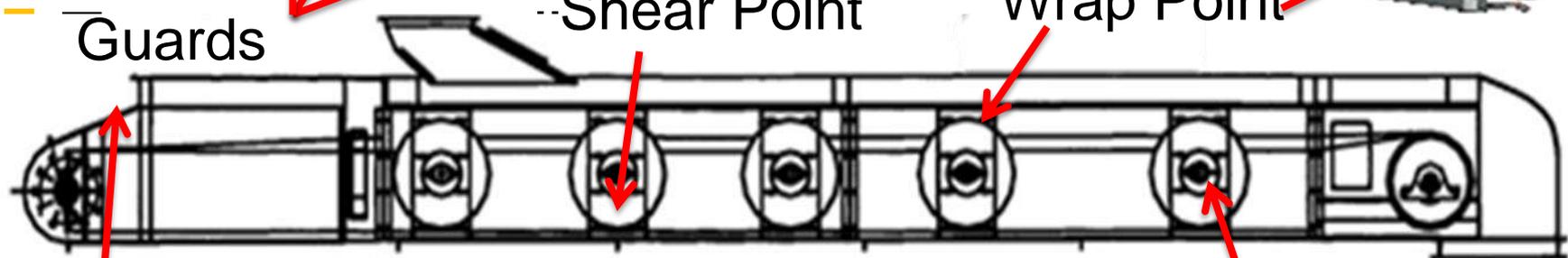
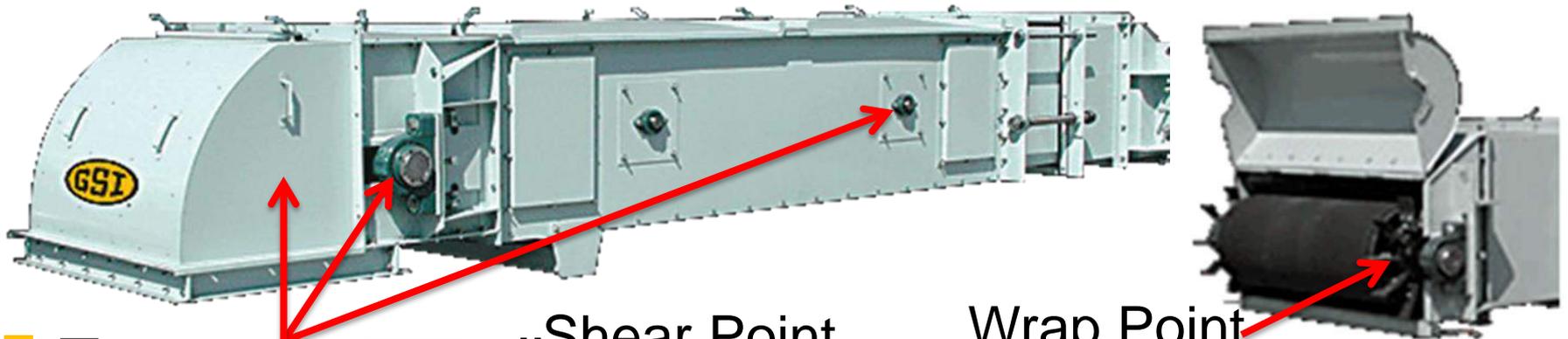
- Continuous loop of chain
Opening should have a shield
- Rotates on two or more sprockets
Pinch Point
- “Paddles” on chain at 90 degree angles
Pull in Point



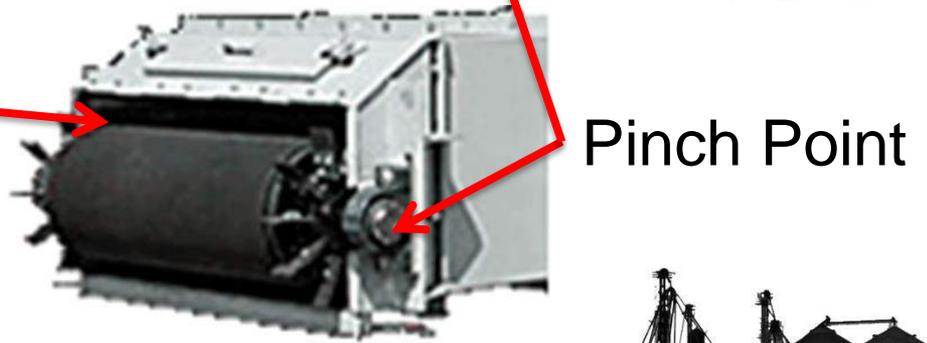
- Saddles hold material in place
Chain “drags” material being moved
Pinch Point



Belt Conveyor



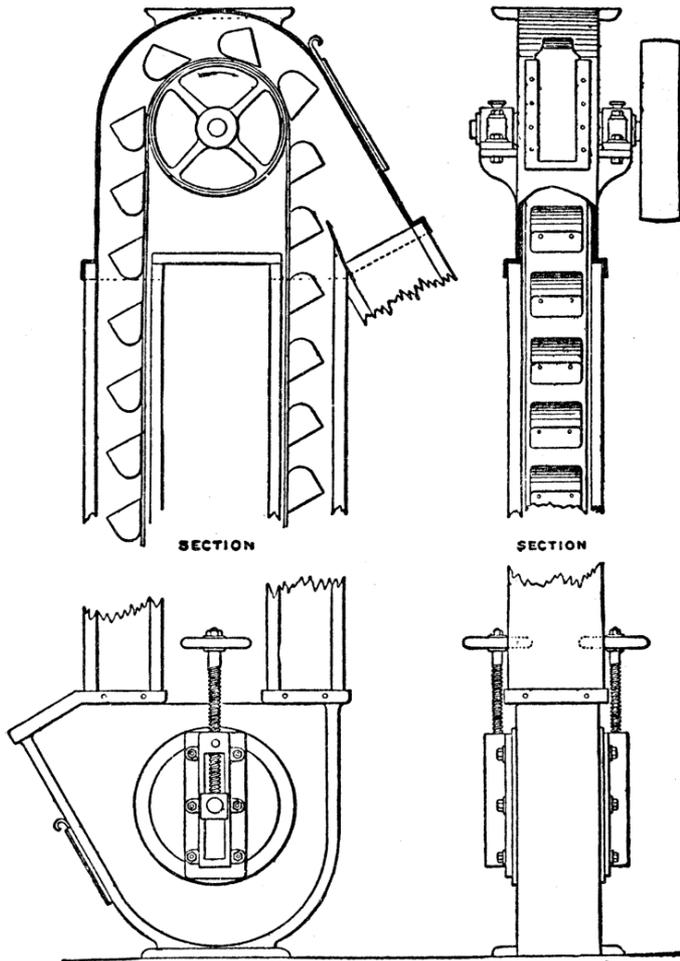
- Material on the belt
- Belt moves material
 - Can be high speed



Grain Leg



Grain Leg



Schematics - Courtesy of Florida Center for Instructional Technology
at University of South Florida <http://etc.usf.edu/clipart/>



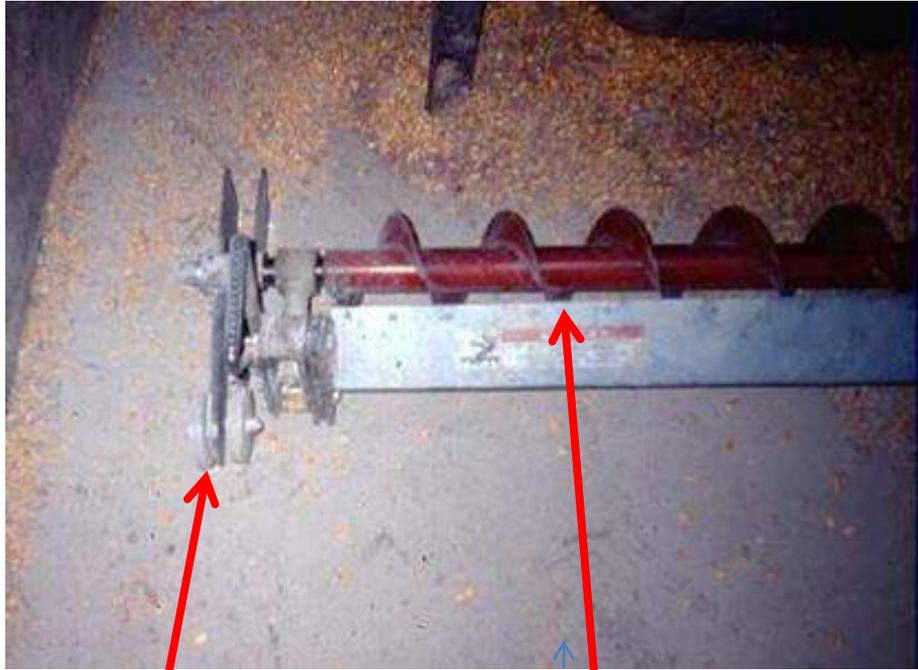
Operating Sweep Auger w/ Stop



- Helps move grain to center sump for removal.
- Moves at differing rates of speed.
- Stop prevents sweep from more than one rotation.



