Confined Space Entry

Controlling Associated Hazards
References

- EM 385-1-1 Section 34
- 29 CFR 1926.21 (b) (6)
- 29 CFR 1910.146
- UFGS 01 35 29 (Latest)
- ANSI Z 111.7
- Accident Abstracts
Why Comply???

- Confined space entry is a leading cause of occupational fatalities in this country
Statistics

- Standard covers 240,000 workplaces and 12.2 million workers
- Workers make 4.8 million entries/year
- Standard may prevent 85% of fatalities and nearly 11,000 injuries
Potential Confined Space Hazards

- Engulfment
- Oxygen deficiency (19.5% or less)
- Oxygen enrichment (above 21%)
- Flammable gases or vapors
- Combustible dusts
- Toxic substances
-IDLH atmospheres
- Physical hazards
Typical Confined Spaces

- Boiler, Degreaser, Furnace
- Pipeline, Pit, Pumping Station
- Reaction or Process Vessel, Mills
- Septic Tank, Sewage Digester
- Silo, Storage Tank, Barges
- Sewer, Utility Vault, Manhole
- Trenches, Shafts, Caissons
Typical Confined Spaces

- Caisson
How to Identify Confined Spaces

Confined space: a space that

- (1) is large enough and so configured that a person can bodily enter and perform assigned work; and

- (2) has limited or restricted means for entry or exit and;

- (3) is not designed for continuous worker occupancy.
Confined Space Characteristics

**Limited Openings for Entry/Exit**

- Openings as small as 18 inches in diameter.
- Difficult to enter with SCBA or other life-saving equipment.
- Difficult to remove downed worker in folded up or bent over position.
- Exit from large openings may be difficult due to presence of ladders, hoists, etc.
Confined Space Characteristics

Unfavorable Natural Ventilation

- Lack of air movement in and out of the space can create an atmosphere much different than the outside atmosphere.
- Deadly gases can be trapped inside.
- Organic materials can decompose.
- May not be enough oxygen due to presence of other gases or chemical reactions such as rusting.
Confined Space Characteristics

Not Designed for Continuous Worker Occupancy

- Most confined spaces are not designed to enter and work in on a regular basis.
- Designed to store a product.
- Enclose materials or processes.
- Transport products or substances.
- Occasional worker entry for inspection, repair, cleanup, maintenance, etc.
Non-Permit Required Confined Spaces (NPRCS)

A confined space that does not contain or have the potential to contain an atmospheric hazard capable of causing death or physical harm.
Typical Non-Permit-Required Spaces

- Utility closets
- Below-grade trenches
- Storage vaults
- Utility subbasements
A confined space that has one or more of the following:

- Contains or has potential to contain a hazardous atmosphere
- Contains the potential for engulfment
- Internal configuration that can trap or asphyxiate entrant
- Any other serious safety or health hazards
Typical Permit-Required Spaces

- Chemical storage tanks
- Waste or storage pits
- Grain bins
- Underground tunnels
- Railroad cars under construction
Confined Space Competent Person (CSCP)

- Thorough knowledge of OSHA’s Confined Space Standard, 29 CFR 1910.146
- Experience with PRCS space entry procedures
- Authority to supervise and influence how work is performed on jobsites and in facilities
CSCP Responsibilities

- Identification and labeling
- Program development
- PRCS permit development
- Coordination with local emergency responders
Attendant Responsibilities

- Knows the hazards that may be faced during entry
- Aware of possible behavioral effects of hazard exposure in authorized entrants
- Continuously maintains an accurate count of authorized entrants
- Remains outside of the PRCS until relieved by another attendant
- Communicate with entrants as necessary to monitor status
- Monitor activities inside and outside the space to determine if space is safe for entrants to remain.
Entrant Responsibilities

- Know the hazards of the space
- Use appropriate equipment
- Communicate with attendant as necessary
- Alert the attendant if:
  - An alarm is activated
  - Detects a prohibited condition
- Exit the PRCS ASAP when:
  - Ordered to do so by attendant
  - Recognizes any warning or sign of exposure to dangerous situation
  - Detects a prohibited condition
  - Alarm is activated
Rescuer Responsibilities

