Iowa Farm Bureau's Margin Management Webinar Series presents:

Confined Manure Pit Safety Webinar

December 11, 2015 1:00 pm

Introduction: Ed Kordick, IFBF

Speaker: Dan Neenan, Director,

National Education Center for

Agricultural Safety (NECAS), Peosta, Iowa

THE NATIONAL EDUCATION CENTER FOR AGRICULTURAL SAFETY

The National Education Center for Agricultural Safety

"an agricultural safety and health partnership between the National Safety Council and Northeast Iowa Community College"

NSC NICC

Hands-on Training Sites

Mobile Safety Classes

Mobile Grain Engulfment Simulator

Confined Space: Grain bin entry program

On Site Ag Safety and Rescue Classes

Safety Classes

- ♦Confined Space- Grain Bin Entry
- ♦Prevention of Grain Dust Explosions
- ♦Chemical Awareness
- ♦Confined Space- Manure Pit Entry
- ♦-Fall protection in Ag

Ag Rescue Classes

- ♦Grain Bin Rescue
- ♦Tractor Rollover
- ♦Combine Auger Rescue
- ♦Grain Storage Fire and explosion
- ♦Manure Pit rescue

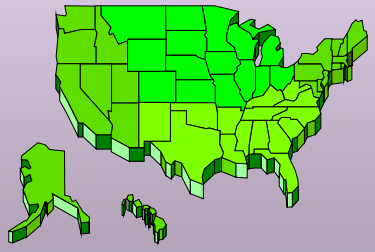
Program Objectives

- At the conclusion of this presentation, participants will:
  - ➢Be able to identify hazards associated with confined space work associated with manure pits
  - ➢Understand the process for confined space entry and lock out/tag out procedures
  - ➢Know where to look for OSHA references and resources related to confined space entry in the agricultural industry

Statistics:

Involvement in Farming in the U.S.

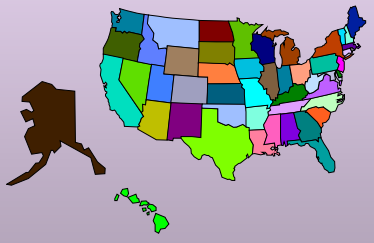
- 2.1 Million farmers
- 2% of the population



Statistics of Injury/Mortality:

U.S.

- 70,000 Disabling Injuries
- 568 Fatalities (2014)
- 40% are tractor related
- 24.9 deaths per 100,000 workers



Confined Space Entry

OSHA Regulation 29 CFR 1910.146

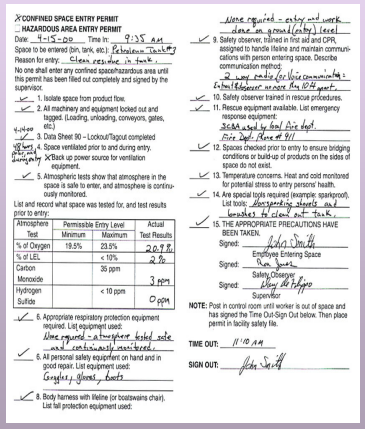
"Confined space" means a space that:
(1) Is large enough and so configured that an employee can bodily enter and perform assigned work; and
(2) Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry.); and
(3) Is not designed for continuous employee occupancy.

Permit-Required Confined Space

- By definition, a **permit-required confined space** has one or more of these characteristics:
- Contains or has the potential to contain a hazardous atmosphere
- Contains a material with the potential to engulf someone who enters the space
- Has an internal configuration that might cause an entrant to be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross section; and/or
- Contains any other recognized serious safety or health hazards.

Complete Entry Permit Form

- **Permit must be correctly and completely filled out prior to entry.**
- **Permit must be activated by Entry Supervisor's signature to be valid.**
- **No entry is allowed without a valid permit.**
- **When work is completed, permit and evaluation form should be returned to your Safety Dept.**
- **Cancelled permits must be kept on file for at least one year.**



X CONFIDENTIAL SPACE ENTRY PERMIT
__ HAZARDOUS AREA ENTRY PERMIT

Date: 4-15-00 Time In: 9:35 AM
Space to be entered (bin, tank, etc.): Petroleum Tank #7
Reason for entry: Clean residue in tank.
No one shall enter any confined space/hazardous area until this permit has been filled out completely and signed by the supervisor.

✓ 1. Isolate space from product flow.
✓ 2. All machinary and equipment locked out and tagged. (Loading, unloading, conveyors, gates, etc.)
✓ 3. Data Sheet 90 – Lockout/Tagout completed
✓ 4. Space ventilated prior to and during entry.
X Back up power source for ventilation equipment.
✓ 5. Atmospheric tests show that atmosphere in the space is safe to enter, and atmosphere is continuously monitored.