Sweep Auger Guarding



Exposed drive mechanism

Inadequate guard

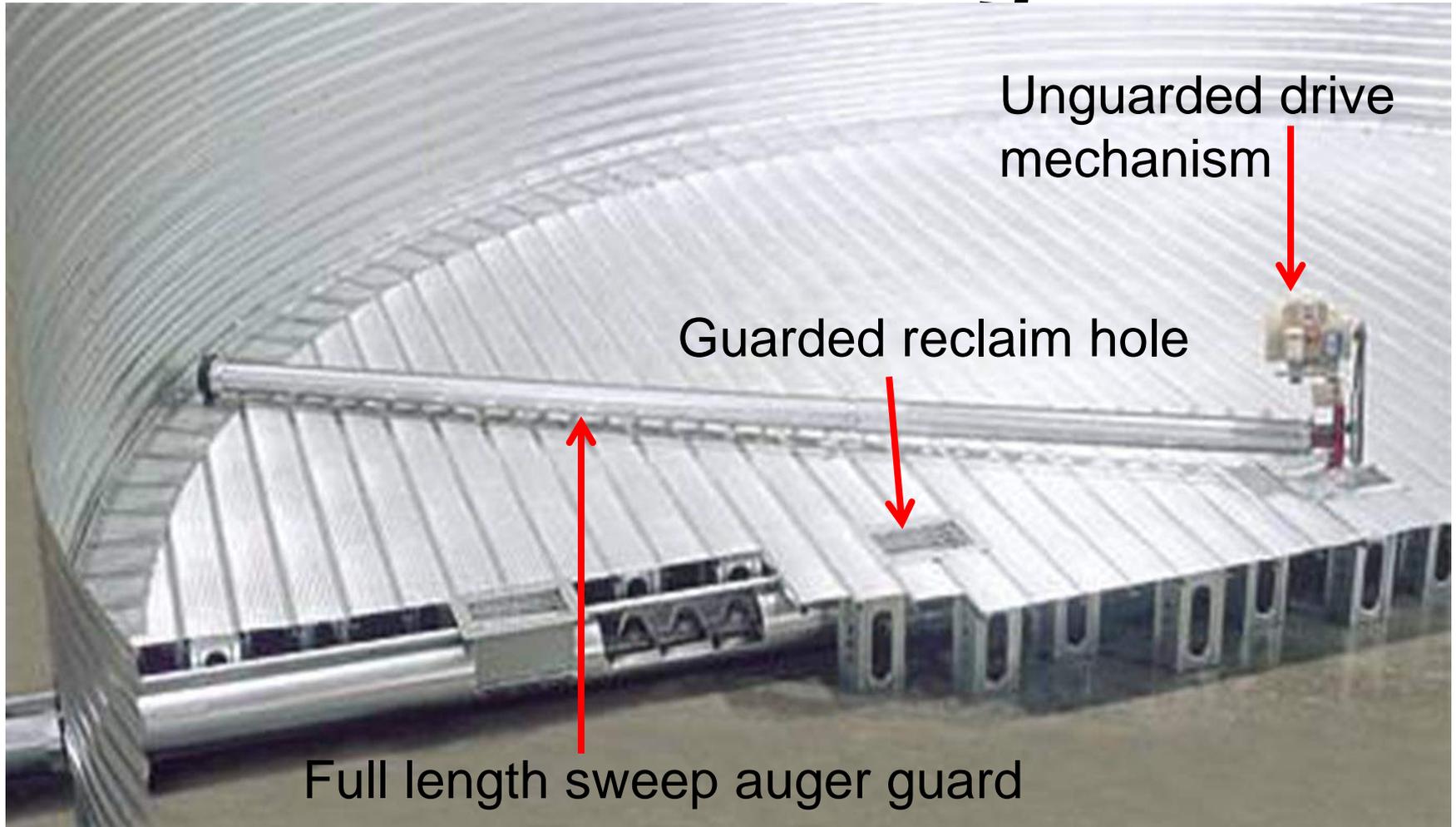


Free hanging power cord

No guard



Under-floor Discharge Screw



Power Supply Control Positioning



Power Supply Control Positioning



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.
NEVER found person's foot!



Guarded Reclaim Hole Removable Guard



Guarded Reclaim Hole Fixed Guard



Summary – Common Machine Entanglement Hazards

Pinch Points

- Belts
- Pulleys
- Chains
- Sprockets
- Gears

Wrap Points

- U-Joints
- Couplings
- Keys & Keyways
- Shafts
- Augers
- PTOs

Pull-in Points

- Feeders
- Gears
- “Teeth”

Shear Points

- Augers
- Blades
- Cutter Bars
- Harvesters



Summary - Specific Machine Hazards

Conveyors

- Tractor - Belt
- Tractor - Auger
- Screw
- Drag
- Belt

Grain Legs

- Buckets
- Chains
- Pulleys

Sweep Augers

- Guarding
- Power Supply
- Reclaim Holes
- Worker Exposure



Identifying Hazards

A tall, slender metal tower with a platform at the top, situated on a roof against a cloudy sky. The tower is supported by several diagonal bracing beams. The background shows a blue sky with white clouds and the roof of a building.

Identifying Hazards

- Knowledge
- Risk Assessment



Safety is everyone's responsibility!



Knowledge

- Location of potential hazard points
 - Type of hazard
 - Know how machine works
 - Places of human contact with machine
 - Optimal vs “Real” working conditions

**Put
knowledge
into action!**

- Regulations/Policy

- OSHA – 1910.272 & 1910.211-219
- Other Regulations
- Standard Operating Procedures (SOPs) and/or work instructions
- Company Policy



Risk Assessment

Reflects both the likelihood harm will occur from exposure to a hazard and the severity of harm.

- Active, Continual Process
- Severity & Frequency
- Corrective Action

Protects people from harm!



Risk Assessment or Job Hazard Analysis (JHA)

A process to:

- Identify hazards
 - Who is exposed & how many
 - Where & why does it occur
- Assess risks to health & safety
 - Determine probability of occurring – improbable, remote, possible, probable, certain
 - Determine severity – trivial, minor, significant, major, severe, fatal



Risk Assessment

- Identify & implement measures
 - Engineering Controls
 - Eliminate the hazard – **First Priority**
 - Substitution
 - Containment
 - Administrative Controls
 - Personal Protection Equipment (PPE) – Last resort
 - All other options are in place and there is still a risk
 - Regulatory requirements – MUST DO
 - BATNEEC – Best Available Technology Not Entailing Excessive Cost



Summary - Identifying Hazards

Know

- Location of Hazard Points
- Type of Hazard
- Regulations

Risk
Assessment

- Who, Where, Why
- Frequency & Severity
- Fix





Preventive and Corrective Action

Preventive and Corrective Action

- Guarding
- Guarding devices
- Lock out/Tag out
- Preventive maintenance
- Visual safety information



Preventive and Corrective Action

Proper Guarding and strict adherence to Lock Out/Tag Out procedures will prevent the majority of Entanglement hazards!



Guard Definition

A barrier that prevents exposure to an identified hazard.

Maybe not
THIS kind
of guard!



Machine Guarding Basics

- Point of operation
- Power transmission apparatus
- Moving parts

If it moves and could cause injury it must be guarded! Best Practice for all.



Point of Operation

- Where the work actually takes place.
- Where a person comes in contact with the machine.

**Pile of corn?
Or human foot?**

The machine

- Doesn't know
- Doesn't care

It just keeps on working.

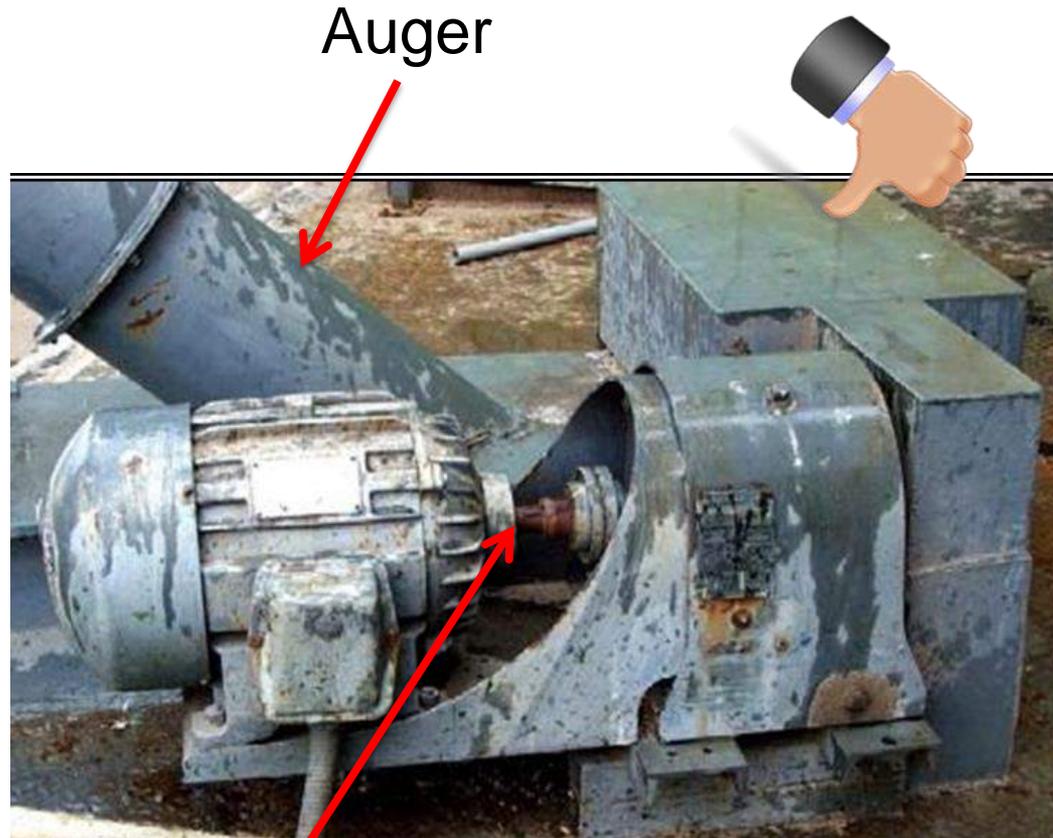


Unguarded Auger



Power Transmission Apparatus

- Carries power from its originating source (motor)
- Through mechanisms (belts, gears) to
- The point of operation.



