

Confined Space Training

Objectives

Training Overview

- General Program Responsibilities
- Confined Space & Permit Required Confined Space Definitions
- Permit Space Entry Team Responsibilities
- Permit Space Entry Equipment
- Permit Space Entry Procedures
- Hands-on Activity
- Quiz

General Responsibilities

Supervisor

- Review and update location lists
- Identify employees in need of training
- Ensure permits are completed and maintained

Employee

- Assist in location information
- Complete training
- Notify supervisor when entry will be required
- Complete fire department notification and entry permit

General Responsibilities

REM

- Conduct training
- Assist in location classification
- Calibrate confined space monitors
- Maintain campus master location list

Fort Wayne Fire Department

- Assumes responsibility as the confined space rescue team

What is a confined space?

A confined space is a space that meets all of the following criteria

- Is large enough and so configured that an employee can bodily enter and perform assigned work
- Has a limited or restricted means for entry or exit
- Is not designed for continuous employee occupancy

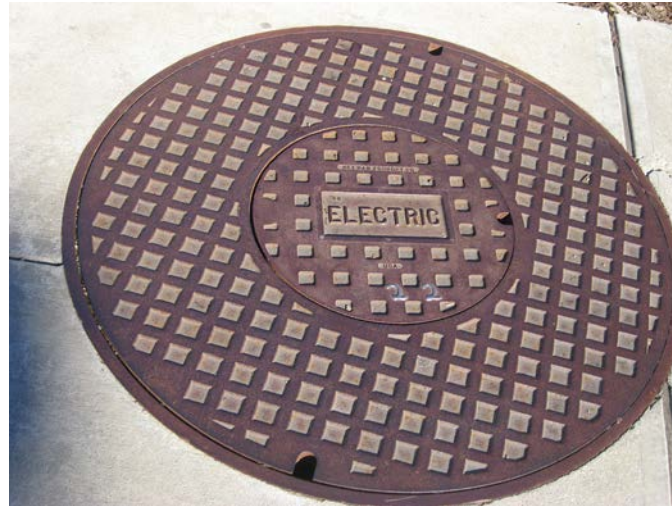
Which of the following is considered a confined space?

Confined space?

- Chemical storage tank
- Grain silo
- Tunnel
- Manhole
- Boiler
- Electric Vault
- Air Handler

- All are considered confined spaces!

Examples of confined spaces



Permit Required Confined Spaces

What makes a confined space permit required?

(only one of these has to apply)

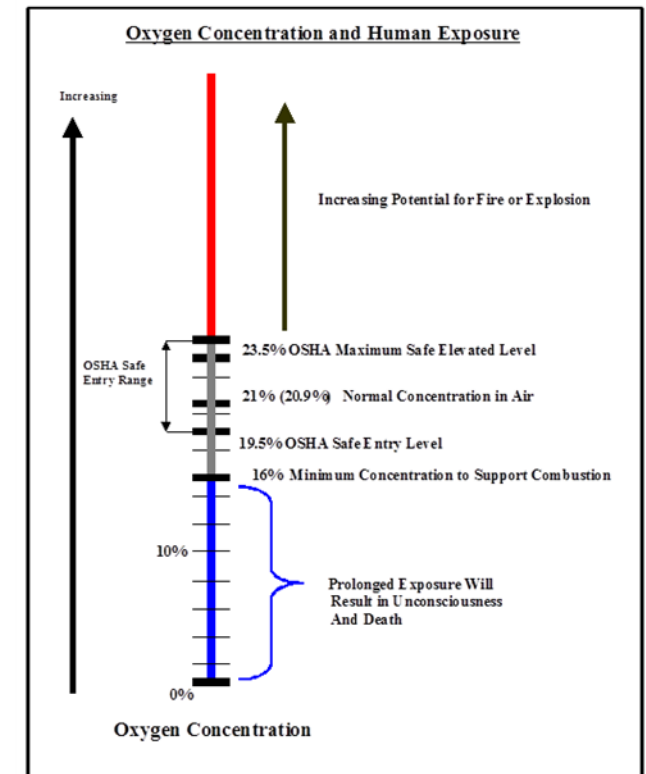
- Contains or has a potential to contain a hazardous atmosphere
- Contains a material that has the potential to engulf an entrant
- Has an internal configuration that could trap or asphyxiate an entrant by inwardly converging walls or floors that tapers downward to a smaller cross section
- Contains any other recognized serious safety or health hazard