List and record what space was tested for, and test results prior to entry:

Atmosphere Test	Permissible Entry Level		Actual Test Results
	Minimum	Maximum	
% of Oxygen	19.5%	23.5%	20.8 %
% of LEL		< 10%	2 %
Carbon Monoxide		35 ppm	3 ppm
Hydrogen Sulfide		< 10 ppm	0 ppm

✓ 6. Appropriate respiratory protection equipment required. List equipment used:
None required – atmosphere tested safe and continuously monitored.
✓ 6. All personal safety equipment on hand and in good repair. List equipment used:
Goggles, Gloves, Boots
✓ 8. Body harness with lifeline (or boatswains chair). List fall protection equipment used:

None required – entry and work done on ground (entry) level
✓ 9. Safety observer, trained in first aid and CPR, assigned to handle lifeline and maintain communications with person entering space. Describe communication method:
2 way radio for voice communication. Entrant/observer across the USA agent.
✓ 10. Safety observer trained in rescue procedures.
✓ 11. Rescue equipment available. List emergency response equipment:
SCBA used by local fire dept.
Fire Dept. Phone # 911
✓ 12. Spaces checked prior to entry to ensure bridging conditions or build-up of products on the sides of space do not exist.
✓ 13. Temperature concerns. Heat and cold monitored for potential stress to entry persons' health.
✓ 14. Are special tools required (example: sparkproof). List tools: Non-sparking shovels and brushes to clean out Tank.
✓ 15. THE APPROPRIATE PRECAUTIONS HAVE BEEN TAKEN.
Signed: John Smith
Employee Entering Space
Signed: Tom Jones
Safety Observer
Signed: Mary McPhyo
Supervisor

NOTE: Post in control room until worker is out of space and has signed the Time Out-Sign Out below. Then place permit in facility safety file.

TIME OUT: 11:10 AM
SIGN OUT: John Smith

Entry Permits

- ♦Permit space to be entered
- ♦Purpose of entry
- ♦Date & authorized duration of permit
- ♦Authorized entrants
- ♦Authorized attendants
- ♦Name & signature of entry supervisor
- ♦Hazards of permit space to be entered
- ♦Isolation of hazard control measures
- ♦Acceptable entry conditions
- ♦Results of initial & periodic atmospheric monitoring
- ♦Rescue & emergency services
- ♦Communications procedures
- ♦Equipment required for entry & rescue operations
- ♦Other necessary information & other required permits

Conduct a Pre-Entry Briefing

- Entire crew must attend
  - Attendants, entrants, entry supervisor
- Review hazards of entry and work
- Review PPE
- Review procedure for contacting rescue
  - verify rescue is available
- Complete permit

Enter the Space and Proceed with work:

- **An attendant shall be posted near the entrance for the duration of the work. They shall be in constant communication with the entrants while the job is in progress.**
- **All entrants shall sign a sign-in-log when entering the space and sign out when exiting.**
- **The attendant shall maintain the permit and sign in log for the duration of the work.**

When the Job is Done:

- Remove all personnel, tools, and debris from the space. Sign off the permit.
- Close the space.
- Cancel the permit.
- Review the job with all personnel (hazards, problems, etc.)

General Requirements

The atmosphere within a pit or tank shall be tested for oxygen content.

Additionally the atmosphere within a pit or tank shall be tested for the presence of combustible gases, vapors and toxic agents when the employer has reason to believe they may be present.

General Requirements

If the oxygen level is less than 19.5% or if combustible gas or vapor is detected in access of 10% of the lower flammable limit, or if toxic agents are present in excess of ceiling limits or present in concentrations that will cause health effects which prevent employees from effecting self-rescue or communication to obtain assistance then the following apply:

General Requirements

A - Ventilation shall be provided until the unsafe condition or conditions are eliminated, and the ventilation shall be continued as long as there is a possibility of recurrence of the unsafe condition while the tank is occupied by employees.

B - If toxic or oxygen deficiency cannot be eliminated by ventilation, employees entering the tank shall wear an appropriate respirator. Respirator use shall be in accordance with the requirements of 29 CFR.1910.134.

