



Lunch Box Safety Webinar

Safety Over Sandwiches

Aug. 7

Safe Entry in Agricultural Confined Spaces

Presented by Joe Mlynek, Progressive Safety Services LLC

Review Permit Required Confined Space
Entry Requirements



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graph TD; A[Review Permit Required Confined Space Entry Requirements] --> B[Review of General Procedure for Entering Permit Required Confined Spaces]; B --> C[Requirements Specific to Grain Storage Structures: Bins, Silos and Tanks];
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Review of General Procedure for
Entering Permit Required Confined
Spaces

Requirements Specific to Grain Storage
Structures: Bins, Silos and Tanks

OSHA 29 CFR 1910.146

Standard outlines all requirements for permit required confined space entry.

“29 CFR 1910.272 Grain Handling Standard” takes precedence over the permit required confined space standard for **the hazards it addresses**” per 2005 LOI.”

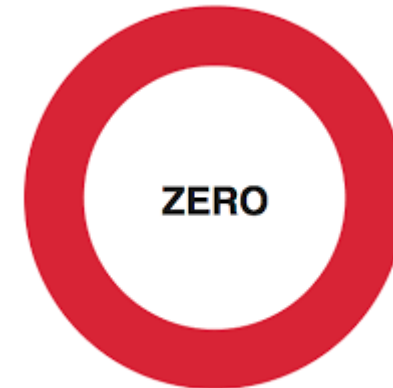
Many companies choose to consolidate confined spaces and grain storage structures into one program.

Zero Entry Mentality

Due to the nature of the hazards in permit required confined spaces it's important to develop a zero-entry mentality

Always evaluate means that would eliminate entry into a permit required confined space

Consistency in approach is paramount



Confined Space Definition

Is large enough and so configured that an employee can bodily enter and perform assigned work

Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry.)

Is not designed for continuous employee occupancy



Permit-Required Confined Space

A Permit-Required Confined Space has one or more of the following characteristics:

- Contains or has the potential to contain a hazardous atmosphere
- Contains material with the potential for engulfing an entrant
- Has an internal configuration such that an entrant can become trapped or asphyxiated
- Contains any other serious safety or health hazard

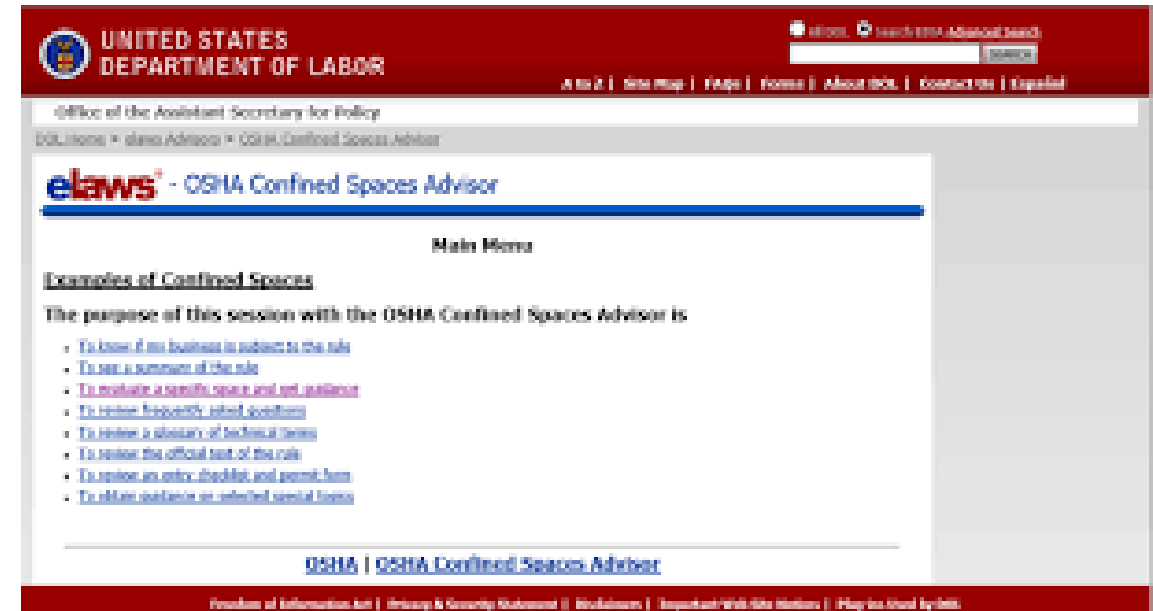
Written Program

Develop and Inventory of confined spaces at the location

Evaluate whether they are permit required

- OSHA Confined Spaces Advisor – osha.gov

Develop procedures for entry



Labeling/Signs

The employer shall inform exposed employees, by posting danger signs or by any other equally effective means, of the existence and location of the danger posed by the permit spaces.

- DANGER -- PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER
- Similar language



Permit Required Confined Space Entry

HAZARDS

Hazardous Atmosphere



"Hazardous atmosphere" means an atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (that is, escape unaided from a permit space), injury, or acute illness from one or more of the following causes:

Hazardous Atmosphere

Flammable gas, vapor, or mist in excess of 10 percent of its lower flammable limit (LFL);

Airborne combustible dust at a concentration that meets or exceeds its LFL;

NOTE: This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 feet (1.52 m) or less.