Permit Required Confined Spaces

Contains or has a potential to contain a hazardous atmosphere

- >70% of deaths in confined spaces involve a hazardous atmosphere
- Low or high oxygen content (<19.5% or >23.5%)
 - Symptoms of low oxygen are non specific and may mimic flu symptoms

Oxygen Content (% by volume)	Signs and Symptoms (at Atmospheric Pressure)
19.5%	Minimum permissible levels that work can be performed without respirators. Below this level, workers shall be required to wear supplied air respirators.
17%	Hypoxia symptoms, accelerated breathing and heart rate appear
14-16%	Accelerated breathing, increased heart rate, poor muscular coordination, fatigue, impaired perception and judgment.
12%	Unconsciousness without warning, poor judgment, blue lips
6-10%	Nausea, vomiting, and unconsciousness; 8 minutes 100% fatal; 6 minutes, 50% fatal; 4-5 minutes, recovery with treatment.
<6%	Coma in 40 seconds, spasmodic breathing, convulsions, and death

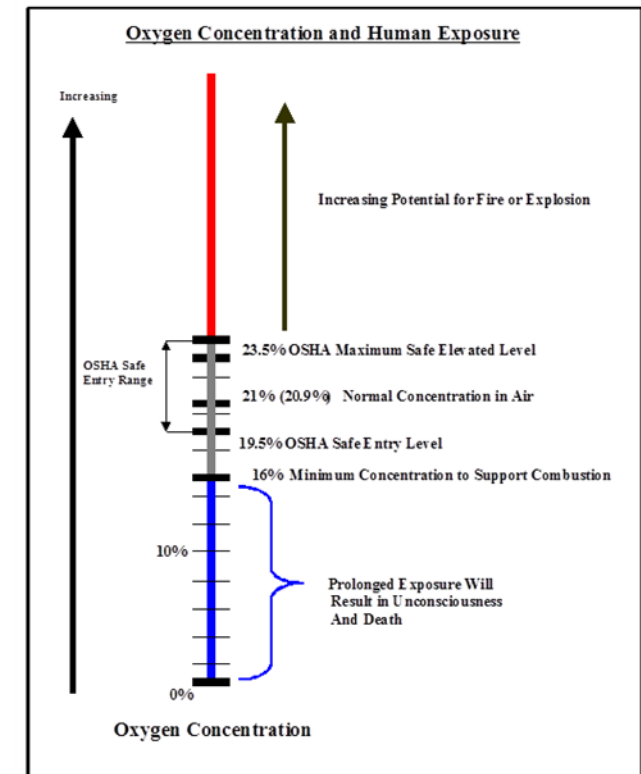


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Permit Required Confined Spaces