Unguarded



Power Transmission Apparatus



Unguarded belts and pulley



Moving Parts



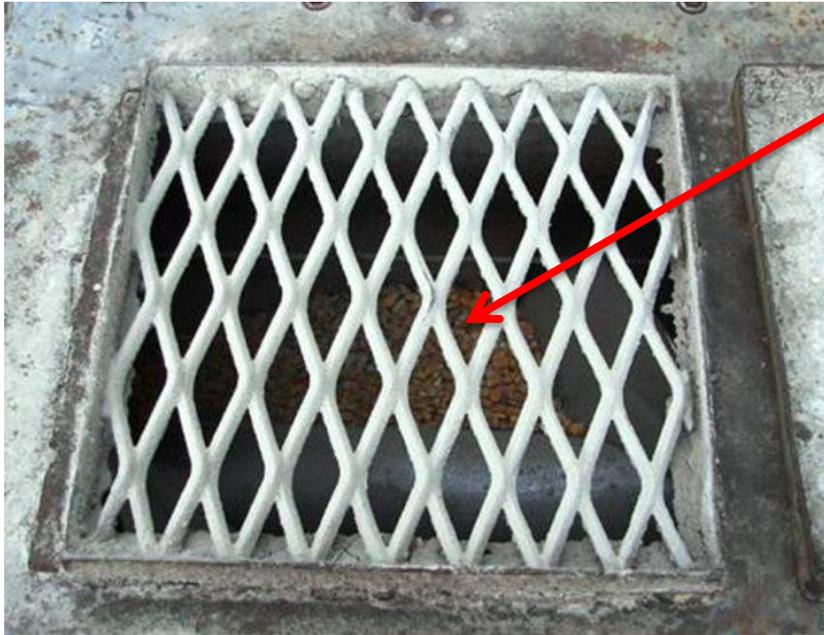
Unguarded
Conveyor



Guarded
Conveyor

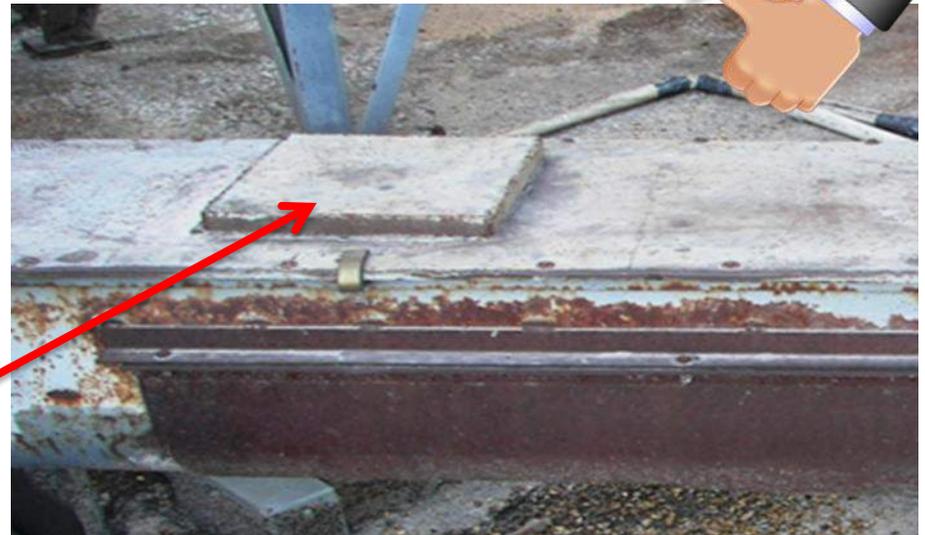


Guarded Augers



Must not be able to reach moving parts – with body or tool.

No exposure to moving parts.



Injury Example

- Corn hung-up & not flowing to dryer from wet holding tank.
- Rod added to top of U-trough conveyor.
- Employee stood on conveyor operating rod.
- Inspection lid was off.
- Employee stepped back into the running screw auger.
- No one around to help.
- Lost inner half of foot.



Injury Example



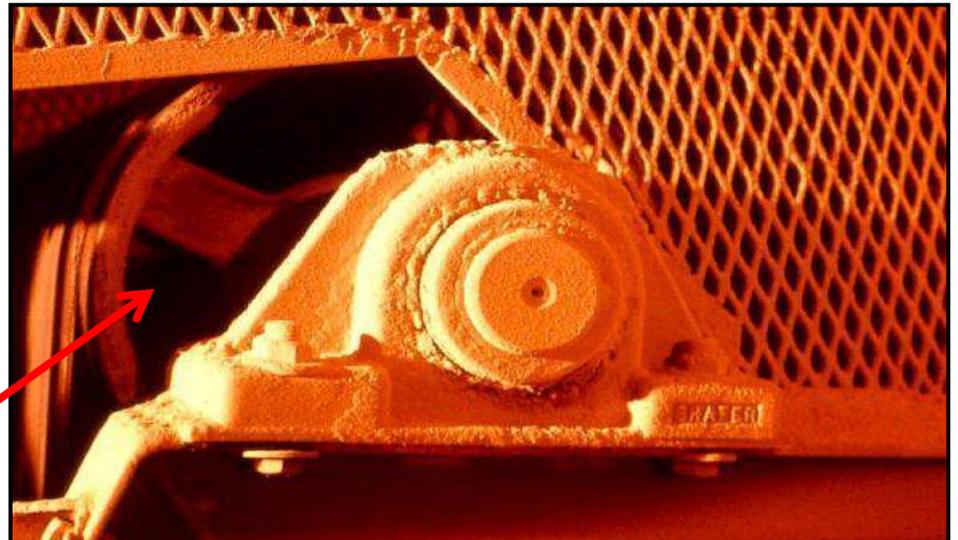
Guard Requirements



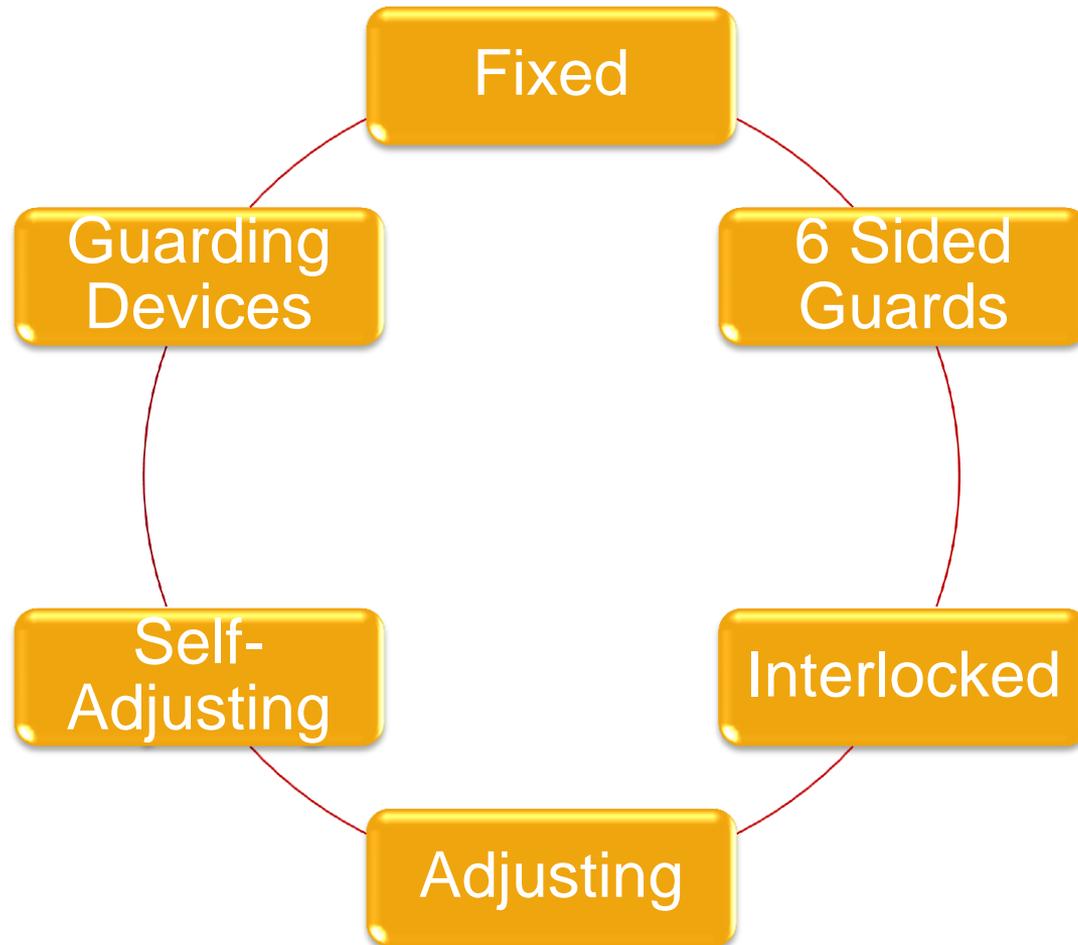
Guard Requirements

Guards should follow the “AUTO” Principle.

