



# **Lunch Box Safety Talks** *Safety Over Sandwiches*

## ***Top Hazards in the Grain Industry***

***Presented by Joe Mlynek  
Safety Made Simple, LLC***

# What can Seriously Injure or Kill a Grain Handling Worker?

# Top Hazards

Grain Engulfment

Grain Dust Explosions

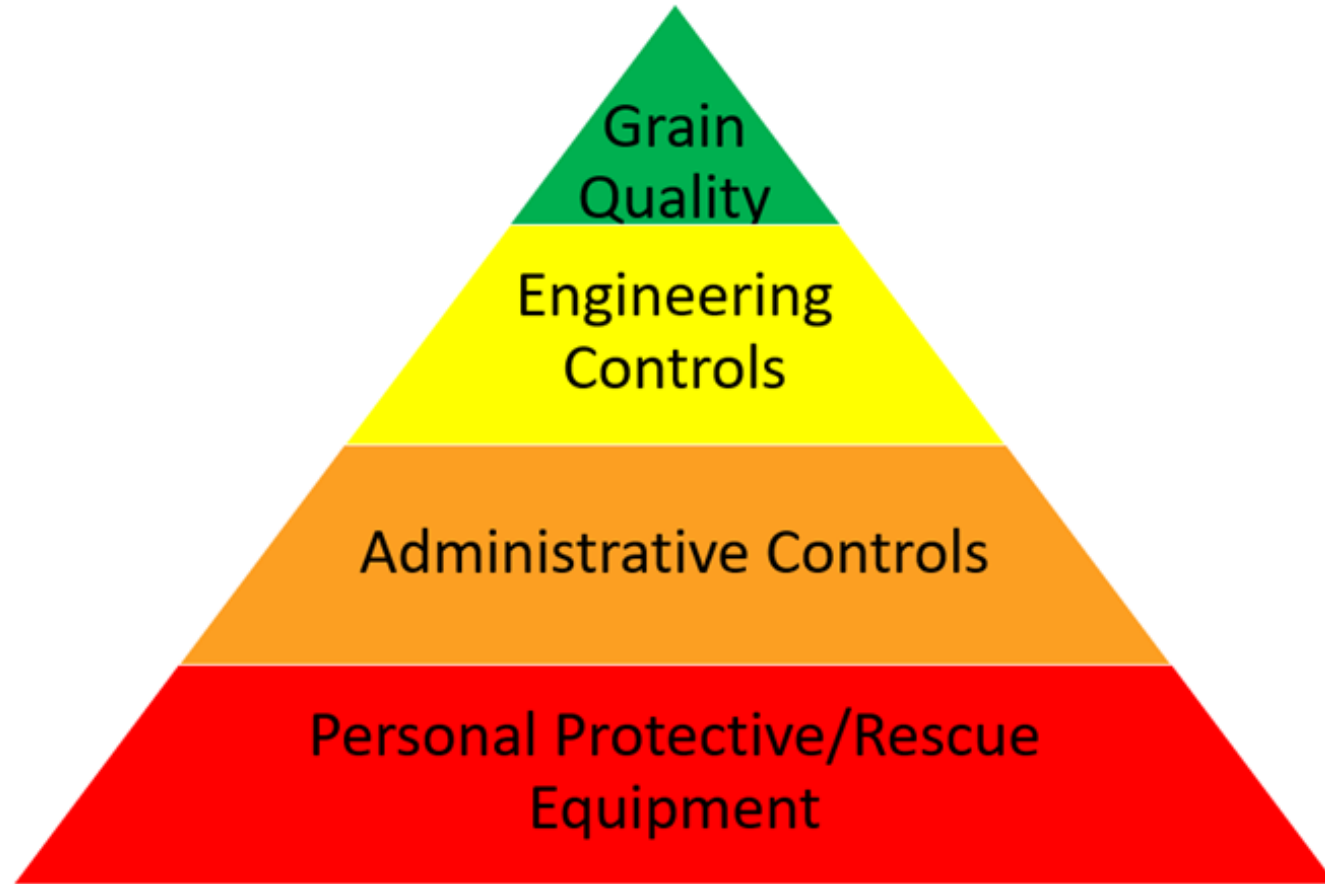
Falls to Another Level

Moving Equipment

Dangerous Equipment

# Number One: Grain Engulfment





# Multi-Faceted Approach

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Prevention through Grain Quality

Engineering – Design

Prevention through Administrative Controls  
(Procedures/Permits/Approvals)

Response - Rescue

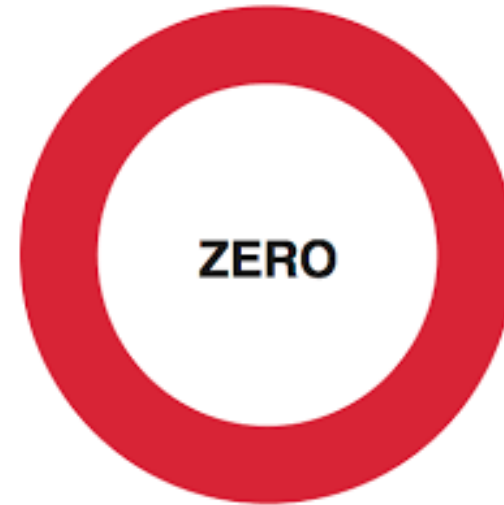


# Zero Entry Mentality

Develop a zero-entry mentality

“where grain engulfment hazards exist”