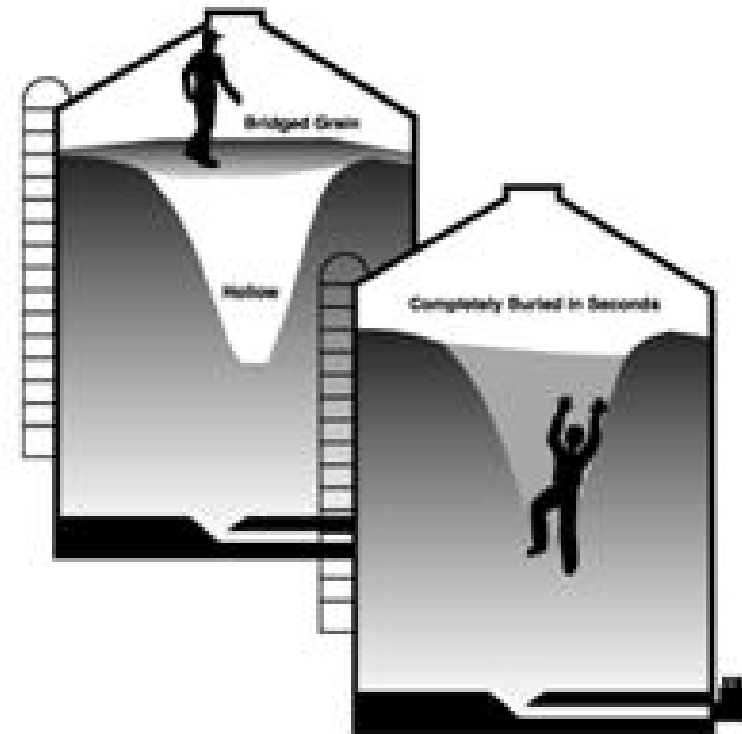
Contains or has a potential to contain a hazardous atmosphere

- Flammable or explosive (>10% LEL)
- Any other contaminants which would create a toxic atmosphere (>PEL, >STEL, IDLH atmospheres)
 - Examples include Hydrogen Sulfide, Carbon Monoxide, and welding fumes
- Some gases are odorless (Carbon Monoxide, Methane)

Permit Required Confined Spaces

Contains a material that has the potential to engulf an entrant

- Silos
- Storage tanks



Permit Required Confined Spaces

Has an internal configuration that could trap or asphyxiate an entrant by inwardly converging walls or floors that taper downward to a smaller cross section



Permit Required Confined Spaces

Any other recognized serious hazards

- Fall hazards
- Mechanical hazards
- Electrical hazards
- Excessive heat

<u>Hazard</u>	<u>Locations</u>	<u>Conditions</u>	<u>Symptoms</u>	<u>Sources</u>
<i>Oxygen Deficiency</i>	Electrical Pits, Silos, Sewers, Valve Pits, Tanks, Sump Pits	Normal Air – 20.9% Oxygen (O ₂) OSHA Safe Entry Limit $\geq 19.5\%$	Headache, Ringing in the ears, Nausea, Confusion, Loss of muscle control, Difficulty in breathing	Corrosion of metal, Biological digestion of organic material, Displacement
<i>Oxygen Enrichment</i>	Any enclosed space, especially unventilated below ground locations	OSHA Maximum Safe Entry Level $< 23.5\% \text{ (O}_2\text{)}$	None (Extreme fire hazard)	Use of Oxy-Acetylene torch
<i>Toxic Chemical Exposure</i>	Sanitary sewer systems, Material stored or used in the space, Leaks into the space	OSHA Permissible Exposure Limit (PEL) American Conference of Govment. Industrial Hygienists (ACGIH) Threshold Limit Values (TLV's)	Eye nose or throat irritation usually accompanied by a strong odor	Volatile solvents, Welding fumes, Products of digestion
<i>Electrical & Mechanical Hazards</i>	Pits containing live elect. Wiring, mixing vats with rotating shafts	Non-zero energy state, Requires use of Lockout/Tagout Procedures	Physical trauma to the body or electrocution	Mixing vats, Electrical Pits, Process tanks
<i>Heat Stress/ Burns</i>	Steam tunnel, Crawl space containing hot water or steams lines.	Physical contact with or high potential for entrapment or extremely high ambient temperatures	Heat cramps, Heat exhaustion, Heat stroke, Burns, Asphyxiation	Steam tunnels, Crawl tunnels under kitchen areas, Power plant boilers
<i>Flammable or Explosive Atmospheres</i>	Sanitary sewers, tanks or process vats that contained combustible material	OSHA Safe Entry Limit $< 10\%$ Lower Explosive Limit (LEL)	Chemical Dependent – odor and possible toxic symptoms Pure methane-odorless	Biological digestion, Residual material, A leak into underground spaces, Material used in the space
<i>Fall Hazard</i>	Any below ground space more than 4 feet in depth	Any pit tank sump more than 4 foot deep, wet conditions, poor lighting No fixed ladder	Physical trauma to the body resulting from a fall	Any Pit, Tank, or Sump, Requiring entry with a ladder (fixed or removable)