Hazardous Atmosphere



Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent.

Atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in Subpart G, Occupational Health and Environmental Control, or

Subpart Z, Toxic and Hazardous Substances, which could result in employee exposure in excess of its dose or permissible exposure limit.

Hazardous Atmosphere

An atmospheric concentration of any substance that is not capable of causing death, incapacitation, impairment of ability to self-rescue, injury, or acute illness due to its health effects is not covered by this provision.

Any other atmospheric condition that is immediately dangerous to life or health (IDLH)

Hazardous Atmosphere

Eight-hour TWA Permissible Exposure Limit (PEL) - the level of exposure established as the highest level of exposure an employee may be exposed to without incurring the risk of adverse health effects.

"Immediately dangerous to life or health (IDLH)" -any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a permit space.

Hazardous Atmosphere

Atmospheric Concentrations of Substances for which a PEL is published:

- Carbon Monoxide (CO)
= < 50 ppm (OSHA)
= < 35 ppm (NIOSH REL)
- Phosphine (PH₃)
= < 0.3 ppm (OSHA/NIOSH)
- Hydrogen Sulfide (H₂S)
= < 20 ppm (OSHA)
= < 10 ppm (NIOSH REL)

NIOSH is the United States federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness.

Oxygen Enrichment/Deficiency

> **23.5%** : oxygen enriched – explosive

12-16% : Increased breathing, elevated heart rate, impaired coordination

10-14%: Faulty judgment, poor muscle coordination

6-10%: Nausea, vomiting, unconscious, unable to move

< **6%**: Difficulty breathing, death



Carbon Monoxide (CO)

Odorless

Colorless

Lighter than air

- Vapor density = 0.98

OSHA PEL – 50 ppm, NIOSH 35ppm REL

IDLH – 1200 ppm



Hydrogen Sulfide (H₂S)

Smells like rotten eggs, sewer gas.

Symptoms of exposure - nausea, headaches, delirium, disturbed equilibrium, tremors, convulsions, and skin and eye irritation. Inhalation of high concentrations of **hydrogen sulfide** can produce extremely rapid unconsciousness and death

Heavier than air

- Vapor density = 1.19
- PEL
 - General Industry 20 ppm
 - Construction Industry 10 ppm
 - Shipyard Industry 10 ppm
- IDLH – 100 ppm



Phosphine

Formed when Aluminum Phosphide reacts with moisture in air

Heavier than air

PEL – 0.3 PPM

IDLH – 50 PPM

Symptoms – ringing in the ears, pressure in the chest, tightness in chest, malaise, etc.

DANGER

**POISON GAS
KEEP AWAY**

PHOSPHINE FUMIGATION IN PROGRESS

Fumigation: Start date End date

Ventilation:

Do not access this storage during fumigation and ventilation

Ventilation period: One day with ventilation fan or five days without ventilation fan
Withholding period: Two days
Place warning signs at all storage access points during fumigation
Warning signs only - see label for use

Additional Hazards - Permit Required Confined Spaces:

Electricity

Falls

Extreme Temperatures

Chemical Exposure

Mechanical Hazards

- Augers
- Mixers

Engulfment



What Constitutes Entry?

The act by which a person intentionally passes through an opening into a permit required confined space.

Any part of the body passing through the opening is considered entry.



Entry Team Responsibilities

ENTRANT, ATTENDANT, ENTRY SUPERVISOR

Entrant

The employee who will physically enters the confined space to perform the work



Entrant Responsibilities

Take an active role in evaluating the space

Know the hazards that may be faced

Use all required equipment

Follow all safety rules and procedures that apply to the job

Alert attendant when a dangerous situation is recognized

Immediately exit the space when attendant issues an evacuation order

Remove all tools from the space prior to completion of the entry



Attendant

The employee who remains outside the confined space.



Attendant Responsibilities

Know the hazards faced

Remain in the immediate area of the space

Control access

Maintain communication with entrants

Order evacuation when:

- Behavioral effects of hazard exposure.
- Situation outside space could endanger entrants.
- If attendant cannot for any reason perform duties.

Perform non-entry rescue if needed



Attendant Responsibilities

(Continued)

Summon emergency assistance as needed. Must have a means of communication:

- Radio
- Cell phone
- Phone in close proximity

Assess hazards in and around the space, and take action when they pose risk to the entrant(s)

Keep records of confined space work (atmospheric monitoring results, personnel entry/exit, etc.)