Around
Under
Through
Over



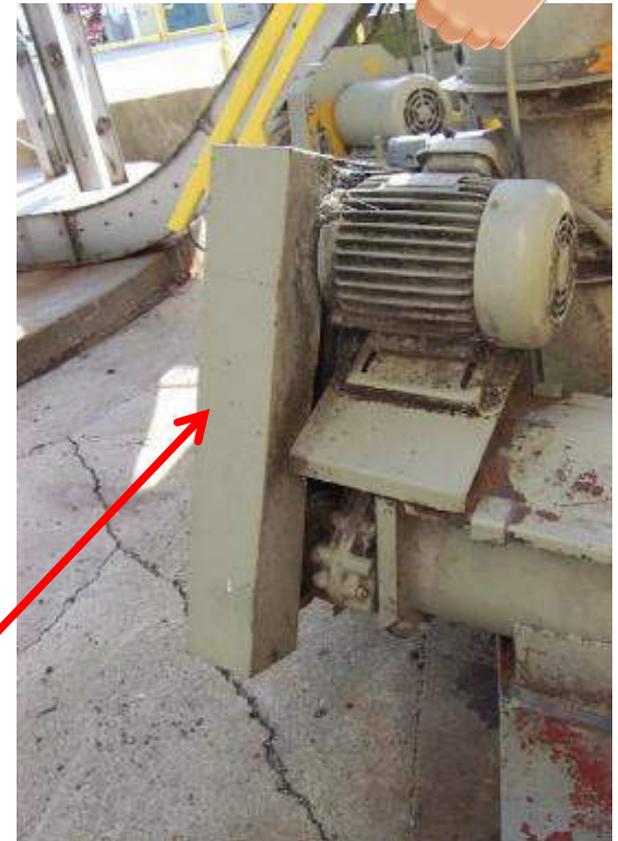
Machine Guarding - Types



Fixed Guard

- Permanent fixture – attached to machine
- Requires a tool to remove
- First Choice/Best Choice

Guard covering belt and pulley

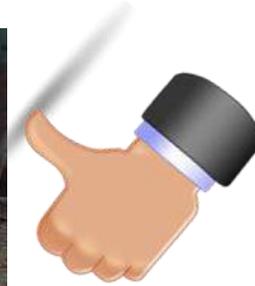


Fixed Guards



6-Sided Guard

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



Interlocked Guard



Shuts off or disengages power (to machine) when it is opened or pushed out of position.

Interlock



Adjustable & Self-Adjusting Guard

- Requires operators to adjust guard to protect themselves
- Similar to fixed – attached to machine

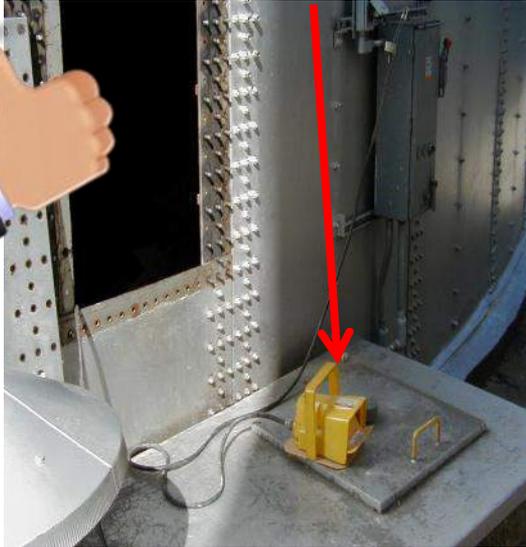


- Guard covers hazard area until moved by
- Material pushed into the point of operation.



Guarding Device

Pressure Sensing



- Interrupts machine's operating cycle
- Prevents workers from entering dangerous areas during machine cycles

Location

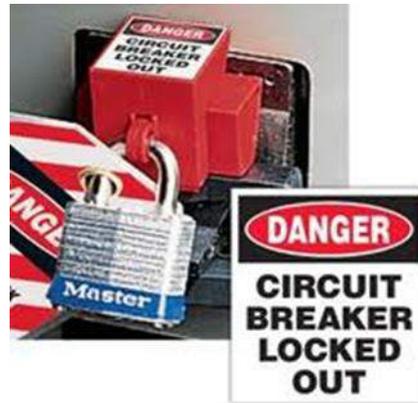


- Prevent access to hazard which cannot be guarded
 - Walls/Barriers/Fences
 - Height



Lock Out/Tag Out – Try Out

- Protects Employees and You.
- Prevents start-up.
- BEFORE maintenance or service begins.
- Shut-off, de-energize & isolate ALL power sources.
- OSHA 1910.147 & others.



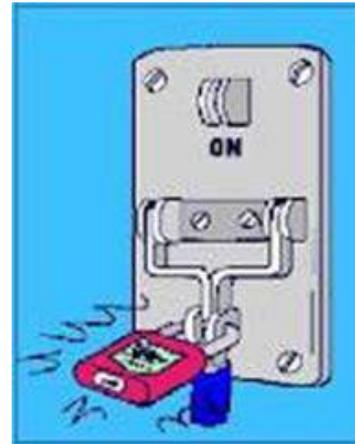
Lock Out/Tag Out – Try Out

- Electrical cords, power tools, PTO's
 - Unplug & tag cords
 - Remove keys from ignition, pocket & tag



Lock Out/Tag Out – Try Out

- Equipment & machines
 - Can have multiple energy sources
 - Can have locks from different people
 - Follow LOTO procedures!
 - Everyone must be trained!



Lock Out/Tag Out – Try Out

TRY OUT
LOTO BEFORE
BEGINNING
WORK!

One Lock, One
Key, One
PERSON!



Best Practice for Everyone!



Preventive Maintenance

Regularly scheduled



According to manufacturer's
recommendations



More frequent if needed



Prompt repair

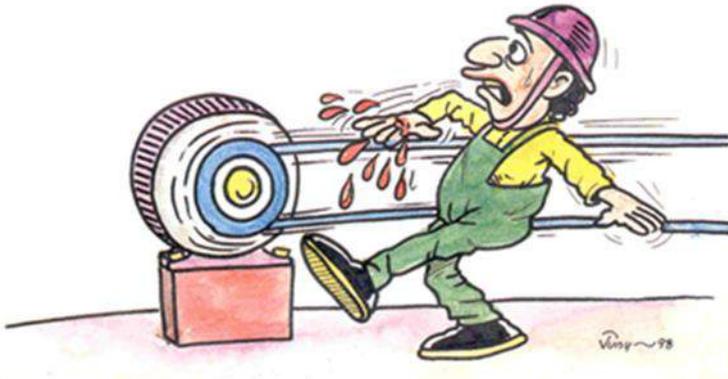


Certification record



Visual Safety Information

- OSHA Required
- Signal Words
- Visual Safety & Pictorial Images
- Workplace posters (pictured here)



**Machines
are safe**



**—when safety rules
are followed**



OSHA Requirements

- OSHA Regulations

- 1910.145
- 1926.200

- Signs and Tags

- ANSI Standards

- Z535



Currently in both ANSI Z535.2 2011 and ANSI Z535.4 2011



Currently in both ANSI Z535.2 2011 and ANSI Z535.4 2011



Currently in both ANSI Z535.2 2011 and ANSI Z535.4 2011



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Currently in both ANSI Z535.2 2011 and ANSI Z535.4 2011



Signal Words

 **DANGER**

- **Immediate** danger.
- Special precautions are necessary.
- High probability of serious injury or death.

 **WARNING**

- Hazard is present.
- Presents risk of injury or death.

 **CAUTION**

- Caution should be used against unsafe practices.
- Follow safety instructions.
- Less serious hazards.



Visual Safety Signs



Pictorial images used with words.



OSHA compliant signs.



SUMMARY - PREVENTIVE AND CORRECTIVE ACTION

**GUARD!
DO NOT
REMOVE
GUARDS!**

**FOLLOW
LOTO!**

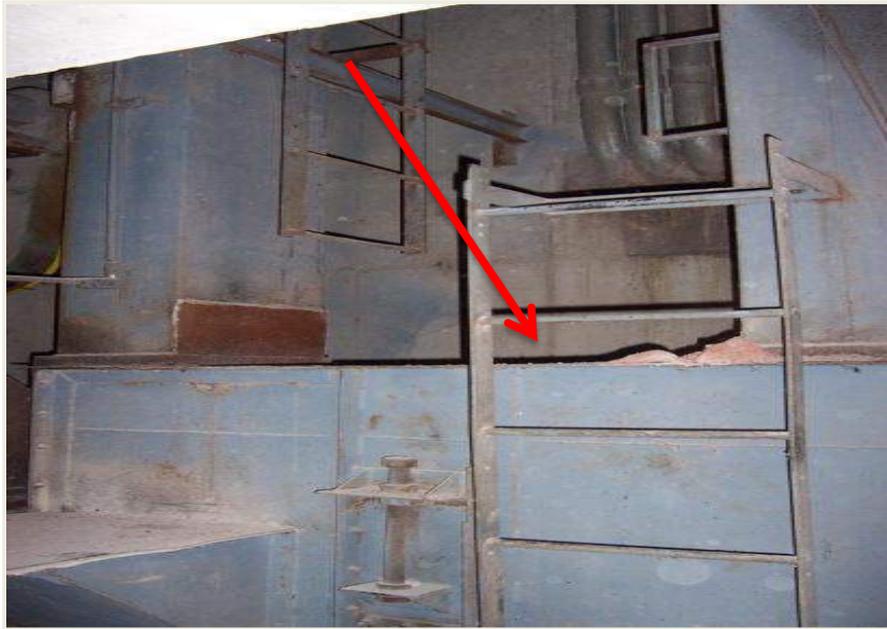
NO EXCEPTION RULES!