Permit Required Confined Spaces

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Confined Space Video

<https://www.youtube.com/watch?v=rUM7tnYcOjQ>

Utility Tunnel Classifications

The utility tunnel system is divided into two separate categories

- Walkable Tunnel
 - Minimum 22" wide and 48" tall
 - Classified as Non-Permit Required Confined Space
 - Conditions could change that change the classification to Permit Required



Utility Tunnel Classifications

The utility tunnel system is divided into two separate categories

- Crawl Tunnels
 - Less than 22" wide or 48" tall
 - Classified as Permit Required at all times
 - Very difficult to enter and exit
 - Ventilation is very limited

Entry Team Responsibilities

Two people are required for ALL permit required confined space entries

Three jobs

- Entrant
- Attendant
- Entry Supervisor

Entry Team Responsibilities

The Entrant is the individual actually entering the space to complete work

- Know the signs and symptoms of exposure
- Assist in identifying and controlling hazards before entry
- Exit the space immediately if the monitor alarms, if the attendant signals to exit, or another hazard is found

Entry Team Responsibilities

The Attendant is the individual outside the entry location, responsibly for monitoring the condition of the entrant(s)

- Know the signs and symptoms of exposure
- Control access to the space
- Call for emergency assistance if needed
- Maintain contact with the entrant during entry
- Assist in the completion of the permit
- Never enter the confined space

Entry Team Responsibilities

The Entry Supervisor is the individual with overall responsibility of the entry

- Know the signs and symptoms of exposure
- Complete a written entry permit and sign to initiate entry
- Notify fire department prior to entry
- Maintain overall responsibility for entry
- Cancel the permit at the end of entry

Entry Equipment

Required equipment for entry into a permit required confined space

- Confined space air monitor
- Fall protection and retrieval system
- PPE (gloves, respiratory protection, hard hat, safety glasses, etc.)
- Portable ventilation system (if needed)



Entry Equipment

Air monitoring is required inside any permit space

- Oxygen (O), Lower Explosive Limit (LEL), Carbon Monoxide (CO), and Hydrogen Sulfide (H₂S)
- Additionally, if there is reason to suspect any other type of gas, steps should be put in place to make sure monitoring is also done for those
- Testing is required prior to entry
- Continuous air monitoring is required for the duration of entry
- Alarms:
 - Oxygen <19.5% or >23.5%
 - LEL >10%
 - CO >10ppm
 - H₂S >1ppm

Entry Equipment

Air monitors

- Prior to any confined space entry, please contact REM at 15744 or 14193 to obtain an air monitor
- Only REM employees are authorized to calibrate and/or repair air monitors
 - If the air monitor you are using displays a negative reading, exit the confined space and contact REM immediately for calibration