Entry Supervisor

The employee responsible for coordinating entry

When possible should be the role of a foreman, supervisor, operations manager or experienced employee



Entry Supervisor Responsibilities

Know hazards faced with entry

Ensure permit and documentation completed

Ensure atmospheric testing performed

Ensure the space is isolated

Ensure all employees trained

Verify rescue services available

Terminate permit upon completion of entry

File permit – One Year

Confined Space Entry Permit					
Space to be Entered:			Date Issued:		
Permit Start Time:			Work to be Performed:		
Name(s) of Entrant(s):			Name of Attendant(s):		
Atmospheric Monitor (Manufacturer/Model):					
Pre-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	
PH2	< 0.3 ppm		PH2	< 0.3 ppm	
Periodic Atmospheric Testing (if Applicable):					
Test	Result	Time	Test	Result	Time
Oxygen:					
Combustibles:					
CO:					
H2S or PH2:					
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 D)		
<input type="checkbox"/> Chemical exposure			<input type="checkbox"/> Continuous forced air ventilation fan		
<input type="checkbox"/> Equipment / entrapment / bridging material			<input type="checkbox"/> Lockout Locks/Tags		
<input type="checkbox"/> Mechanical exposure (machinery/equipment)			<input type="checkbox"/> Hot work permits		
<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"/> Tanks 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: _____					
Permit has been cancelled by (entry supervisor): _____ Time: _____ Date: _____					
Date of Last Revision: 8/10/16					

Permit Required Confined Space Entry

GENERAL PROCEDURE

Permit-Required Confined Space Entry Procedure:

- 1) Notify affected persons of the entry
- 2) Inspect and set up all equipment
- 3) Assign roles to entry team
- 4) Secure area around the confined space
- 5) Isolate the Space
- 6) Ventilate (if applicable)
- 7) Calibrate gas monitor and perform pre-atmospheric testing.
- 8) Complete permit
- 9) Enter the Space
- 10) Cancel the permit and file with supervisor

Notify Affected Persons

Notify persons in the immediate area and management of the entry

Review isolation and lockout/tagout procedures to be used

Communicate the time frame for the entry

Consider approval system involving member outside of the entry team



Inspect/Set-Up All Equipment

Fall protection/retrieval equipment

Intrinsically safe lighting/equipment

- Class I and II Environments

Calibrate/Bump Test Air monitor

Personal protective equipment



Vertical Entry

Vertical entry greater than 5 feet:

- A mechanical means shall be available
- No ladder – two-line system
- Ladder – one -line system



Assign Entry Roles to the Team

Entry Supervisor

Entrant(s)

Attendant(s)

REMINDER ALL PERSONS INVOLVED MUST COMPLETE REQUIRED
TRAINING!!!!

Secure the Area Around the Confined Space

Restrict access to the immediate area prior to, during and after entry

- Non-essential personnel
- Traffic

Remove obstacles that may get in the way of entry or potential rescue operations:

- Vehicles
- Debris
- Un-needed Equipment

Isolate the Space from Hazards

Close and Isolate Systems

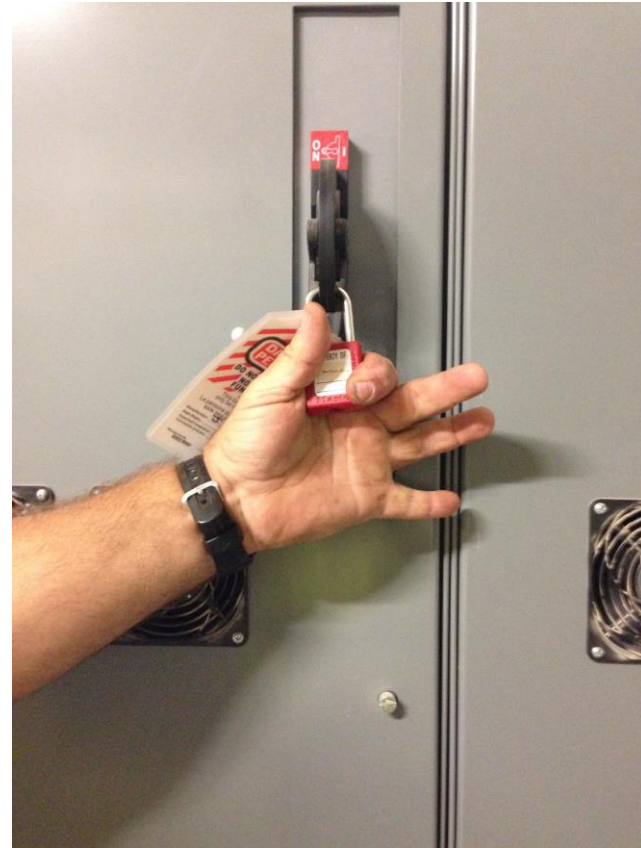
- Lock and Tag
- Blank/In-Flow
- Communicate with Control Room

Empty the Space

- Remove as much of the contents as possible prior to entry

Lockout/Tagout Equipment

- Augers
- Moving equipment



Ventilate the Space



Continuous ventilation required if:

- Initial atmospheric tests are not acceptable
- Natural ventilation is not adequate
- Chemicals are being introduced into the space for cleaning, maintenance or other purposes

Must not enter space until ventilation has eliminated the hazardous atmosphere

Air supply from a clean source

Rated for Proper Electrical Classification

Test the Atmosphere

In this order:

- **Check for Oxygen Content:**
 - At least 19.5% and less than 23.5%
- **Check for Combustibles:**
 - Less than 10% of the LEL
- **Check for Toxic Gases:**
 - Carbon monoxide
 - Hydrogen Sulfide
 - Phosphine (fumigation)
 - Ammonia (liquid fertilizer)



Atmosphere Testing Shall Be Performed:

Prior to every entry when the space is vacant;

- After breaks

Before and after ventilation

Continually throughout the entry



Air Monitors

Monitor may have a pump or aspirator, tubing or wand to draw air to the monitor (remote sampling)

Monitors are equipped with a peak/low function/latching features (top entry):

- Allows user to measure different levels of a space
- Best used for spaces of greater depth
- The monitor will save the peak and low readings for the gases indicated

Air Monitors

Make sure that monitor has been calibrated according to manufacturer recommendations.