Lockout/Tagout

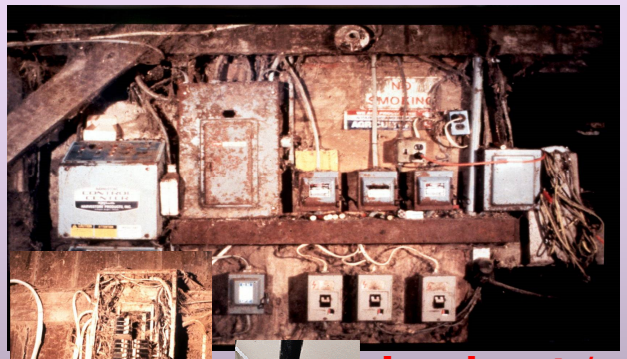
OSHA Regulation 29 CFR 1910.147

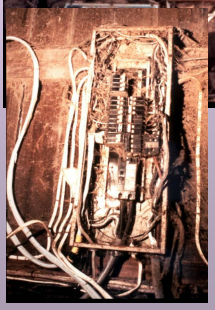
- *"Lockout"* To physically insure that all mechanical or electrical systems, that can be energized or started up, or release stored energy, are secured, isolated, disabled, or rendered inoperative.

- *"Tagout"* The placement of a device to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

General Requirements

All mechanical, electrical, hydraulic and pneumatic which presents a danger to employees inside of the storage structures shall be de-energized and shall be disconnected, locked-out and tagged, blocked off, or otherwise prevented from operating from other equally effective means or methods.





Lockout / Tagout

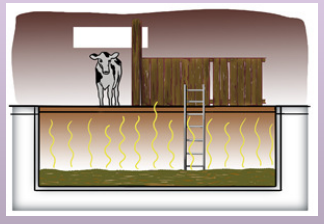
Where?
How?

Electrical & Valves Lockout /Tag out

Shut off the tractor and power equipment. Keep ventilation fans operating.

Atmospheric Hazards

- ♦Oxygen Deficiency
- ♦Presence of Combustible Gases
- ♦Presence of Hazardous Gases



None of these conditions can be seen!

Confined Space - Hazards

Oxygen deficiency can be caused by several different processes:

Consumption: oxygen is used up by the person who is in the confined space and is turned into carbon dioxide.

Displacement: denser materials push the oxygen out of the confined space.

Reaction: oxygen reacts with other materials to make other compounds.

Work Performed in a confined space.

- Welding, cutting, painting, scraping, sanding, etc.

Toxic Atmospheres

Toxic atmospheres can be caused by:

Product stored in a confined space.

- Gases released by decomposing manure.
- Decomposition of materials stored.
- Gases released when cleaning.
- Oxidation of metals

Work Performed in a confined space.

- Welding, cutting, painting, scraping, sanding, etc.

Toxic materials adjacent to a confined space.

Temperature Extremes

- Extremely hot or cold outside temperatures can magnify the temperature inside the confined space.
- Steam cleaning & working can increase temperatures within a confined space.
- Humidity factors & wearing PPE can affect workers.
- Attendant needs to keep watch on the entry worker & have them take frequent breaks with rest and water.

Oxygen Deficient Atmospheres

19.5%	Minimum acceptable oxygen level.
15 –19%	Decreased ability to work strenuously. Impaired coordination.
12 –14%	Respiration increases - Poor Judgment.
10 –12%	Respiration increases – Lips Blue.
8 –10%	Mental failure – Fainting, Nausea, Unconscious, Vomiting.
6 – 8%	Possible recovery 4-5 minutes, 50 percent fatal after 6 minutes, fatal after 8 minutes
4 – 6%	Coma in 40 seconds – Death.

Source: NIOSH Datasheet

Oxygen Deficient Atmospheres

- ♦Hydrogen Sulfide
- ♦Carbon Dioxide
- ♦Ammonia
- ♦Carbon Monoxide
- ♦Methane

Hydrogen Sulfide

Hydrogen sulfide (H_2S) is a highly toxic gas with a "rotten egg" odor at low concentrations [NIOSH/OSHA 1981]. At high concentrations, hydrogen sulfide can paralyze the olfactory senses [NIOSH 1979]. Because this gas is heavier than air, it can settle near the bottom of the manure pit. Hydrogen sulfide is a severe eye irritant and may cause tissue damage [NIOSH/OSHA 1981]. At low concentrations, gas can cause dizziness, headache, nausea, and irritation of the respiratory tract. At high concentrations, hydrogen sulfide can cause unconsciousness, respiratory failure, and death within minutes. In addition, hydrogen sulfide may be explosive at a wide range of concentrations in air--4.3% to 46% by volume [NIOSH 1985a].

Carbon Monoxide

- Odorless, cannot see or taste
- By-product of combustion
- Found in gas/oil furnaces, engines and small motors.