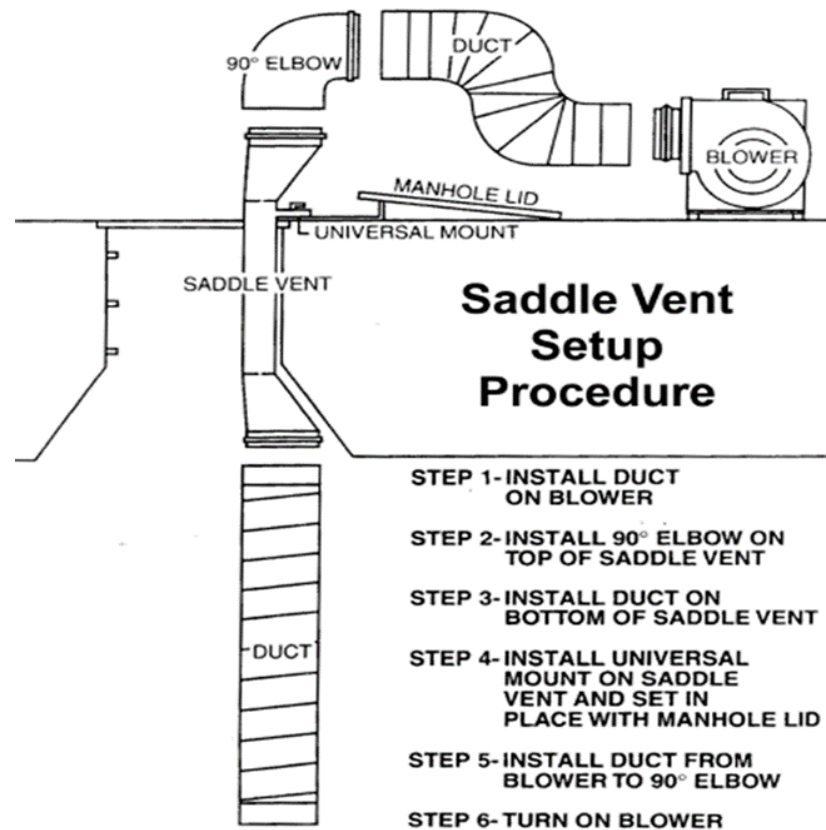
Entry Equipment

Air monitoring in the confined space

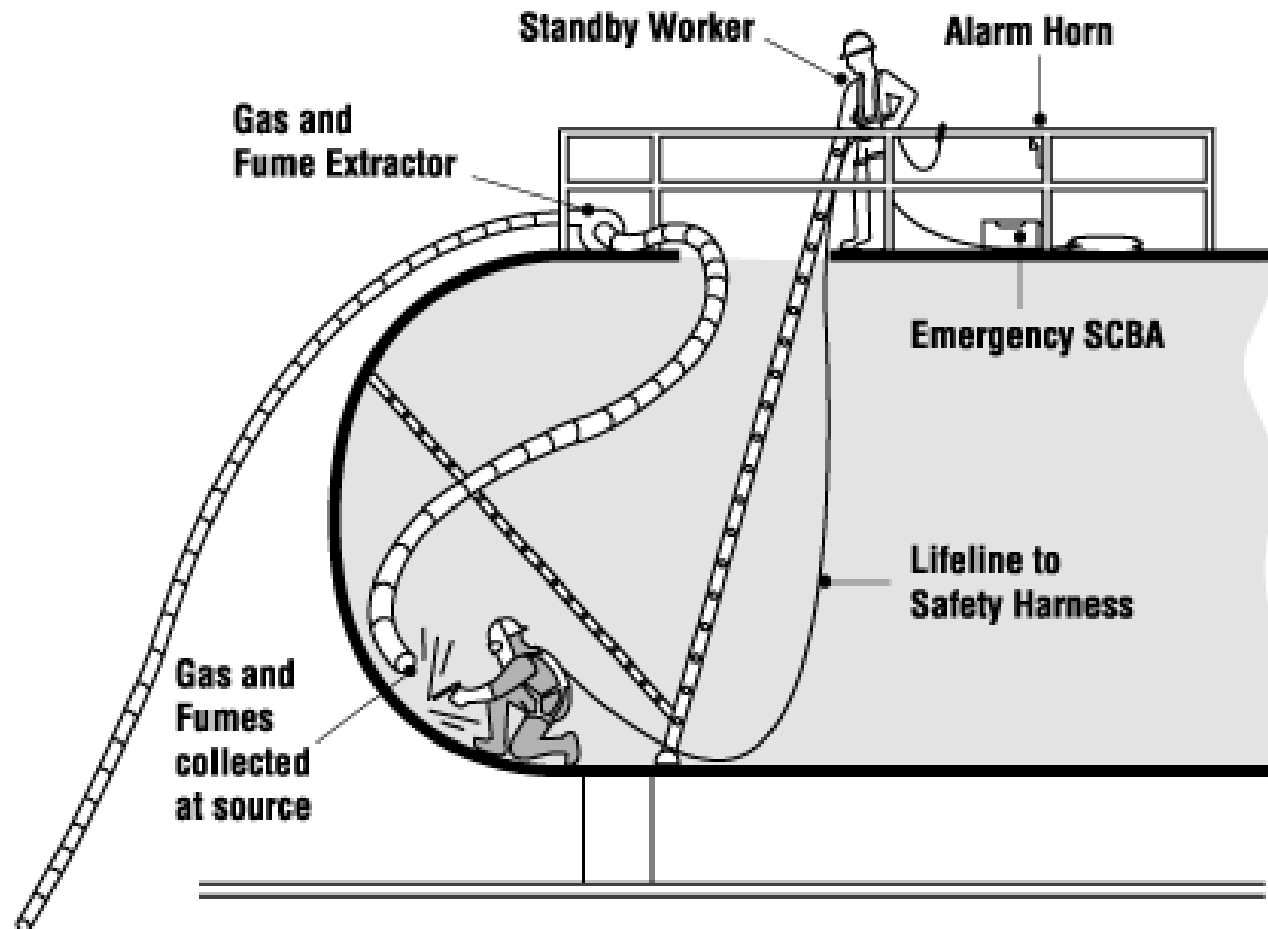
- If the initial air quality is not acceptable, ventilation should be used to supply fresh air to the space
- Continuous air monitoring is required for all permit required confined spaces