- Understand the hazards of the space
- Be certified in emergency first aid and CPR
- Understand appropriate entry procedures
- Know how to use rescue equipment
- Practice confined space rescues at least annually
Confined Space Program Elements

- Identification and labeling
- Confined space hazard identification
- Safe confined space entry conditions
- Equipment to be used for confined space entry at the site
- Procedures for evaluating PRCS conditions when entry is conducted
- Policies and procedures to ensure at least one attendant is available outside the PRCS
- Designate by name, personnel at the site with active roles in confined space entry.
- Document procedures and agreements with local emergency responders.
- Document a site specific procedure for preparing, issuing, using and cancelling entry permits
- Document procedures for concluding entry after operations are complete
- Develop procedures for reviewing PRCS entries and documenting lessons learned
- Establish a policy to review cancelled permits to modify procedures
Confined Space

Restricted Access
Oxygen Deficient Atmospheres

- 19.5% Minimum acceptable oxygen level.
- 15 - 19% Decreased ability to work strenuously. Impair coordination. Early symptoms.
- 12-14% Respiration increases. Poor judgment.
- 10-12% Respiration increases. Lips blue.
- 6-8% 8 minutes - fatal, 6 minutes - 50% fatal, 4-5 minutes - possible recovery.
- 4-6% Coma in 40 seconds. Death
Oxygen Enriched Atmospheres

- Oxygen level above 21%.
- Causes flammable and combustible materials to burn violently when ignited.
- Hair, clothing, materials, etc.
- Oil soaked clothing and materials.
- Never use pure oxygen to ventilate.
- Never store or place compressed tanks in a confined space.
Flammable Atmospheres

- 2 Critical Factors:
  - Oxygen content in the air.
  - Presence of a flammable gas, or vapor
  - Presence of dust (visibility of 5’ or less)

- Proper air/gas mixture can lead to explosion

- Typical Ignition Sources:
  - Sparking or electric tool, Welding / Cutting
  - Smoking
Toxic Atmospheres

- Product stored in a confined space:
  - Gases released when cleaning.
  - Materials absorbed into walls of confined space.
  - Decomposition of materials in the confined space.

- Work performed in a confined space:
  - Welding, cutting, brazing, soldering.
  - Painting, scraping, sanding, degreasing.
  - Sealing, bonding, melting.

- Areas adjacent to a confined space.
Hydrogen Sulfide

- Decomposition of materials. Human waste.
- Rotten egg odor at low concentrations.
- Possibly no warning at high concentrations.

<table>
<thead>
<tr>
<th>PPM</th>
<th>Effect</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 ppm</td>
<td>Permissible Exposure Level</td>
<td>8 Hours</td>
</tr>
<tr>
<td>50 - 100</td>
<td>Mild Irritation - eyes, throat</td>
<td>1 Hour</td>
</tr>
<tr>
<td>200 - 300</td>
<td>Significant Irritation</td>
<td>1 Hour</td>
</tr>
<tr>
<td>500 - 700</td>
<td>Unconsciousness, Death</td>
<td>1/2 - 1 Hour</td>
</tr>
<tr>
<td>&gt;1000</td>
<td>Unconsciousness, Death</td>
<td>Minutes</td>
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</tbody>
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Carbon Monoxide

- Odorless Colorless Gas.
- Combustion By-Product.
- Quickly collapse at high concentrations.

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<thead>
<tr>
<th>PPM</th>
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<tr>
<td>50</td>
<td>Permissible Exposure Level</td>
<td>8 Hours</td>
</tr>
<tr>
<td>200</td>
<td>Slight headache, discomfort</td>
<td>3 Hours</td>
</tr>
<tr>
<td>600</td>
<td>Headache, discomfort</td>
<td>1 Hour</td>
</tr>
<tr>
<td>1000-2000</td>
<td>Confusion, nausea, headache</td>
<td>2 Hours</td>
</tr>
<tr>
<td>1000-2000</td>
<td>Tendency to stagger</td>
<td>1 1/2 Hours</td>
</tr>
<tr>
<td>1000-2000</td>
<td>Slight heart palpitation</td>
<td>30 Min.</td>
</tr>
<tr>
<td>2000-2500</td>
<td>Unconsciousness</td>
<td>30 Min.</td>
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Testing The Atmosphere

- Confined Space Competent Person (CSCP) must verify presence of safe work atmosphere.
- Test all areas of a confined space.
  - Top, Middle, Bottom
- Methane is lighter than air.
- Carbon Monoxide is the same as air.
- Hydrogen Sulfide is heavier than air.
- Oxygen Deficiency.
At a minimum, test the PRCS atmosphere for the following in the order specified:

(a) Oxygen;
(b) Combustible gases and vapors; and
(c) Toxic gases and vapors.