Carbon Monoxide

- IDLH: 1200 ppm
- Exposure Limits: NIOSH REL- TWA 35 ppm, OSHA PEL- TWA 50 ppm
- Physical Description: Colorless, odorless gas
- Exposure Routes: Inhalation, skin &/or eye contact
- Symptoms: Headache, Tachypnea, Nausea, Weakness, Exhaustion, Dizziness, Confusion, Hallucinations, Cyanosis, Depressed S-T segment of electrocardiogram, Angina, Syncope

Methane

- Methane (CH_4), is an odorless gas that is flammable or explosive at concentrations of 5% to 15% by volume of air [NIOSH 1985b]. At high concentrations, methane can displace enough oxygen to cause death by suffocation. Because this gas is lighter than air, it occurs near the top of the pit. Methane should be expected to be present in manure pits.

Ammonia (NH_3)

Ammonia (NH_3) has the sharp odor characteristic of household ammonia [NIOSH/OSHA 1981]. This gas can severely irritate the eyes, nose, throat, and lungs. Exposure to high concentrations can be fatal.

Carbon Dioxide (CO_2)

- Product of decomposition
- Common in manure storages.
- Odorless, colorless.
- Difficult to measure.
- Displaces oxygen.

Carbon Dioxide

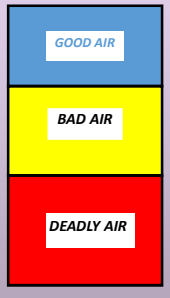
- Carbon dioxide (CO_2) is an odorless that is normally in the atmosphere [NIOSH/OSHA 1981]. Because this gas is heavier than air, it can settle near the bottom of the manure pit. At low concentrations, carbon dioxide can result in labored breathing, drowsiness, and headache. At high concentrations, carbon dioxide can displace enough oxygen to cause death by suffocation.

Ventilate the Space

- **Use mechanical ventilation**
  - Fans
- **Ventilate at the rate of at least four (4) volumes per hour**
  - Larger spaces require more ventilation
- **Make sure air supply is not contaminated**
  - Ventilation air supply must be from fresh air uncontaminated with flammables, toxins, etc.
  - **Gas powered fans can be Dangerous**

Air quality

Always test the air at different levels of the structure to make sure it is safe. The air might be clear at the top and deadly at the bottom.



Atmosphere Testing Shall Be Performed:

- Prior to every entry when the space is vacant;
- At least hourly for permit-required confined spaces.
- More frequently, if conditions or suspicions warrant.

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:**
  - Most commonly carbon monoxide (PEL 50 ppm)
  - or any other hazardous materials as determined by the use of the space.

Dairy Farmer's Boys Have Close Call With Manure Gas

9/22/2012 7:00 AM

By Chris Torres Staff Writer

DANVILLE, Pa. — Monday was a harrowing day for dairy farmer Dennis Beachel of Danville, Montour County.

Just as he was starting to stir his 124-foot-wide, 12-foot-deep, 1.2-million-gallon concrete manure pit late Monday morning, he saw something no parent would ever want to see.

"We had just started to stir the pit and within two to three minutes, I turned around and both of the boys laid beside their bicycles," Beachel said.

The boys, 4-year-old Denyn and 2-year-old Denallen, who had just celebrated his birthday the week before, were found face up and unresponsive. The younger boy's face had turned blue, and his eyes had rolled back into his head.

The boys were playing next to the large manure pit when Beachel and his father starting prepping it to be emptied.

Aware of past accidents involving manure gas on dairy farms, Beachel feared the worst.

"They looked like they were dead. I feared they were when I first picked them up," he said.

Unresponsive but breathing 500-600 PPM

150 PPM

Confined Space Rescue

Means of emergency rescue must be readily available to the confined space entry attendant for emergency extrication of entrants.

Pit Gases

- When foaming occurs, gases become trapped in the foam's bubbles, which may be comprised of 50 to 70% methane.

Photo Courtesy of: David Schmidt, University of Minnesota

To guard against pumping accidents, agricultural engineers, animal scientists and pork industry consultants have developed a series of recommendations to help producers address this serious safety concern:

Provide continuous ventilation to prevent gas build-up. Increase ventilation during agitation to quickly dissipate released gases.

When pumping pits that are close to being full, pump without agitation until manure is about 2 ft. below the slats.

Pumping a pit when foam is present

- ♦Remove people and animals from building
- ♦Lock-Out and Tag Out all devices except the pit fans

Turn off heater pilot light and other non-ventilation electrical systems (such as the feeding system), that might produce an ignition spark. Lock Out- Tag Out

Standby/Rescue Personnel

A worker who is assigned to remain outside a confined space must be:

- In constant contact with the workers inside.
- Know emergency procedures.
- Be trained in the use of emergency rescue equipment and PPE.

60% of workers who die in confined spaces are would-be rescuers.

NECAS Contact Information

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