Group Exercise



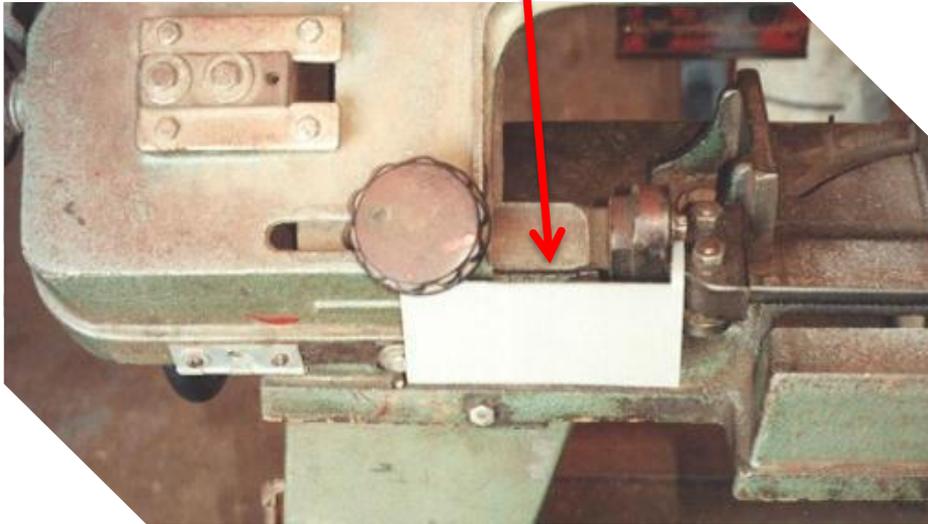
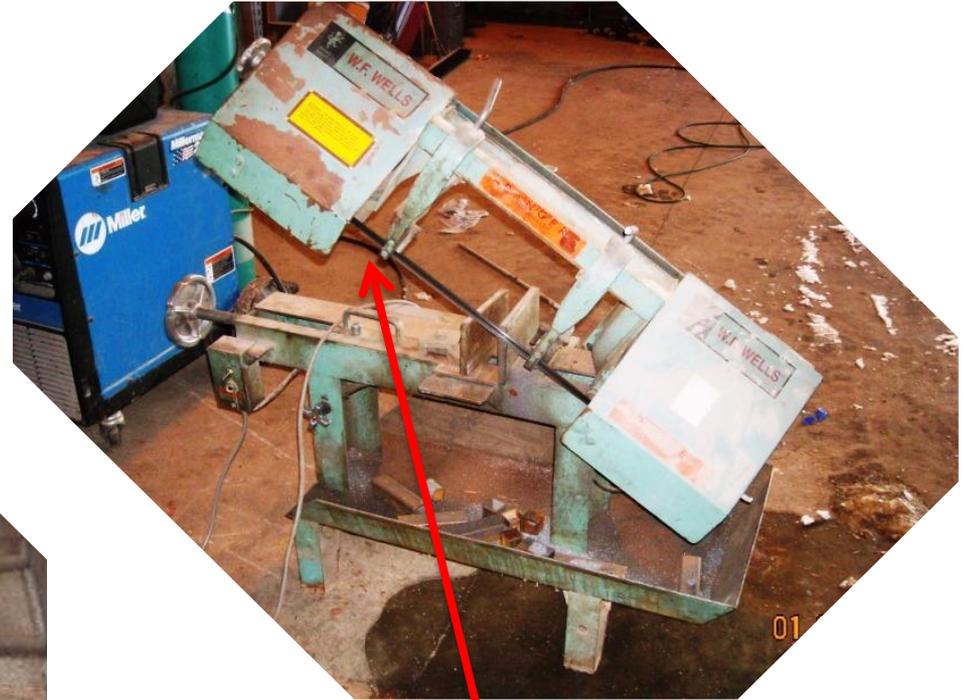
Identify the Hazard(s) and Corrections



Identify the Hazard(s) and Corrections



Guard



Sweep Augers



Sweep Auger Issue

How to use a sweep auger that:

- Meets OSHA criteria
 - OSHA standards 1910.272 & 1910.272(g)(1)(ii)
 - February 6, 2012 OSHA Letter of Interpretation on Sweep Augers
 - May 3, 2013 OSHA Memorandum - Grain Handling Facility Sweep Auger Enforcement Maintains safety of workers
- Allows for performance issues & tasks



OSHA – Concerns

- Equipment that exposes workers to hazards must be:
 - De-energized
 - Energy source must be locked out
- Sweep augers may expose workers to hazards-unguarded or partially guarded.
- Employer must demonstrate worker is not exposed to hazards.

 OSHA[®]



Hazards per OSHA



- Entanglement
- Unable to turn off power to avoid injury
- Engulfment/Entrapment



What is the issue per industry?

- Entanglement
 - Run sweep augers while worker is in bin to clean it out
 - Sweep augers move slowly
 - Workers go behind sweep
- Unable to turn off power to avoid injury
- Engulfment/Entrapment – minimal risk
 - Sweep augers run when bin is near empty



Solution - SAMS

10 Points of Light

1. Evaluate bin for engulfment & atmosphere hazards before entry.
2. LOTO before entering bin to set up or dig out sweep auger.
3. Sump grate/guard in place & secure before operating sweep auger
4. Employees operating sweep auger cannot walk on grain that presents an engulfment hazard.
5. Sweep auger guards



Solution - SAMS

10 Points of Light

6. A rescue trained and equipped observer.
7. Entering a bin with an energized sweep – use of engineering controls.
8. Auger must be provided with a positive speed control mechanism or bin stop device.
9. Workers are prohibited from using their hands, legs other similar means to manipulate the sweep auger while it is operating.
10. Maintenance/adjustments – LOTO.



SAMs

Specific Abatement Measures

1. Evaluate bin for engulfment & atmospheric hazards before entry.
 - a. From entry section of the standard.
 - b. Each time employee enters a bin hazards must be evaluated – by qualified person.
 - c. Employees not to enter until permit completed.
 - d. Producers – use bin entry checklist as guide.
 - e. No engulfment hazards.
 - f. No atmospheric conditions present



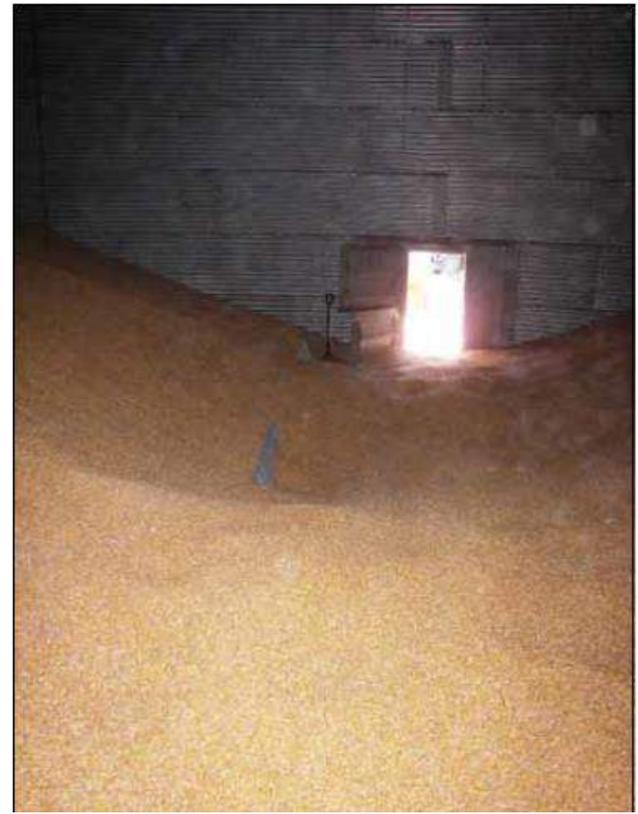
SAMs

Specific Abatement Measures



Dangerous Entry Condition

Evaluate
Entry
Hazards



Acceptable Entry Condition



SAMs

Specific Abatement Measures

2. LOTO before entering the bin to set up or dig out the sweep auger.

- a. Subfloor auger
- b. Grain entry points



SAMs

Specific Abatement Measures

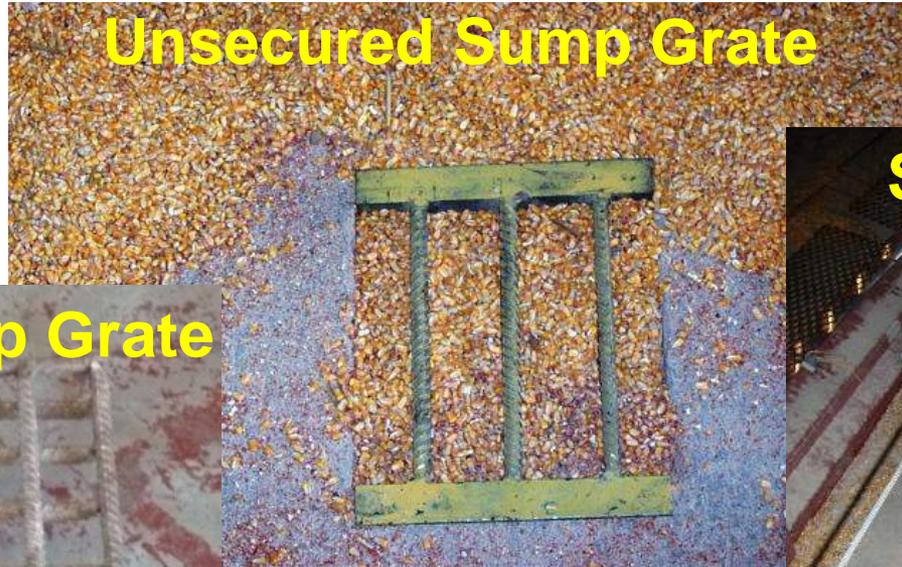
3. Sump Grate/guard in place & secure before operating the sweep auger.