Entry Equipment



Entry Equipment



Ventilation equipment

- This diagram illustrates ventilation equipment used to remove contaminants at the point of operation
- The space would not normally have an atmospheric hazard, but one is created by the worker welding

Entry Equipment

Atmospheric Hazards

- An alternative to using ventilation is to use a respirator
- Air purifying respirators may only be used to filter known air contaminants
 - They are NOT effective for low/high oxygen atmospheres or high carbon monoxide atmospheres



Entry Equipment

Retrieval system

- OSHA states that a retrieval line is a standard piece of equipment for a confined space entry unless its rendered ineffective or inappropriate by the configuration of the space being entered (line can become entangled, obstructions or turns in the confined space)



Entry Equipment

Opening protection equipment

- If the floor opening to the confined space is an area that is accessible to others in the area, it shall be protected from accidental entry



Entry Procedures

1. Request a confined space permit from your supervisor
 - The Entry Supervisor will need to notify the fire department in advance of planned entries (day before)
 - Form CS-2?

Entry Procedures

2. Assign an entrant, attendant, and entry supervisor (an entrant or attendant may serve as an entry supervisor)
3. Gather the appropriate PPE (tripod, harness, confined space monitor, ladder, etc.) based on hazard assessment forms
4. Upon arriving at the confined space location, secure the confined space opening, if necessary
5. Fill out the confined space permit form completely (prior to entry)

Entry Procedures

6. Conduct pre-entry and continuous air monitoring for

- Oxygen content (19.5%-23.5%)
- Flammable gases or vapors (<10% LEL)
- Carbon Monoxide (<10 ppm)
- Hydrogen Sulfide (<1 ppm)

7. Call Fort Wayne Fire Department to notify them you are ready to enter the space and initiate the permit

Entry Procedures

8. Perform continuous air monitoring during entry and work activities
9. Attendant and entrant remain in constant communication
10. Once everyone is out of the space, call Fort Wayne Fire Department to let them know the entry is complete
11. After ensuring everything is complete on the permit, cancel the confined space permit



Questions?