Exhaust all options to eliminate the need to enter, regardless of investment



Confined Space Entry Permit					
To be Entered:			Date Issued:		
Start Time:			Work to be Performed:		
Name(s) of Entrant(s):			Name of Attendant(s):		
Atmospheric Monitor (Manufacturer/Model):					
Entry Atmospheric Testing (Initial Check):			Atmospheric Testing (After Ventilation):		
Test	Acceptable Level	Results	Test	Acceptable Level	Results
Oxygen:	19.5% to 23.5%		Oxygen:	19.5% to 23.5%	
Combustibles:	Less than 10%		Combustibles:	Less than 10%	
CO:	< 35 ppm		CO:	< 35 ppm	
H2S:	< 10 ppm		H2S:	< 10 ppm	
PH3:	< 0.3 ppm		PH3:	< 0.3 ppm	
Periodic Atmospheric Testing (If Applicable):					
Test	Result	Time	Result	Time	Time
Oxygen:					
Combustibles:					
CO:					
H2S or PH3:					
Hazard Identification (check all that apply)			Required Equipment (check all that apply)		
<input type="checkbox"/> Oxygen deficient			<input type="checkbox"/> Respiratory protection – type:		
<input type="checkbox"/> Flammable gases, vapors, or combustible dust			<input type="checkbox"/> Eye protection – type:		
<input type="checkbox"/> Hazardous air contaminants (phosphine (PH3), CO2, etc.)			<input type="checkbox"/> Protective clothing – type:		
<input type="checkbox"/> Extreme temperatures			<input type="checkbox"/> Lighting (Class II Group G)		
<input type="checkbox"/> Chemical exposure			<input type="checkbox"/> Continuous forced air ventilation fan		
<input type="checkbox"/> Engulfment / entrapment / bridging material			<input type="checkbox"/> Lockout Locks/Tags		
<input type="checkbox"/> Mechanical exposure (machinery/equipment)			<input type="checkbox"/> Hot work permit		
<input type="checkbox"/> Electrical exposure			<input type="checkbox"/> Fire extinguisher		
<input type="checkbox"/> Noise			<input type="checkbox"/> Retrieval equipment (tripod, winch, lifeline etc.)		
<input type="checkbox"/> Fall hazards			<input type="checkbox"/> Radio for communication		
Pre-Entry Preparation (check applicable items)			Entrant Signature(s) – Indicates Item Completion		
<input type="checkbox"/> Pre-entry briefing with entry team					
<input type="checkbox"/> All entry equipment inspected					
<input type="checkbox"/> Roles assigned to entry team					
<input type="checkbox"/> Area around space secured					
<input type="checkbox"/> All applicable equipment inspected/setup					
<input type="checkbox"/> Tank Drained or contents of space removed					
<input type="checkbox"/> Space isolated (chutes, spouts, in-flow systems blinded, disconnected or blocked)					
<input type="checkbox"/> Energy sources/equipment locked out and tagged					
<input type="checkbox"/> Gas monitor calibrated					
<input type="checkbox"/> Hot work permit completed					
<input type="checkbox"/> Employees briefed on hazards					
<input type="checkbox"/> Rescue equipment available					
Entry Supervisor(s): _____					
Permit has been cancelled by (entry supervisor): _____ Time: _____ Date: _____					
Date of Last Revision: _____					

# Bin-Entry/PRCS Permit

Permit “Permission”

Think of it as a checklist evaluation approach/question based

Consider layered approval process

# Lockout Tagout



“All mechanical, hydraulic, and pneumatic equipment **which presents a danger to employees inside grain structures** must be de-energized, and shall be disconnected, locked-out and tagged, blocked off, or otherwise prevented from operating by other equally effective means.”

Sweep Augers - 10 Sweep Auger  
Safety Principles if accepted by your  
state



# Atmospheric Testing

The atmosphere must be tested for the presence of:

“Combustible gases and vapors when there is reason to believe that they may be present;”

“Toxic agents when there is reason to believe that they may be present (i.e. phosphine)”

Oxygen unless there is:

“continuous natural air movement or;”

“continuous forced air ventilation before and during the entry.”

Don't use exceptions within the standard



# Precautions



A body harness or boatswain's chair attached to a lifeline are required when:

“An employee enters a grain storage structure from a level at or above the level of grain products.”

“An employee walks or stands on or in stored grain at a depth which poses an engulfment hazard.”

Take a stance, don't enter bins where there is an engulfment hazard.

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# Understand Angle of Repose

Definition - The steepest angle of descent or dip relative to the horizontal plane to which a material can be piled without slumping.

At this angle the material on the slope face is on the verge of sliding.

The angle of repose can range from zero to ninety degrees.