Make sure monitor has proper classification:

- i.e. Class II, Division I, Group G



Air Monitors

Perform a bump test prior to each use

Bump testing is the process of briefly exposing the installed sensors to an expected concentration of calibration gas that is greater than the low alarm set point.

Ensure that sensors and alarms are working



Complete Entry Permit Form

Permit must be correctly and completely filled out prior to entry

Permit must be activated by Entry Supervisor's signature

Permit duration may not exceed the time required to complete the assigned work

Entry is not allowed without a valid permit

File for one year



Entry Permit Requirements

Confined Space Entry Permit									
Space to be Entered:					Date Issued:				
Permit Start Time:					Work to be Performed:				
Name(s) of Entrant(s):					Name of Attendant(s):				
Atmospheric Monitor (Manufacturer/Model):									
Pre-Entry Atmospheric Testing (Initial Check):									
Test:	Acceptable Level:	Results:	Test:	Acceptable Level:	Results:	Test:	Acceptable Level:	Results:	Test:
Oxygen:	19.5% to 23.5%		Oxygen:	19.5% to 23.5%		Oxygen:	19.5% to 23.5%		Oxygen:
Combustibles:	Less than 10%		Combustibles:	Less than 10%		Combustibles:	Less than 10%		Combustibles:
CO:	< 35 ppm		CO:	< 35 ppm		CO:	< 35 ppm		CO:
H2S:	< 10 ppm		H2S:	< 10 ppm		H2S:	< 10 ppm		H2S:
PH3:	< 0.3 ppm		PH3:	< 0.3 ppm		PH3:	< 0.3 ppm		PH3:
Periodic Atmospheric Testing (if Applicable):									
Test:	Result:	Time:	Test:	Result:	Time:	Test:	Result:	Time:	Test:
Oxygen:			Oxygen:			Oxygen:			Oxygen:
Combustibles:			Combustibles:			Combustibles:			Combustibles:
CO:			CO:			CO:			CO:
H2S or PH3:			H2S or PH3:			H2S or PH3:			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 II)				
<input type="checkbox"/> Chemical exposure					<input type="checkbox"/> Continuous forced air ventilation fan				
<input type="checkbox"/> Engulfment / entrapment / bridging material					<input type="checkbox"/> Lockout/Tags/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: _____									
Permit has been cancelled by entry supervisor: _____ Time: _____ Date: _____									
Date of Last Revision: 8/10/18									

Permit space to be entered

Purpose of Entry

Date and Authorized Duration of Permit

Names of Authorized Entrants

Names of Authorized Attendants

Name of Entry Supervisor

Hazards of the Space to be Entered

Measures Used to Isolate or Control Hazards

Acceptable Entry Conditions

Permit Requirements

Continued

Result of Initial and Periodic Tests

Rescue and Emergency Services that can be
Summoned

Measures Used to Isolate or Control Hazards

Acceptable Entry Conditions

Equipment Provided – PPE, Testing,
Communications, Alarm Systems, Rescue
Equipment

Any Additional Information Determined to be
Important

Enter the Space and Proceed with Work

An attendant shall remain near the entrance for the duration of the work

The attendant shall ensure that the permit is up to date with current entrants

The attendant shall maintain the permit for the duration of the work

When Work is Complete:

Remove all personnel, tools, and debris from the space

Close the space

Cancel the permit

Review the job, any problems, etc.

Communicate issues to Management

Rescue

Self Rescue

Non-Entry

Capabilities:

- Trained services must be available
- Can be internal or external provider

Annual rescue training and pre-planning

Employee Training Requirements

Employees must acquire the understanding, knowledge and skills necessary for the safe performance of the duties assigned

Training required before assigned to duties or a change in assigned duties

Whenever there is a change in the permit space operations that presents a hazard to which the employee has not been previously trained

Employee Training

Whenever employer believes that there have been deviations from the permit entry procedures or inadequacies in the employees knowledge

Training shall establish proficiency in duties required

Employer shall certify the training to include:

- Employees name
- Signature or initials of trainer
- Dates of training

Requirements for Entry into Grain Storage Structures

BINS, SILOS, TANKS PER OSHA 1910.272.