34.A.06.e.(2)
Reasons for Space Ventilation

- Maintain oxygen levels at least 19.5% and below 22% by volume.
- Maintain toxic gases and vapors at acceptable levels.
Ventilation

☐ Required by UFGS on all entries.
☐ To correct problems and maintain safety.
☐ Must be aware of hazards you are trying to correct in the confined space.
☐ Air intake in a safe location to draw fresh air only.
☐ Continuous ventilation with minimum air exchanges.
☐ Retest the confined space before entry.
Types of Personal Protective Equipment

- Harnesses
- Retrieval lines
- Chemical protective clothing
- Welding apron/sleeves
- Respirators
- Gloves
- Safety glasses

PPE necessary in the event that engineering controls and work practices do not adequately protect entrants (does not apply to NPRCS).
All permits shall be signed by each employee entering the confined space, the CSCP, the attendant and the authorized entry supervisor.
PRCS Confined Space

- All confined spaces shall be identified and labeled. The label shall identify the space as a PRCS or NPRCS.
PRCS Training

- Employee Training - Employees entering confined spaces shall be trained to understand the requirements of the facility/site specific confined space program.

34.A.07
Training and Education

- All workers involved; entrants, attendants, and rescue team members.
- Prior to initial work assignment.
- Space’s hazards communicated with each worker during AHA review session.
- Retraining:
  - Job duties change.
  - Change in permit-space program.
  - New hazards are present.
  - Job performance indicates deficiencies.
Standby / Rescue

- Trained in use of emergency rescue equipment and PPE.
- Shall practice making rescue every 12 months.
- Trained similar to entrant training level.
- Provided access to PRCS
- Retrieval system available for depth >5ft.
Standby / Rescue

- Retrieval System – more than 5 feet deep
Standby / Rescue

- Retrieval System – more than 5 feet deep
Most Recent UFGS (01 35 26)
Confined Space Overview

- Provide a competent person for confined space per EM 385-1-1
- Develop a confined space entry plan per EM 385-1-1, 29 CFR 1910, 29 CFR 1915, and 29 CFR 1926, etc.
- Identify the qualified person’s name and qualifications, training, and experience.
- Procedures for rescue by contractor personnel and coordination with emergency responders.
- Post confined space entry permit on bulletin board.
Provide permanent signs integral to or securely attached to access covers of new-permit required spaces.

Follow entry procedures per section 34.A.04.b of EM 385-1-1.

Forced air ventilation for all confined space entry.

Sewer wet-wells require continuous atmosphere monitoring with audible alarm.
Is this a Confined Space?
Are these PRCS Confined Spaces?
Is this trench a Confined Space?
Work Performed in Confined and Enclosed Spaces on Ships and Vessels

The following items applies only to ship and vessel repair and maintenance, not regular sip and vessel activities.
Definitions

- Adjacent spaces are spaces which border an area on a vessel or vessel section such as:
  - Cargo tanks or holds
  - Pump or engine rooms
  - Storage lockers
  - Tanks containing flammable or combustible liquids, gases or solids
  - Crawl spaces in all directions
A Competent Person for Confined Spaces in Ships and Vessels (CPCSSV) is someone who has:

- Knowledge of the designation of spaces where work is done
- Ability to understand and follow through on the air sampling, PPE, and instructions of Marine Chemist, Coast Guard authorized persons, or CIH
What are confined spaces on ships and vessels?

- Compartment of small size and limited access such as bottom tank, cofferdam, or other space which by its small size and confined nature can readily create or aggravate a hazardous exposure.
Summary

- Written confined space procedures are mandatory.
- All confined spaces are considered permit-required confined spaces until testing proves it otherwise.
- Trained personnel
- Rescue equipment
- Notification to the federal fire department