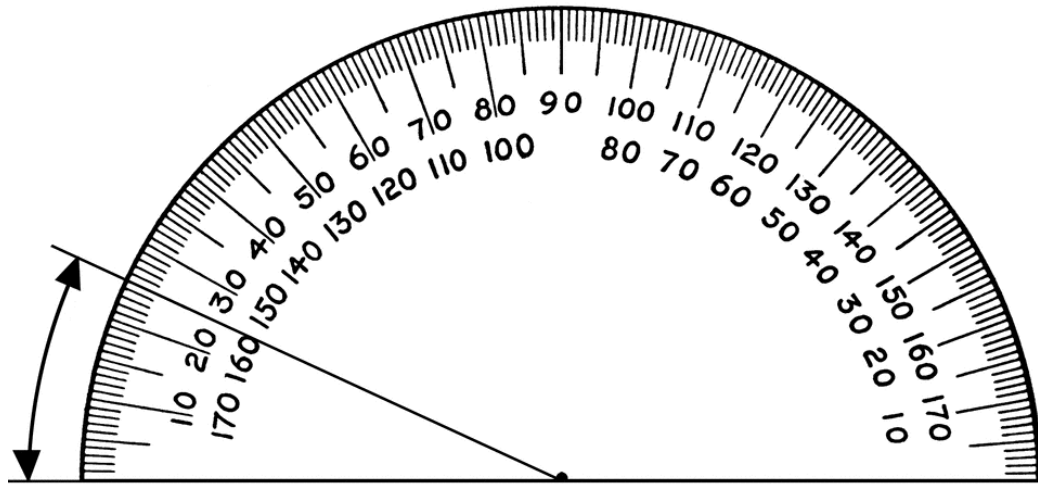
# Understand Angle of Repose



A material with a low angle of repose forms flatter piles than a material with a high angle of repose.

Teach people to identify angle of repose. Include on permit.

# Understand Angle of Repose



Corn - Approximately 21.5 - 23 degrees

Soybeans - Approximately 25 degrees

Wheat - Approximately 25 degrees

Oats - Approximately 28 degrees



# Rescue Equipment

“Employer shall provide equipment for rescue operations which is specifically suited for the bin, silo, or tank being entered.”

Train on response





## Number Two: Combustible Dust





## 2020 Statistics Purdue University's Department of Agricultural and Biological Engineering

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8 Grain Dust Explosions reported  
in the U.S. compared to 9 in 2019