Grain Storage Structures

1910.272 (g) Requirements:

- Apply to employee entry into bins, silos, tanks, and other grain storage structures.
- Exception – “Entry through unrestricted ground level openings into **flat storage structures** where there are no toxicity, flammability, oxygen deficiency, or other atmospheric hazards is covered under paragraph (h)”

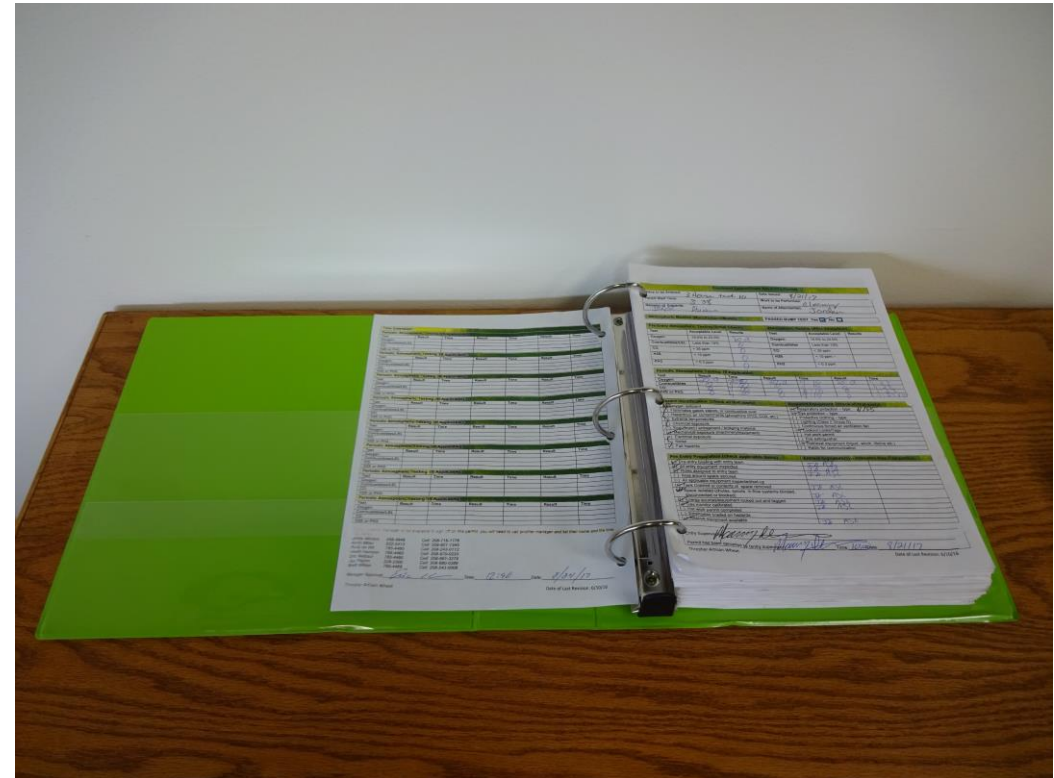
Unrestricted – employees can enter by stepping, walking, or driving through the openings.

Permits

“Issue a permit before entering bins, silos, or tanks.”

Exception: “Permit is not required if the employer’s representative (who would authorize the permit) is present during the entire operation.”

Strongly encourage the use of a permit system regardless of who is part of the entry team



Permit

“The permit must be kept on file until completion of entry operations.”

- Best Practice: permits on file for at least one year

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Combustibles:	Less than 10%		Combustibles:	Less than 10%	
CO	< 35 ppm		CO	< 35 ppm	
H ₂ S	< 10 ppm		H ₂ S	< 10 ppm	
PH ₃	< 0.3 ppm		PH ₃	< 0.3 ppm	
Periodic Atmospheric Testing (if Applicable):					
Test	Result	Time	Test	Result	Time
Oxygen:					
Combustibles:					
CO:					
H ₂ S or PH ₃ :					
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 (PH ₃), CO, etc.)			<input type="checkbox"/> Protective clothing – type:		
<input type="checkbox"/> Extreme temperatures			<input type="checkbox"/> Lighting (Class II Group D)		
<input type="checkbox"/> Chemical exposure			<input type="checkbox"/> Continuous forced air ventilation fan		
<input type="checkbox"/> Equipment / 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		
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<input type="checkbox"/> Tanks 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: _____					
Permit has been cancelled by (entry supervisor): _____ Time: _____ Date: _____					
Date of Last Revision: 8/10/16					

Permit

Must certify that the following precautions are taken prior to entry:

- “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

Precautions

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.”



Precautions

Ventilation

Ventilation shall be provided when;

- “oxygen is less than 19.5% “
- “combustible gas or vapor is in excess of 10% of the lower flammable limit, or”
- “toxic agents are present at levels in excess of the PEL (i.e. phosphine, carbon monoxide, etc.).”

“Ventilation shall be provided until the unsafe condition(s) are eliminated.”

“Ventilation shall be continued as long as there is a possibility of recurrence of an unsafe condition while in the bin.”

Precautions

“If toxicity or oxygen deficiency cannot be eliminated by ventilation, employees shall wear an appropriate respirator.”



Precautions

“Walking Down Grain or similar practices where an employee walks on grain to make it flow within or out from a grain storage structure is prohibited” or

“Where an employee is on moving grain are prohibited”



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.”



