



Lunch Box Safety Webinar

Safety Over Sandwiches

June 13 • Confined Space Entry

Presented by Joe Mlynek, Progressive Safety Services LLC

Discussion Outline

Review Permit Required Confined Space
Entry Requirements



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](https://www.osha.gov)
- ▶ Develop procedures for entry

Labeling/Signage

- ▶ 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

- ▶ Hazardous Atmosphere
 - Oxygen
 - 19.5% to 23.5%
 - Flammable Gases
 - <10% LFL
 - Propane
 - Acetylene



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)
- ▶ Combustible Dust (obscures vision at 5 feet or less)
- ▶ NIOSH is the United States federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness.

Hazardous Atmosphere – 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



Hazardous Atmosphere – Carbon Monoxide (CO)

- ▶ Odorless
- ▶ Colorless
- ▶ Lighter than air
 - Vapor density = 0.98
- ▶ OSHA PEL – 50 ppm, NIOSH 35ppm REL
- ▶ IDLH – 1200 ppm



Hazardous Atmosphere – 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



Atmospheric Hazards – 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
Please maintain signs at all storage access points during fumigation
Warning signs only - does not label for use

Additional Hazards in 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

Confined Space Entry Duties and Responsibilities

- ▶ Entrant
- ▶ Attendant
- ▶ Entry Supervisor



Entrant

- ▶ The employee who will physically enter 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 filled out
- ▶ 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

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



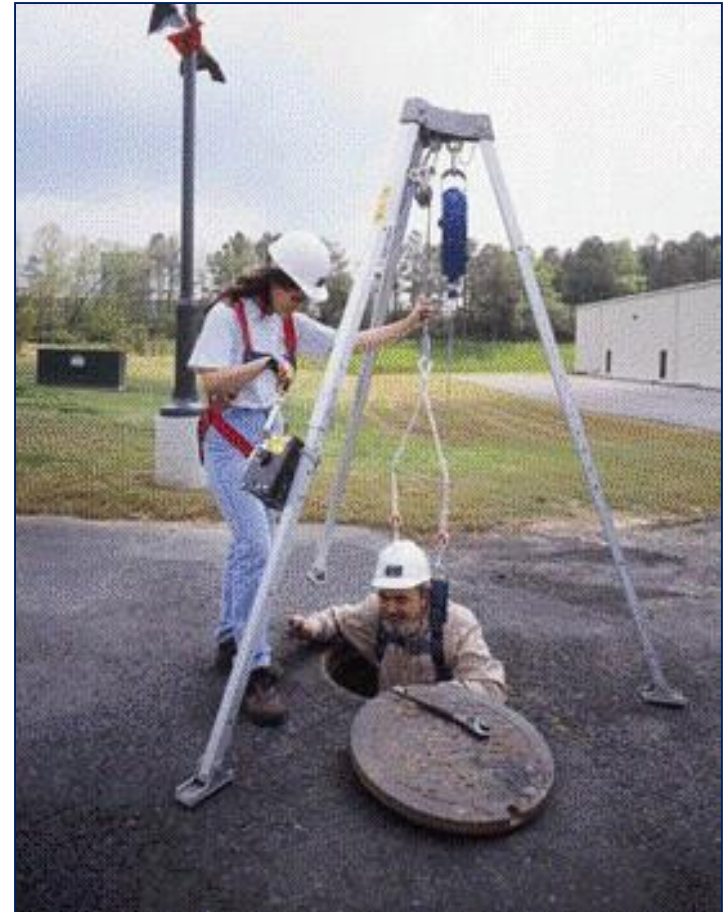
Inspect/Set-Up All Equipment

- ▶ 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 all 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 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)
 - Others??????



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.
- ▶ The bump test ensures that the atmospheric monitor is working correctly .



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

- ▶ 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, Flat Storage
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



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

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 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.

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.”



Further Information

- ▶ <http://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
- ▶ NFGA – Boot Pit Guidance Document
- ▶ NGFA – Sweep Auger Guidance Document
- ▶ www.grainentrapmentprevention.com

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?

Joe Mlynek CSP, OHST

joe@safetymadesimple.com

joe.mlynek@progressivesafety.us

www.safetymadesimple.com

www.progressivesafety.us