Ten-year average – 8.1

### Type of Facility

- Feed Mill - 1
- Grain Processing Mills - 3
- Grain Elevators - 4

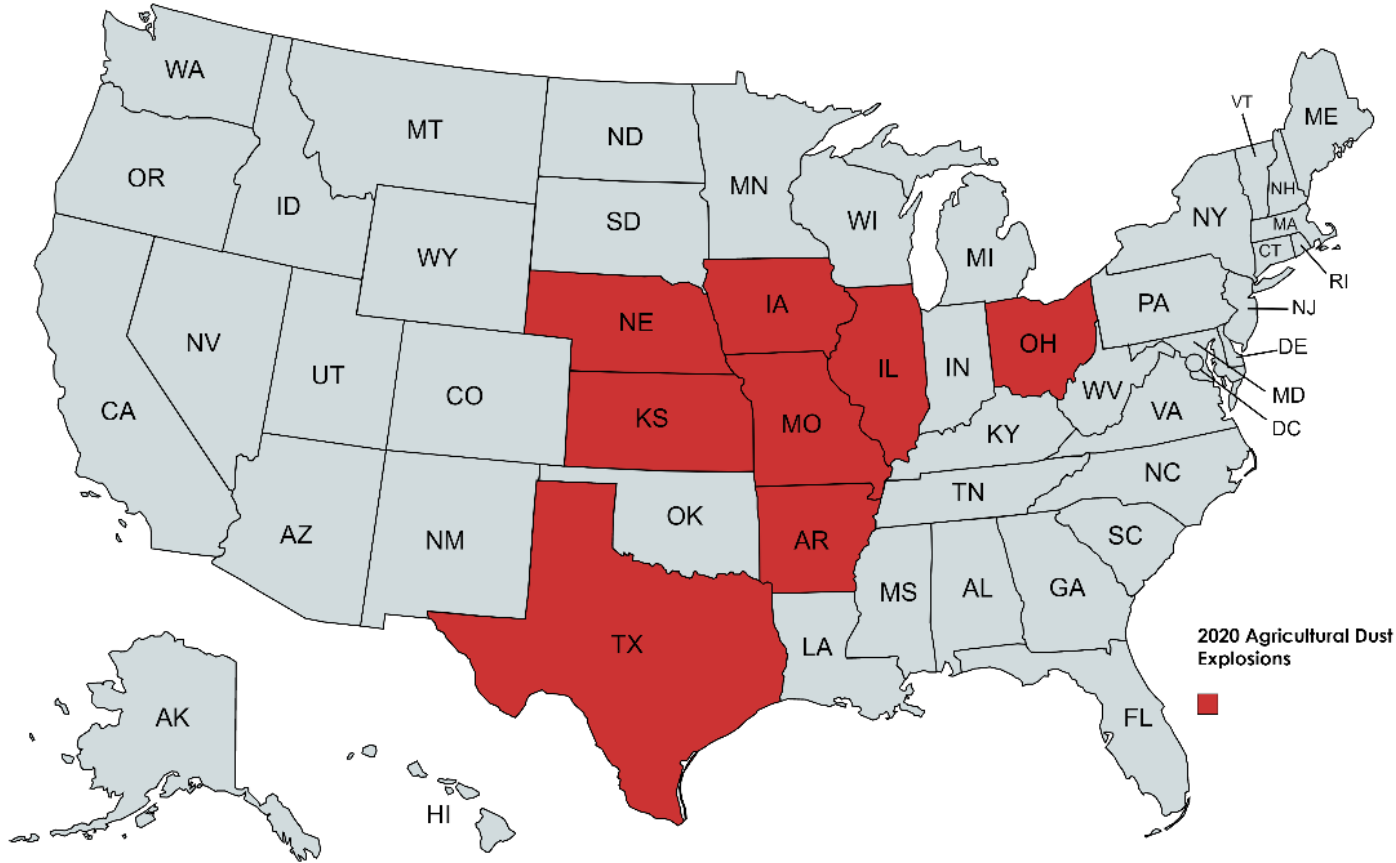
**ZERO** Fatalities

Nine Injuries

# Locations - 2020

Locations:

- Arkansas - 1
- Illinois – 1
- Kansas - 1
- Iowa – 1
- Missouri -1
- Nebraska – 1
- Ohio – 1
- Texas – 1



# Statistics May Be Misleading





# Explosion Pentagon



Combustible Dust

Dispersion (Suspension)

Oxygen

Ignition Source

Containment/Confinement

Removal of any one of the elements may prevent an explosion or flash fire

# Housekeeping

## OSHA 1910.272:

Immediately remove fugitive grain dust accumulations that exceed 1/8 inch (0.32 cm) at priority housekeeping areas.

Develop a written housekeeping plan that establishes frequency and methods for removing fugitive grain dust on:

Ledges

Floors

Equipment

Exposed Surfaces

# Housekeeping

Housekeeping program must address priority areas:

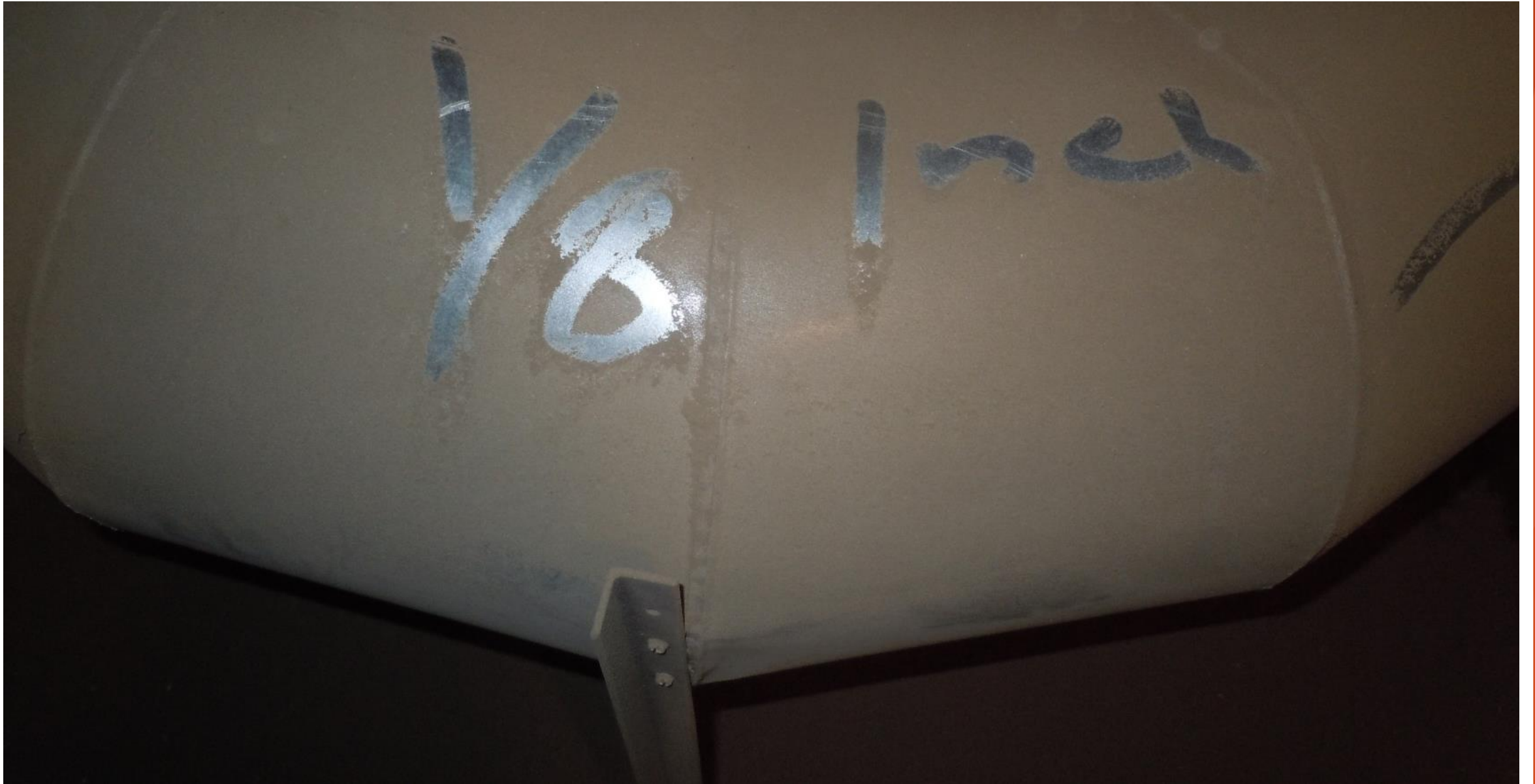
Areas within 35 feet of **inside** bucket elevators.