Lifelines

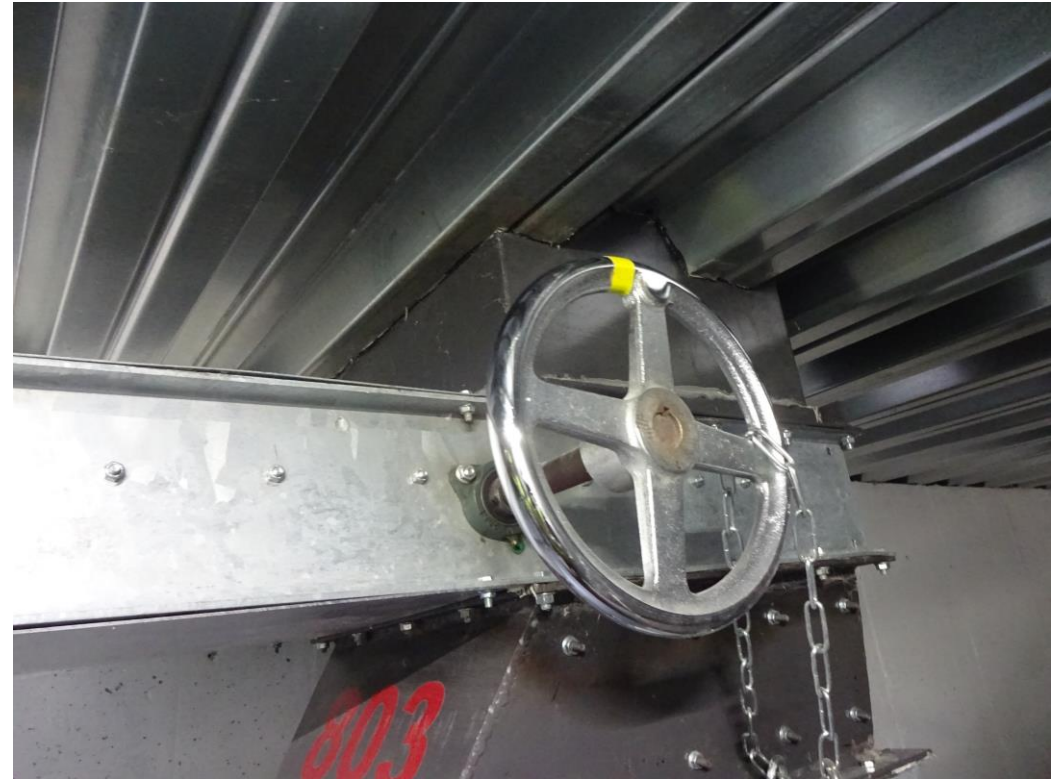
The lifeline:

- “Must be positioned and of sufficient length to prevent the employee from sinking further than waist deep in grain.”
- *Exception “ Where the employer can demonstrate that the protection required are not feasible or creates a greater hazard the employer can provide an alternative means of protection against sinking further than waist deep in grain.”*

Lifelines

When the employee is standing or walking on a surface which the employer demonstrates is free of engulfment hazards, the lifeline or alternative means can be disconnected or removed.

Note: Always follow your Company's requirements.

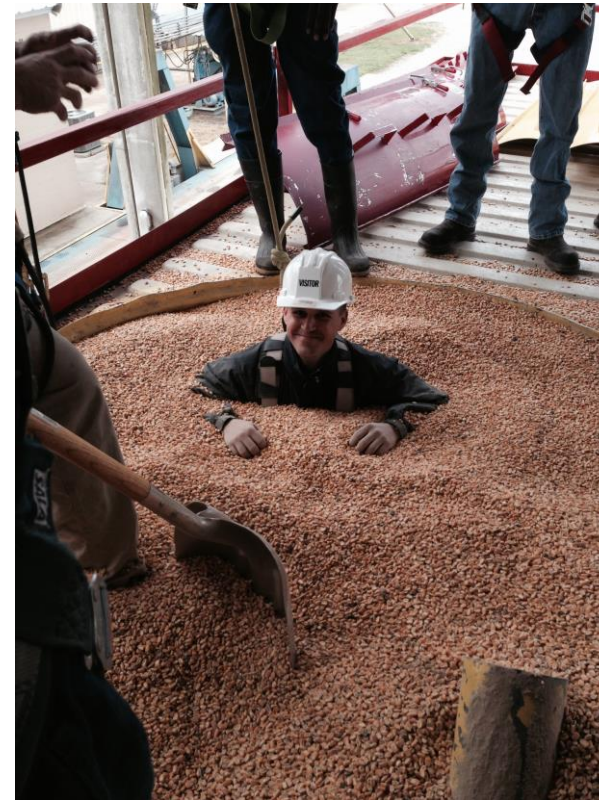


Engulfment and Entrapment

Definitions:

- Engulfment – “to swallow up-in”
- Entrapment – “Partially Submerged”

Engulfed victims rarely survive



Entrapment/Engulfment

- ▶ Goal: Identify ways to eliminate the need to enter grain storage structures (bins, silos, tanks)
 - ▶ Examples?

- ▶ Employees can become trapped in grain in several ways:
 - Collapse of bridged grain
 - Collapse of a vertical wall of grain
 - Entrapment in flowing grain



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.

Angle of Repose

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

Steepest angle at which an object can rest on an inclined plan without sliding down.