- a. Machine guarding Subpart O
- b. Difficult to secure
- c. Sumps – closed & LOTO



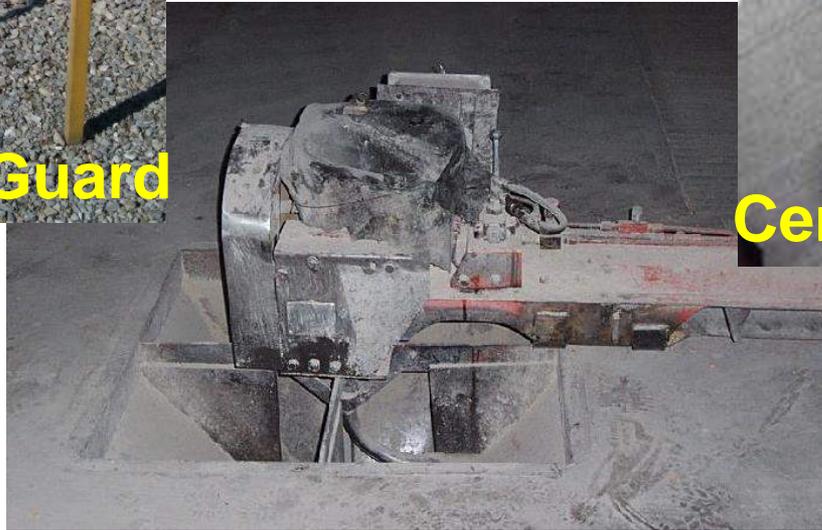
SAMs

Specific Abatement Measures



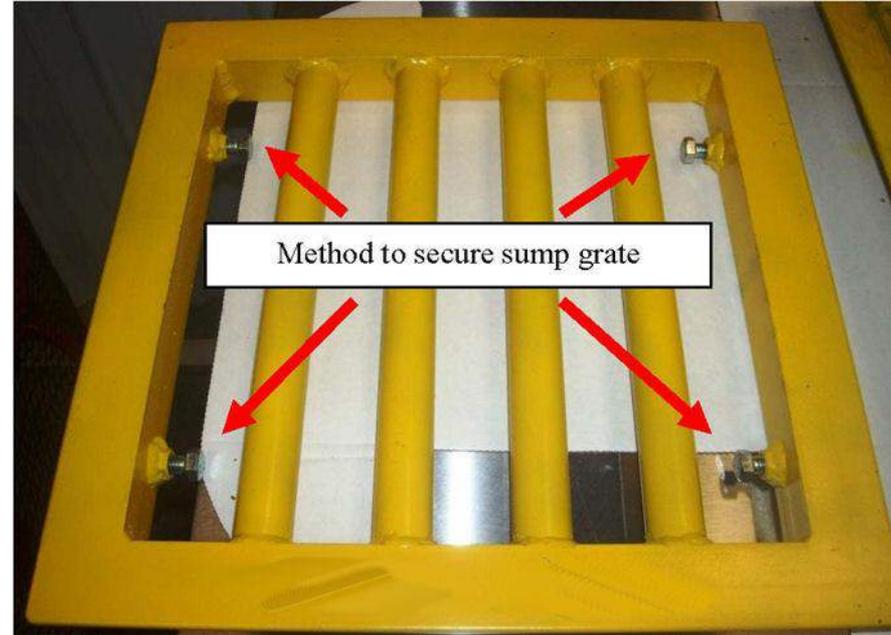
SAMs

Specific Abatement Measures



SAMs

Specific Abatement Measures



Custom made sump guards



SAMs

Specific Abatement Measures

Subpart O

- 1910.217
- mechanical power press standard
- how far away employee needs to be in relationship to hazards

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 ¾ inches
17 ½ to 31 ½ inches	2 ¼ inches
31 ½ inches to less than 7 feet	6 inches
More than 7 feet	Protective covering not required



SAMs

Specific Abatement Measures

4. Employees operating the sweep auger cannot walk on grain that presents an engulfment hazard.



SAMs

Specific Abatement Measures

5. Sweep Auger Guards

- a. Provided with guards per manufacturer's design.
- b. Guard that comes with sweep must be intact.
- c. Only part of sweep that can be unguarded is the point of operation.



SAMs

Specific Abatement Measures

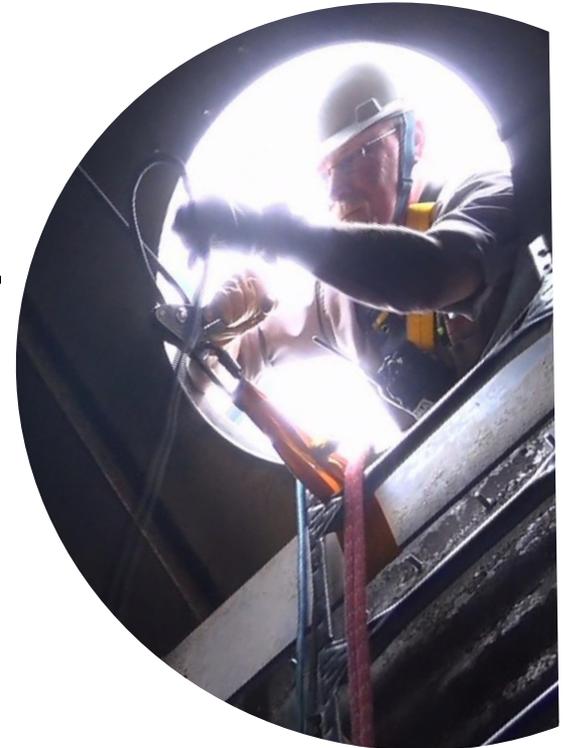


SAMs

Specific Abatement Measures

6. Observer must always be positioned outside bin.

- a. Rescue trained and equipped.
- b. Monitor activities of workers inside
- c. Trained in calling for help
- d. In constant communication with entrant –visual, voice, other.



SAMs

Specific Abatement Measures

7. Entering a bin with energized sweep auger.

- a. Must have engineering controls
 - i. Guard or device
 - ii. Prevents workers from coming into contact with energized sweep auger.
- b. Administrative controls only is not sufficient.
 - i. Company policy
 - ii. Is not acceptable means of protection by itself



SAMs

Specific Abatement Measures

Engineering controls:

- Attached guard
 - Prevents worker contact with unguarded portion of the auger.
 - 1910 subpart O –chart from the 1910.217 mechanical power press standard.
 - Tells how far away employee needs to be in relationship to the hazards.
 - The farther the distance away from hazard the larger the opening can be on the guard.



SAMs

Specific Abatement Measures

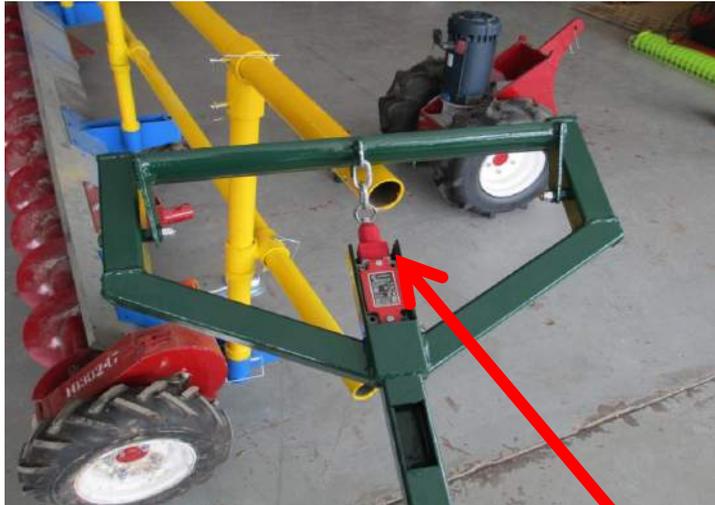
Engineering controls:

- Equipped with a Control Mechanism
 - Dead-man switch or other similar device.
 - **Only** when operator is in contact with device should sweep operate.
 - Worker must be 7 feet from energized auger at all times.
 - Other workers must be protected by additional engineering controls.



SAMs

Specific Abatement Measures



Operator must be 7' from point of operation

SASH

Sweep Auger Safety Handle

(Developed by COOP in Ohio)



Push bar has dead-man switch.

Device to prevent jackknifing push handle



SAMs

Specific Abatement Measures

Engineering controls:

- Portable guardrails
 - Placed at least 7 feet behind sweep auger
 - **Comply with Subpart O**
 - Handrail complies with OSHA – 42” top rail & 21” mid-rail
 - Warning line & other easily removable devices not sufficient control.



SAMs

Specific Abatement Measures



Extends total length of auger



Meets guard rail requirements



SAMs

Specific Abatement Measures



“Snow fence” must comply with Subpart O



SAMs

Specific Abatement Measures



Safety Cage/Control Center



Dead-man foot switch



SAMs

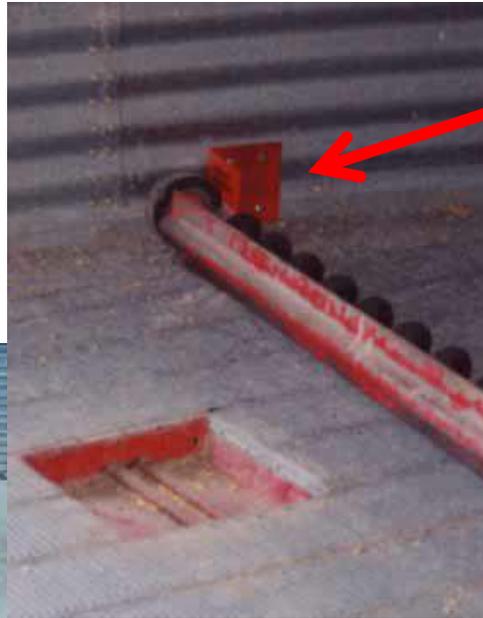
Specific Abatement Measures

8. Auger must have positive speed control mechanism or bin stop device.
 - a. Prevents uncontrolled rotation of the sweep auger.
 - b. Hydraulically driven sweep auger is a positive speed control.
 - c. Bin stop is for direct drive sweep augers.
 - d. Bin stop located no closer than 7 feet from the bin entry point.