“a bucket elevator that has the boot and more than 20 percent of the total leg height (above grade or ground level) inside the grain elevator structure.”

“Bucket elevators with leg casings that are inside (and pass through the roofs) of rail or truck dump sheds with the remainder of the leg outside of the grain elevator structure, are not considered inside bucket elevators.”

Floors of enclosed areas containing grinding equipment

Floors of enclosed areas having grain dryers inside the facility













# Pneumatic Dust Control Systems

Captures dust suspended in air at grain transfer points

Goal: decrease dust concentration to below the minimum explosive concentration (MEC)



# Proper Electrical Classifications

Class II, Division 1, Group G

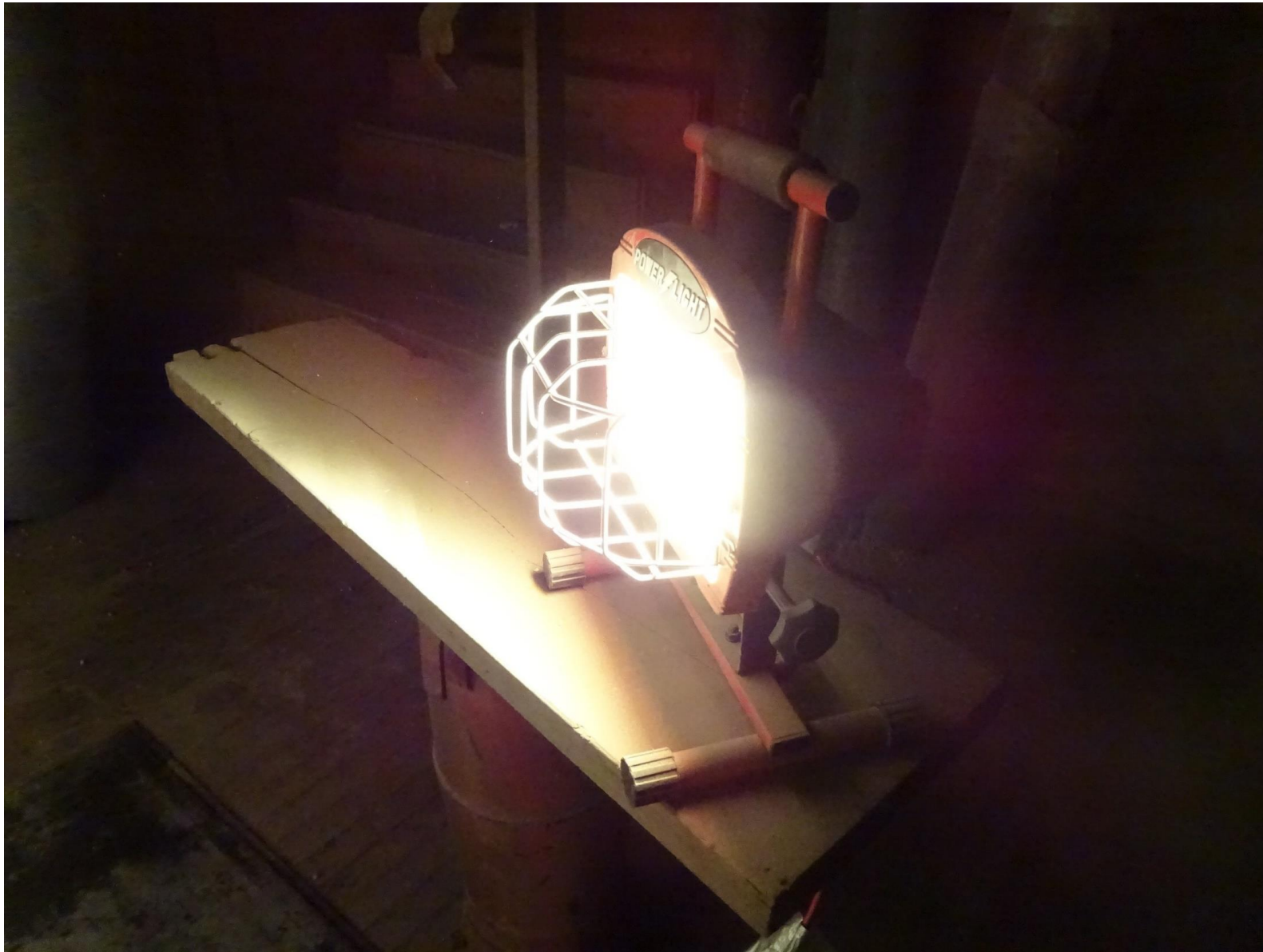
“Open System”