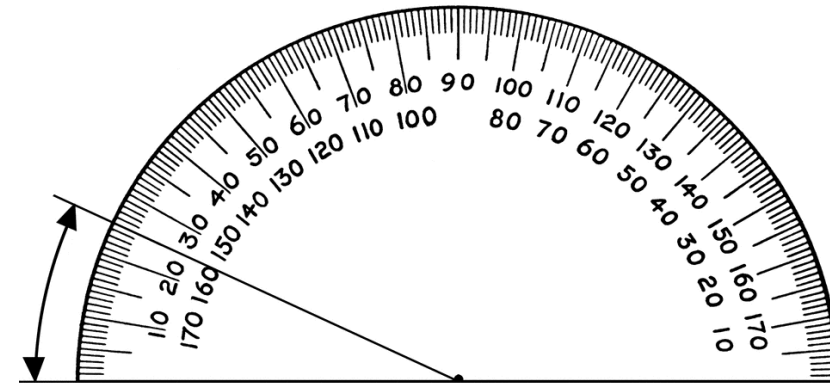
Angle of Repose

Corn – Approximately 21.5 - 23 degrees

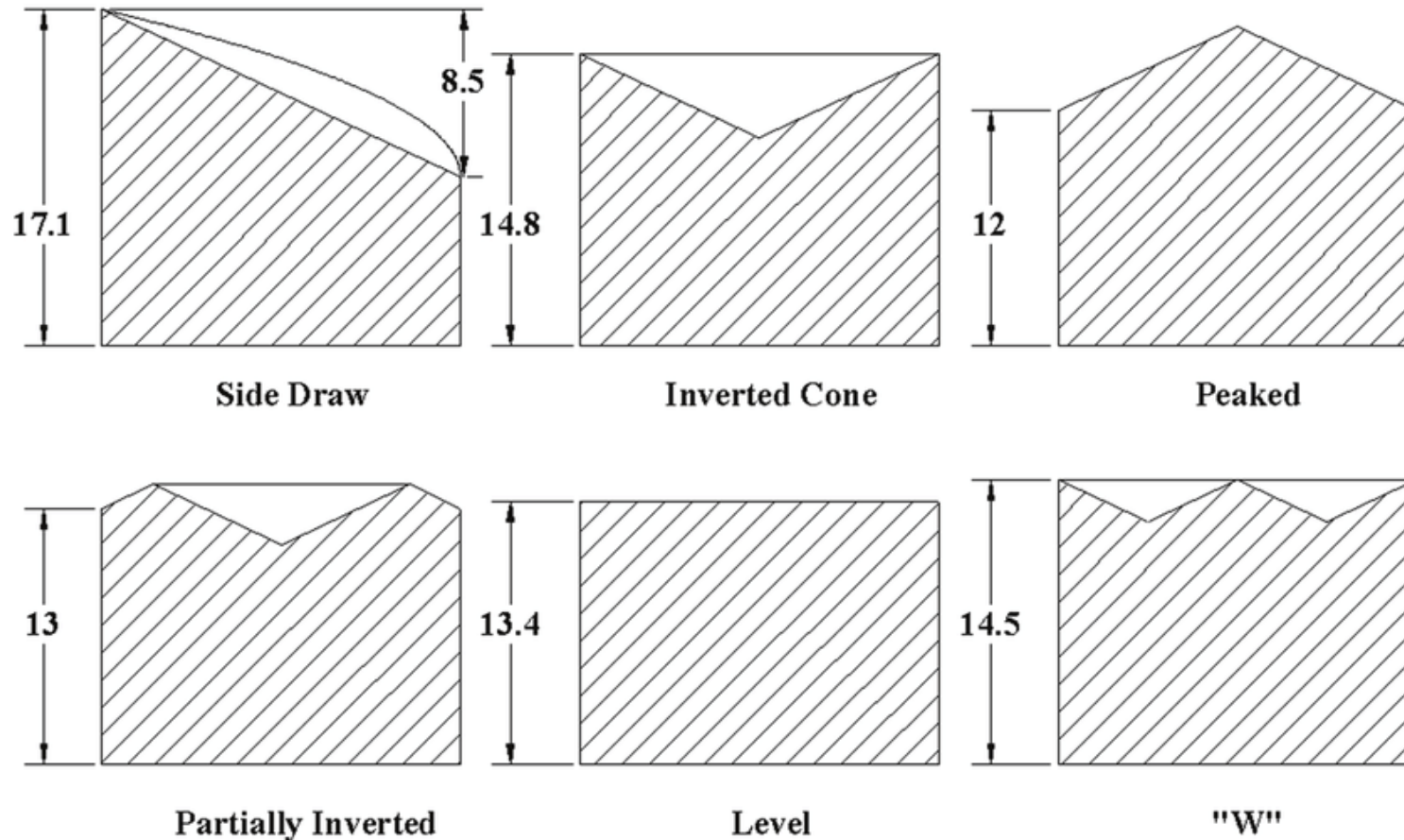
Soybeans – Approximately 25 degrees

Wheat - Approximately 25 degrees

Oats – Approximately 28 degrees

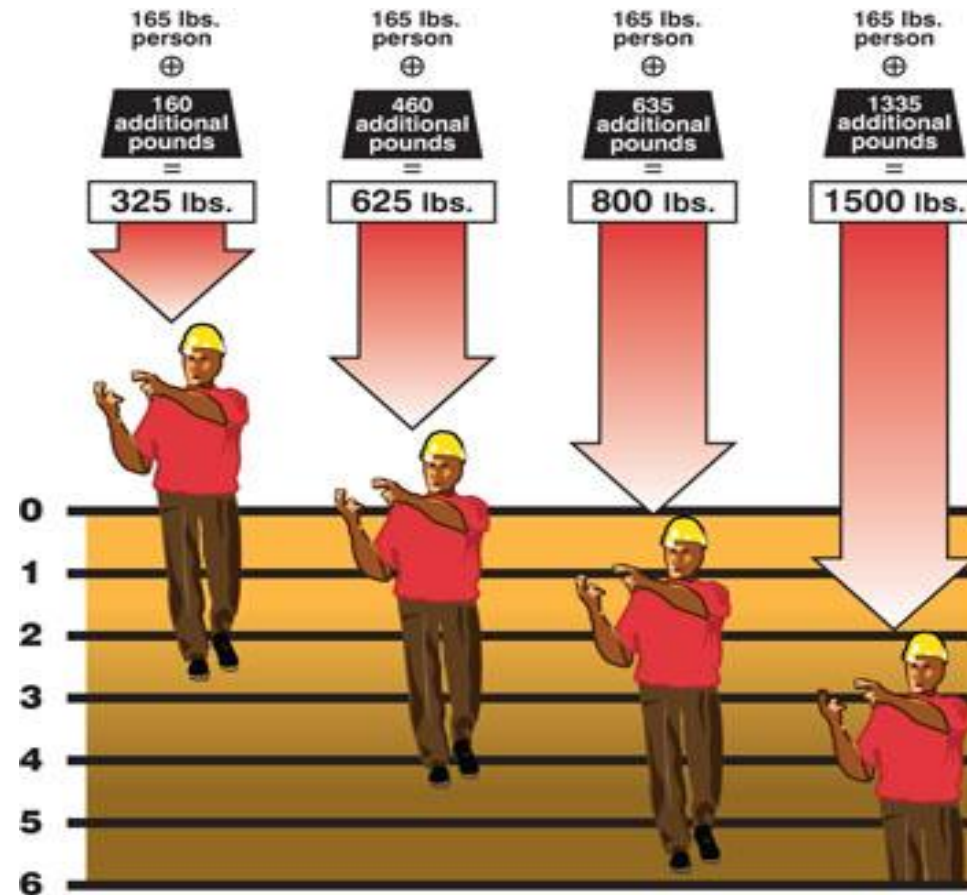


Hazards - Grain Surface Conditions



Forces on the Body

Illustration of the amount of force needed to extract someone entrapped or engulfed at different levels (ft.).



Precautions

“An observer equipped to provide assistance needs to be stationed outside of the bin, silo, or tank.”

“Communications shall be maintained between the observer and employee entering the bin, silo, or tank.”

- “voice”
- “visual”
- “signal line”



Precautions

Observer must be trained in:

- “Rescue procedures”
- “Notification methods for obtaining additional assistance”



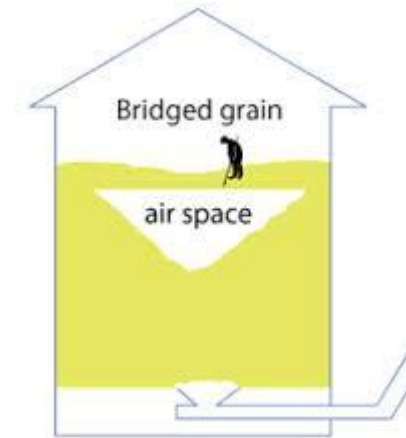
Precautions

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



Precautions

“Employees shall not enter bins underneath bridging conditions, or where buildup of grain products on the sides could fall and bury them.”



Debrief

Foster a zero-entry mentality

Be consistent in approach

Develop an inventory of spaces

Evaluate each space for hazards

Develop procedures for entry

Use a permit with a focus on hazard analysis

Consider rescue – non-entry, entry

Train employees

Evaluate the program annually



Further Information

www.grainnet.com/webinars.html

“New Sweep Auger Enforcement Policies” Eric Conn, Epstein Becker Green

“OSHA Enforcement and Boot Pits, Where are We” Melissa Bailey, Ogletree Deakins

www.ngfa.org

Boot Pit Guidance Document

Sweep Auger Guidance Document

Safety Tips

www.grainentrapmentprevention.com

<https://extension.entm.purdue.edu/grainsafety/>

2017 Summary of All Documented Agricultural Confined Space Related Cases

Additional Materials

Supervisor Talking Points

Quiz – Permit Required Confined Space Entry

A recording of this webinar will be available on grainnet.com

Disclaimer

- ▶ This presentation was developed to give general safety information on grain bin and confined space entry. Progressive Safety Services LLC (Progressive Safety) does not make any representation or warranty as to the accuracy or completeness of the information in this presentation. Refrain from doing any act or omission that are reasonably foreseeable that a particular other person (or class of persons) is likely to suffer damage or loss as a result of the act or omission. Progressive Safety is excluded from liability for negligence for both personal injury and damage to property. The information within this presentation is general. It does not constitute and should not be relied on as legal advice. Progressive Safety Services LLC tries to ensure that the content of this presentation is accurate, adequate or complete, it does not represent or warrant or its accuracy, adequacy of completeness.



Questions?

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