SAMs

Specific Abatement Measures



Bin Stop Device



SAMs

Specific Abatement Measures

9. Workers are prohibited from using their hands, legs, or other similar means to manipulate the sweep auger while it is operating.



This is a common practice that must stop.



SAMs

Specific Abatement Measures

10. Maintenance or adjustments

- a. Sweep auger must be unplugged.
- b. Person making adjustments must maintain exclusive control of the plug.
- c. OR sweep auger must be **LOCKED OUT** and **TAGGED OUT**.



Sweep Auger Non-Entry Procedure

Prepare de-energized sweeps for operation

- Enter bin
- Make adjustments
- Exit bin
- Start sweeps back up

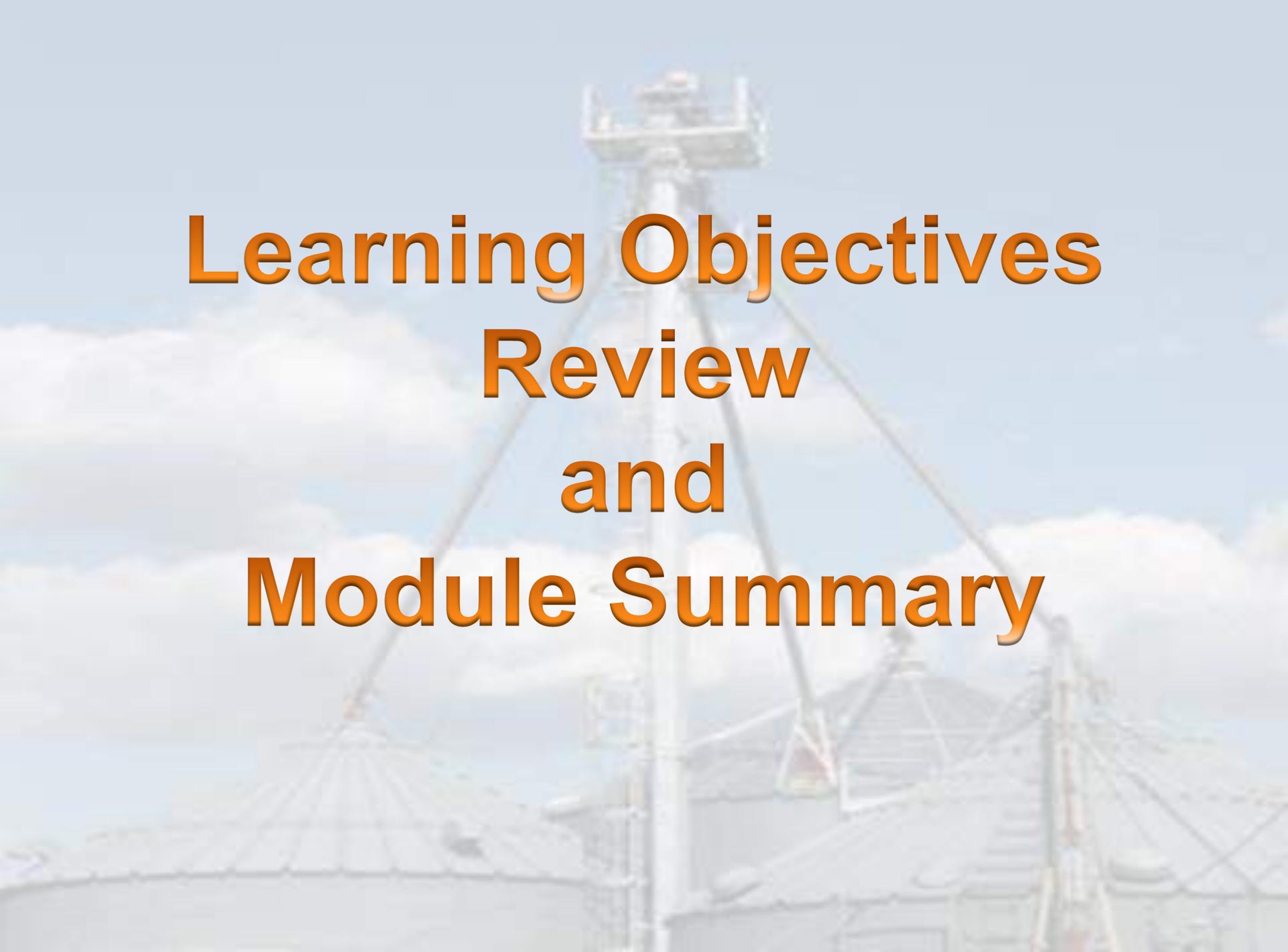
De-energize and lockout sweeps

- Exit bin
- Turn sweeps on
- Sweeps work until not effective

Sweep specified area

- De-energize sweeps
- Clean area
- Exit bin
- REPEAT PROCESS



The background of the slide features a tall, silver telecommunications tower with a platform at the top, set against a blue sky with scattered white clouds. The tower is supported by several diagonal struts. In the foreground, the roof of a building with a grey, corrugated metal surface is visible, showing some structural details and a small red warning sign on one of the struts.

Learning Objectives Review and Module Summary

Learning Objectives Review

Identify sources of entanglement & examples:

- Common machine hazards
- Specific machine hazards

Explain PTO hazards, factors that influence safety & prevention/abatement

- Wrapping, speed, visibility, exposed parts, shear, unsafe work practices
- Guarding, reaction time, LOTO, clothing/hair, safe work practices



Learning Objectives Review

Recognize unsafe machinery & provide corrective action.

- Exposed hazards
- Identify & eliminate hazards – Risk Assessment
- Continuum of abatement strategies

Two most common causes of entanglement & characteristics of corrective action.

- Guarding – requirements, AUTO, type
- LOTO – written procedures, authorized person



Entanglement Summary

- Discussed sources of entanglement
- Discussed PTO hazards
 - Oldest and most common machinery accident causing Entanglements.
- Introduced specific safe work practices
- Explored hazards of sweep augers & common work practices.
- Learned how to identify & prevent or correct hazards through risk assessments, proper guarding, LOTO, visual safety, & work practices



Entanglement Summary

ENTANGLEMENT HAZARDS CAN BE PREVENTED!

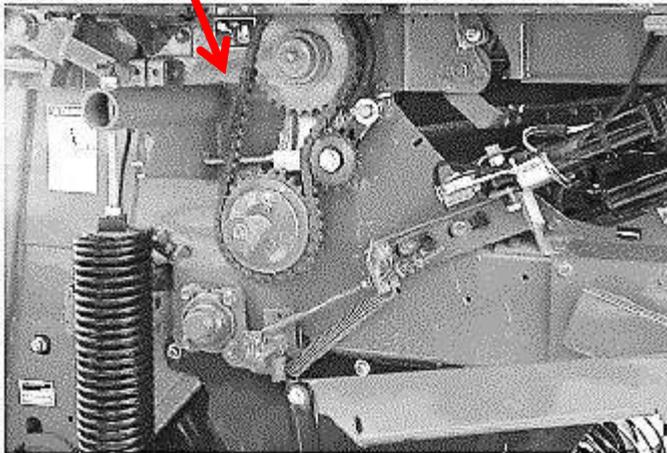
- **PROPER GUARDS ON MACHINES!**
- **FOLLOW LOCK OUT/TAG OUT!**
- **FOLLOW OTHER SAFETY PRECAUTIONS COVERED IN THIS MODULE!**



Entanglement Hazards & Guarding Post-Test

Directions: Circle the correct answer.

1. Which pictures show entanglement dangers?



A. Gears

YES

NO



B. Catwalk

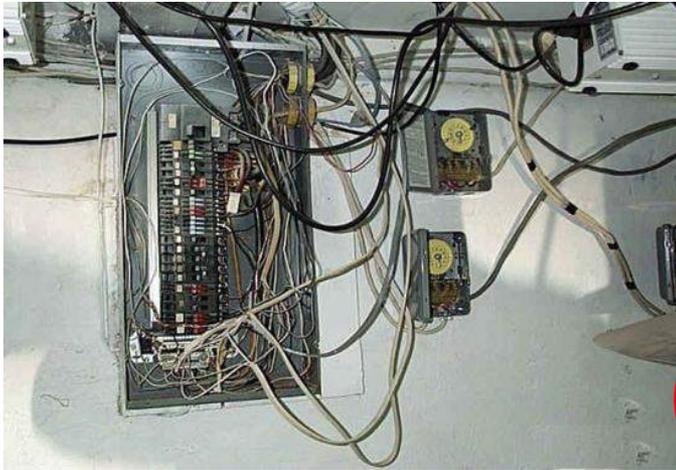
YES

NO



Entanglement Post-Test, cont.

Which pictures show entanglement dangers?



YES

NO

C. Electric Panel



YES

NO

D. Belt conveyor



Entanglement Post-Test, cont.

Which pictures show entanglement dangers?