Class II, Division 2, Group G

“Closed System”

Dust Tight



Progressive Safety Services LLC ©



# Equipment Concerns

Two methods to address equipment  
Concerns:

Documented Preventive Maintenance  
Programs

Installation of Safety Control Equipment

**Dual Approach Most Effective!**

# Preventive Maintenance

Outlined in the OSHA Grain Handling  
Standard

Employer shall implement preventive  
maintenance procedures

Regularly scheduled inspections of at least  
the mechanical and **safety control  
equipment** associated with:

- Grain Stream Processing Equipment

- Filter Collectors

- Bucket Elevators

- Grain Drying Systems

# Preventive Maintenance



Lubrication schedules and maintenance in accordance with manufacturer recommendations, or as determined by prior operating records



Promptly correct dust collection systems which are malfunctioning or operating below design efficiency



Employer shall promptly correct , or remove from service, overheated bearings, and slipping or misaligned belts associated with inside bucket elevators



Certification record needs to be maintained for each inspection to include:

Date of inspection

Name of person inspecting, repairing, etc.

Serial number or other identifier of equipment



# Preventive Maintenance

Infrared Thermography - the use of an infrared imaging and measurement camera to "see" and "measure" thermal energy emitted from an object.

Can be used on:

- Electrical Systems

- Bearings

- Motors



# Hazard Monitoring Equipment

Bearing Monitoring Systems

Conveyor Zero Speeds

Belt Alignment Systems



A close-up photograph of a white metal structure, likely part of a vehicle or industrial equipment. A blue cable is connected to a black mechanical component, possibly a sensor or actuator. The structure is made of white-painted metal with visible bolts and a small label.

# Hazard Monitoring

**Approved for the area (Class II,  
Group G)**

**Prescribed preventive maintenance  
at regular intervals - Contact  
installer or manufacturer**

# Explosion Suppression

Detects grain dust explosion early

Floods area with an extinguishing agent

Can effectively suppress grain dust explosions in bucket elevator legs and dust collection equipment





# Number Three: Falls to Another Level



A photograph of a worker in a high-visibility vest and hard hat standing on top of a grey railcar. A yellow crane is lifting the railcar by a cable. In the background, there are large industrial silos and a red metal structure. The image is part of a presentation slide with orange and white geometric shapes.

# Falls to Another Level

Falls while climbing ladders

Falls from aerial lifts

Falls from work surfaces

Falls from tops of railcars



Elimination

Passive Systems

Restraint

Personal  
fall Arrest



# Passive Fall Protection

Best example - Guardrail

Once a guardrail is installed it doesn't need to be altered to prevent access to the leading edge or fall hazard.

**Leading edge** means the unprotected side and edge of a floor, roof, or formwork for a floor or other walking/working surface (such as deck) which changes location as additional floor, roof, decking or formwork sections are placed, formed or constructed.

# Fall Restraint

A tie off system that “restrains” the employee from falling

Does not allow the worker to access the fall hazard





# Fall Restraint

Consists of an anchorage point

- 1,000 lbs.. (ANSI Z359) static load per person

Body Harness

Connector

- Adjustable Restraint Lanyard Preferred



# Personal Fall Arrest System(PFAS)

Designed to stop a fall once it has already begun

Bring an employee to a complete stop and limit deceleration distance:

- 3.5 feet with a traditional energy absorbing lanyard

- 24 inches for Self- Retracting Lifeline



# Basic Pieces of Fall Arrest System

Anchorage/ (Anchorage Connector)

Full-Body Harness (Body Wear)

Connector (Connecting Device)

**MAKE SURE EMPLOYEES UNDERSTAND CLEARANCE  
DISTANCE!**



# Horizontal Lifelines

Rigid or Flexible

Attach prior to stepping on to car or climbing ladder

Tug and walk technique

Retract when not in use (stress on retraction springs)





# Ladders

No employee carries an object or load that could cause the employee to lose balance or fall while climbing up or down the ladder.





# Number Four: Moving Equipment

# Hazard - Struck-By

According to OSHA, Struck By is defined as an injury produced by forcible contact or impact between the injured person, object or piece of equipment.

**Examples:** Involve vehicles including forklifts, semi-trucks, end-loaders, skid-steer loaders, etc.



# Hazard - Back-Over

A back-over incident occurs when a backing vehicle strikes a worker who is standing, walking, or kneeling beside or under a vehicle.

## Generally Caused by:

- Driver not being able to see a worker in their blind spot

- Workers not hearing back-up alarms

- Employee retrieving equipment or tools under vehicles







## Reflective/High Visibility Clothing

Intended to clearly distinguish the worker from the environment

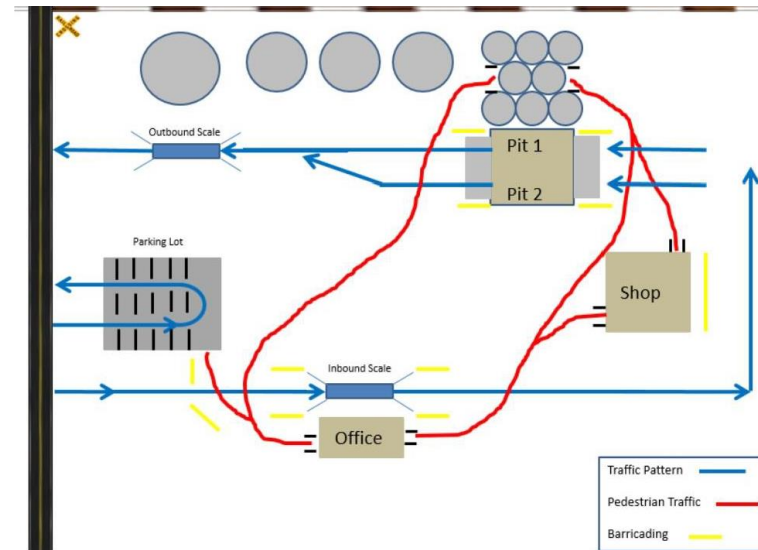
Consists of background material, retro-reflective bands, and combined performance material

# Preventing Back-Over/Struck-By Incidents

Develop internal traffic control Plans

Plans should coordinate the flow of moving equipment, workers and vehicles to eliminate vehicles and employees from crossing paths

Establish work zones (storage piles, bunkers, storage structures, etc.)



*From NGFA Safety Tips - Vehicle Struck-By*



# Preventing Back-Over/Struck-By Incidents

Eliminate cell-phone usage in traffic areas, work zones, and receiving areas

# Preventing Back-Over Incidents

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Use a spotter when backing up in the work area

Equip vehicles with in-vehicle display monitors

Ensure back-up warning devices are operational

Define work zones using signs, traffic cones, etc.

Establish work zones for vehicles (trucks, loaders, forklifts, etc.)

Require communication between workers entering work zones and the driver (radios, hand signals, etc.)

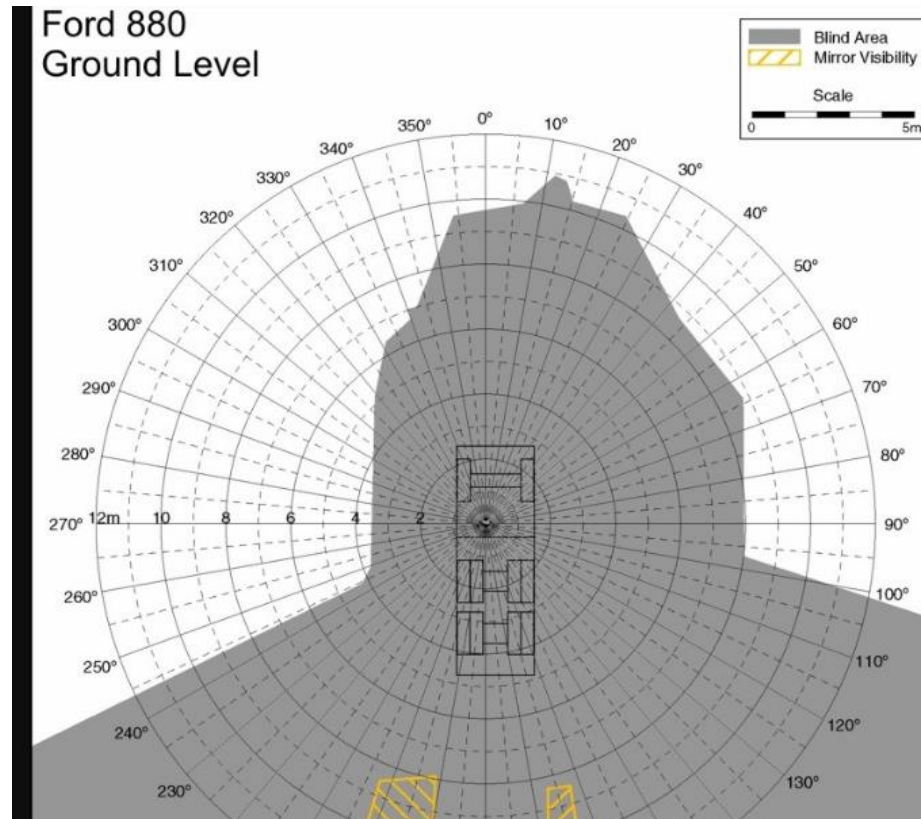


# Preventing Back-Over Incidents

Train Employees on the blind spots behind and around vehicles.

Put Workers in the driver seat to experience what they can see and what they can't

Review blind spot diagrams provided by NIOSH



# Preventing Struck-By Incidents

Define pedestrian walkways and vehicle traffic areas

- Barriers

- Signs

- Striping

Post signs at doorways that enter into traffic/vehicle areas

Stay in designated walkways and wear high visibility clothing





# Safe Practices

Establish the “red zone.” The red zone is any area within arm’s length of the vehicle. Communicate with the driver prior to stepping into the red zone (neutral/Parking Brake, etc.).

Communicate with the driver prior to crossing in front-of, in between, behind vehicles (verbal or visual). Follow company requirements for crossing in-between.