YES

NO

E. Electric Panel



YES

NO

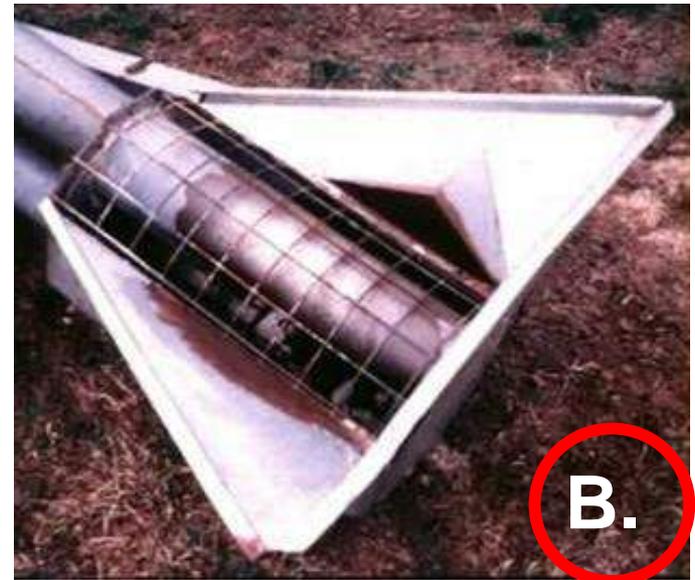
F. Screw conveyor



Entanglement Post-Test, cont.

Circle the best way to prevent the entanglement danger.

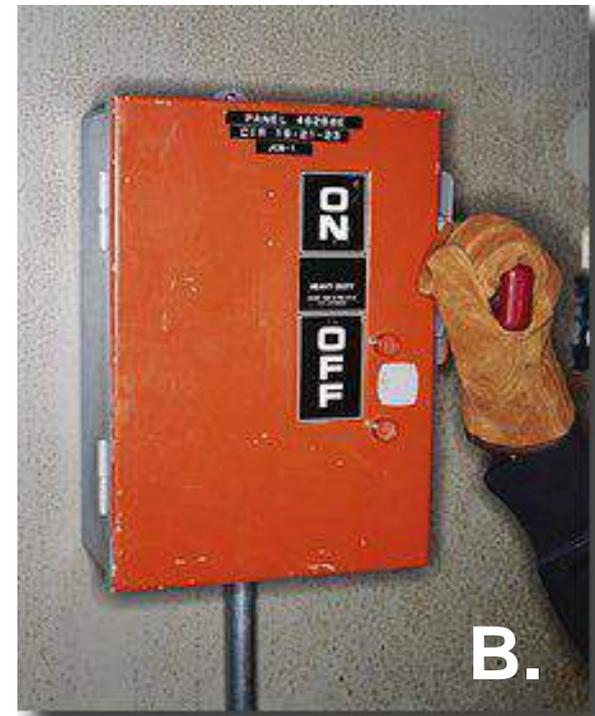
2.



Entanglement Pre-Test, cont.

Circle the best way to prevent the entanglement danger.

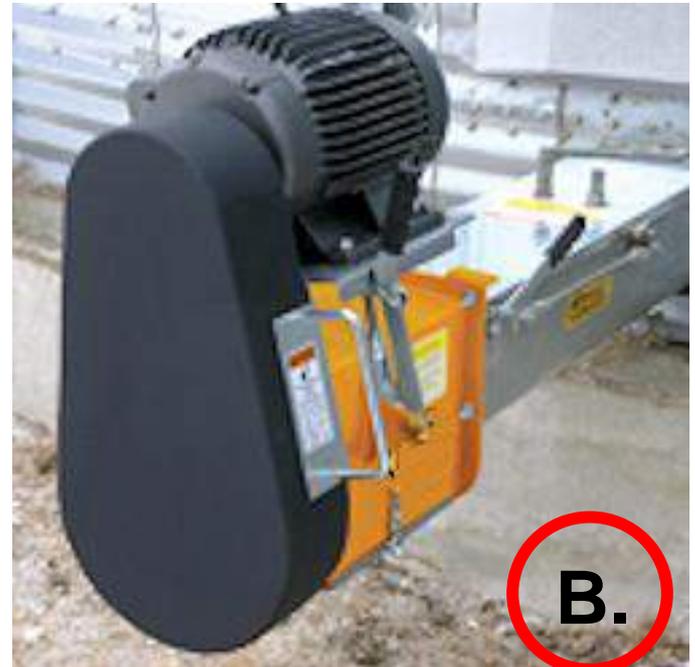
3.



Entanglement Pre-Test, cont.

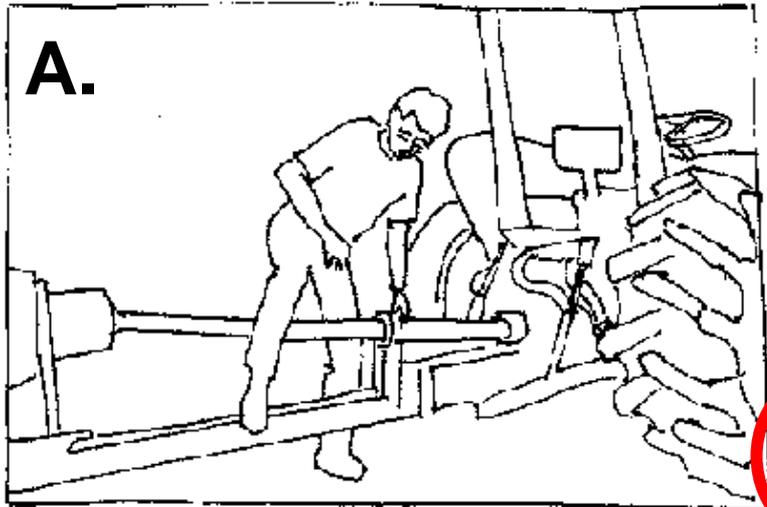
Circle the best way to prevent the entanglement danger.

4.



Entanglement Pre-Test, cont.

5. Is this safe?



YES

NO



YES

NO



Entanglement Post-Test, cont.

5. Is this safe?



YES

NO



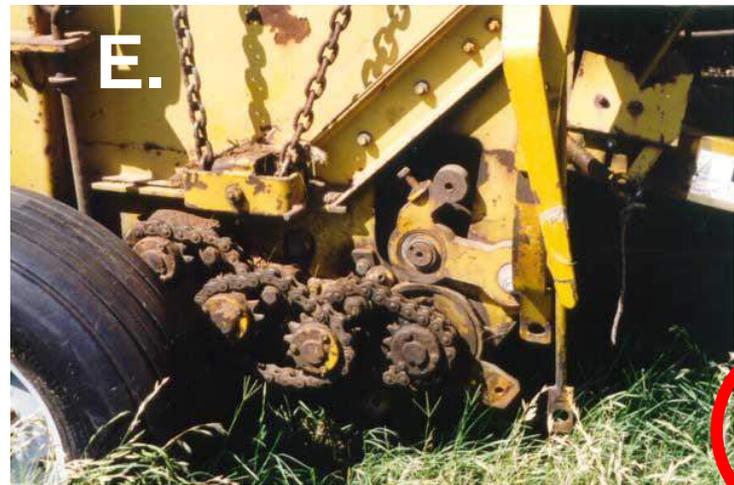
YES

NO



Entanglement Pre-Test, cont.

5. Is this safe?



YES
NO



YES
NO



Entanglement Pre-Test, cont.

5. Is this safe?



YES

NO



YES

NO



Thank you to our Supporters

The Grain Handling Safety Coalition wishes to extend our thanks and appreciation for supporting our efforts by allowing us to use their photos to the following:

- Grain and Feed Association of Illinois (unless noted below or from a government site all photos are theirs).
- The GSI Group, Inc. - slides, 44, 45, 90
- Brock Grain Systems - slides 42 & 80

Photos are used with the permission of the owners.



Reference Citations

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complianceassociatesinc.com/lockouttagout.html
- Hallman, E.M. (2005). Lapsed Time vs Distance Chart. Taken from Power Take-Off Safety. Accessed January 1, 2012
 - <http://nasdonline.org/document/1893/d001820/power-take-off-safety.html>
- Lee, John (2012). Personal Unpublished Slides and Pictures. Used with permission.
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<http://www.osha.gov/SLTC/etools/woodworking/nippoints.html>
- Petrea, R.E. (2000). Grain Handling Demonstration Equipment. Accessed January 1, 2012



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- Photobucket (2011) Photos. Accessed December 31, 2011.
<http://photobucket.com/images/>
- Unless otherwise noted, pictures are from John Lee of Grain and Feed Association of Illinois
- US Chemical Board
- OSHA
- Brock used with permission
- GSI used with permission



Risk Assessment Resources

1. OSHA – Job Hazard analysis workbook
<http://www.osha.gov/Publications/osha3071.pdf>
2. OSHA – Conducting a Job Hazard Analysis –
<http://www.oshatrain.org/courses/studyguides/706studyguide.pdf>
3. OSHA Safety and Health Program Evaluation Profile -
<http://www.osha.gov/dsg/topics/safetyhealth/pep.html>
4. Job Hazard Analysis - https://www.rit.edu/~w-outrea/training/Module2/M2_JHA.pdf
5. JHA - https://www.osha.gov/dte/grant_materials/fy07/sh-16625-07/worksitehazanalysis2.ppt
6. Job Hazard analysis form NASA - http://server-mpo.arc.nasa.gov/Services/NEFS/GSFC_PDFData/GSFC23-60.pdf
7. Job Safety Analysis templates UCLA - <http://jsa.ehs.ucla.edu/>
8. JHA – Washington State – good
http://www.lni.wa.gov/Safety/TrainTools/Online/Courses/courseinfo.asp?P_ID=188