Never cross under trailer

# Safe Practices

When directing vehicle movement stay in a position visible to the driver

Ensure that a designated person directs movement

Remember: if you cannot see the driver in the mirror, he or she cannot see you. Maintain constant communication with the driver

Keep persons not involved in the receiving process out of the area





# Number Five: Dangerous Equipment



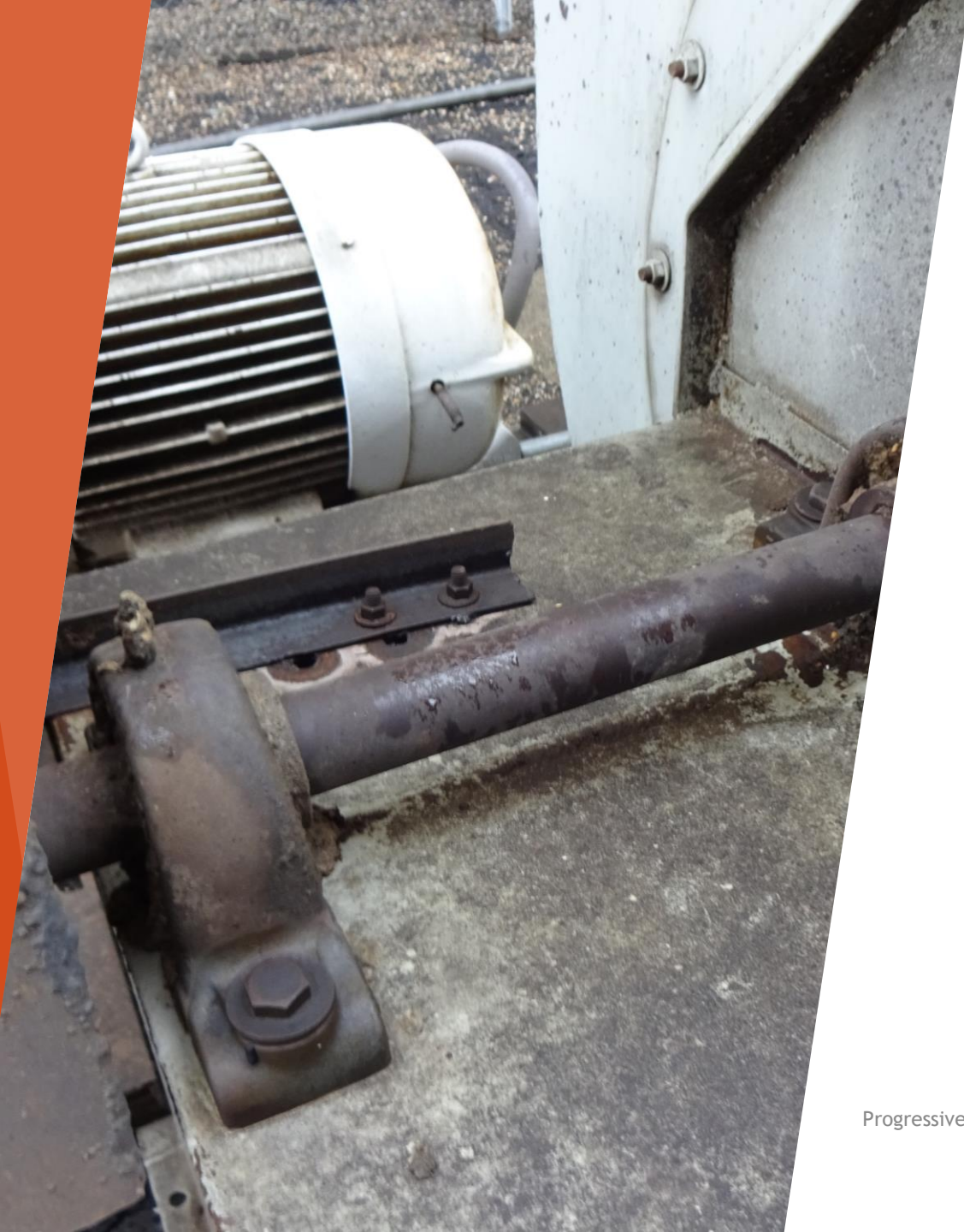
# Machine Guarding - Inward Running Point/Rotating Shaft





# Machine Guarding - Inward Running Point





# Machine Guarding - Rotating Shaft





# Machine Guarding - Rotating Shaft

# Machine Guarding Example

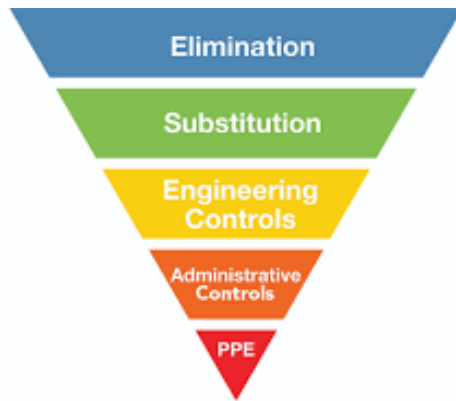








# What Can I Do to Prevent Serious Injuries and Fatalities (SIFS)



Small Focus Groups “What can kill or severely injure you at work?”

Identify top 5-10

Use Hierarchy of Controls to address hazards

Implement Near Miss program

Implement Incident Analysis Program

Implement JHA/ JSA Process

Implement Stop Work Authority Program

Repetition, repetition, repetition!



# Questions

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