



# Confined Spaces

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To help keep workplaces safe, attention needs to be paid to confined space safety. An average of 90 people lose their lives in a confined space each year — 60% of these fatalities are untrained would-be rescuers. By abiding by OSHA standards, it's possible to prevent 85% of fatalities and nearly 11,000 injuries.

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## What's a Confined Space?

A confined space includes the following criteria:

- Limited openings for entry and exit
- Openings as small as 18 inches in diameter
- Spaces that are difficult to enter with life-saving equipment
- Spaces where exit from larger openings may be difficult due to presence of ladders, hoists, etc.
- The potential for engulfment or entrapment exists.

### 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

### Work performed in a confined space

- Welding, cutting, brazing, soldering
- Painting, scraping, sanding, degreasing
- Sealing, bonding, melting
- Areas adjacent to a confined space
- General maintenance and cleaning

## What's a Permit-Required Confined Space?

A permit-required confined space is one that has one or more of the following characteristics:

- It contains or has potential to contain a hazardous atmosphere.
- It contains material that has the potential of engulfing an entrant.
- It has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross section.
- It contains any other recognized serious safety or health hazard.

### Typical permit-required confined spaces

- Grain bins
- Feed tanks
- Underground tunnels
- Railroad cars
- Chemical storage tanks
- Waste of storage pits

## Hazards of Confined Spaces

There are a number of hazards associated with confined spaces. Most confined spaces are not designed to be entered and worked in on a regular basis, as they are typically designed to store a product, enclose materials or processes, or transport products or substances. Hazards include:

### Immediately Dangerous to Life or Health (IDLH) Atmospheres

- Any condition that poses an immediate threat to the health or life of an entrant
- Would cause irreversible adverse health effects
- Would interfere with an individual's ability to escape unaided from a permit-required space

### Toxic Atmospheres

These environments can also cause injury, illness, or death but may take more time than IDLH atmospheres to do so. Safety concerns include inhalation and skin exposure from:

- Welding and cutting with use of bonding agents
- Cleaning with solvents and use of other chemicals
- Use of gas-powered equipment
- Presence of carbon dioxide
- Hydrogen sulfide

### Oxygen-Deficient Atmospheres

The minimum acceptable oxygen level is 19.5%. Anything less can be detrimental to workers, including inducing coma or death. Therefore, it's important for employers to pay attention, test oxygen levels in their workers and be ready to react to emergency situations.

### Combustible Atmospheres

These have enough oxygen and flammable vapor, gas or dust to ignite and support a fire or explosion if exposed to flames, sparks or heat. Concerns include:

- Oxygen content in the air
- Presence of a flammable gas or vapor, such as:
  - Methane
  - Hydrogen
  - Acetylene
  - Propane
- Gasoline fumes
- Presence of dust (visibility of 5" or less)
- Poor air/gas mixture leading to explosion
- Sparking or electric tools
- Welding or cutting operations

## Safety and Health Hazards

- Lack of air movement in and out of the space can create an environment much different than the outside atmosphere.
- Deadly gases can be trapped inside.
- Sound amplified due to acoustics within the space can damage hearing.
- The worker can be engulfed in flames.
- Injury as of result of improperly locked/tagged out equipment e.g. augers, agitation equipment.
- Electricity.

## Taking Precautions

To protect workers in these situations, OSHA requires confined spaces be entered only by properly trained personnel and rescue personnel be available. The precautions OSHA requires for confined space entry include permit systems be in place and an attendant present whenever someone enters a confined space to do work. Remember: any body part passing through the opening is considered entry.

### Permits should include the following information:

- Space to be entered
- Purpose of the entry
- Date and authorized duration of the permit
- Authorized entrants within the permit space
- Names of attendants
- Name of entry supervisor
- Hazards of the permit space
- Measures used to isolate the permit space
- Measures used to eliminate or control permit space hazards before entry
- Acceptable entry conditions
- Results of initial and periodic testing performed
- Rescue and emergency services
- Communication procedures
- Equipment required
- Other pertinent safety information

### Once permits have been created, a system should be implemented to carry them out:

- Know how to obtain an entry permit — the permits must be available to authorized entrants.
- Entry supervisors are responsible for endorsing the permit and allowing entry to begin work.
- Verify that all required information has been filled in.
- Verify that all necessary equipment is in place.
- Ensure that entry procedures are understood.
- Ensure the permit is not endorsed until everything is ready.
- Post the permit prior to entry.
- The entry supervisor can cancel the permit at any time.
- Keep permits for a period of 12 months after entry.

### In some cases, alternate entry procedures may be used:

- Alternate entry procedures are allowed when the only hazard is a hazardous atmosphere controlled by forced air ventilation.
- Employers must provide documentation of monitoring, inspection and other supporting data.

### Reclassification of spaces occurs when a permit-required confined space can be confirmed as a non-permit confined space:

- The permit space must not have atmospheric hazards.
- All hazards can be eliminated without entry
- Certification must be available to the entrants and contain:
  - Date
  - Location
  - Signature of the person providing the certification

**Proper use of equipment**

Training sessions should include the following topics:

- Testing
- Monitoring
- Ventilation
- Communication
- Personal protection
- Lighting
- Barriers and shields
- Safe ingress/egress
- Emergency and rescue equipment
- Calibration, function, proper use and maintenance of equipment

Workers must be able to demonstrate knowledge and skill in equipment use:

- Authorized entrants must be able to observe monitoring or testing.
- Pre-entry and subsequent testing can be observed.
- Entrants can request a re-evaluation of confined space conditions.
- Entrants must be immediately provided with test results.

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**Responding to Confined Space Emergencies****Evacuation procedures — must occur if the entrant detects:**

- A warning sign or symptom of exposure
- A prohibited condition
- An evacuation alarm

**Rescue and emergency procedures**

- Either an outside rescue service or on-site rescue team can be used.
- Selection of rescue services must be based on ability to respond and perform.
- Rescue teams must be informed of permit space hazards.
- Rescue teams must have access to permit spaces for training.

**Authorized entrants must be provided with retrieval systems**

- Full-body harness
- Retrieval line
- Wristlets

**Coordinating entry with multiple employers**

- Host employers must coordinate entry operations.
- Entry supervisors must determine that entry operations are consistent with the permit.

**Rescue & Retrieval — Priorities and Compliance****Self-Rescue**

- Entrant must know and recognize the hazards for self-evacuation.
- Entrant must know all egress points.
- Entrant must evacuate the space when told to by the attendant.
- Attendant should order evacuation and call for rescue as soon as they realize there may be a problem.

NOTE: If the attendant has to assist the entrant in escaping the space, retrieval rather than self-rescue procedures should be used.

**Retrieval**

- Use a harness and retrieval block for vertical tank entries; use at least a harness and rope for horizontal tank entries.
- Consider how the entrant could get pulled out of the space in an emergency.
- Make sure the attendant knows how to use the retrieval block.
- Think through how the entrant and attendant can communicate in the event of an emergency.
- Use of a harness should depend on whether there is a greater risk to do so or if harness does not contribute to the rescue of the entrant.
- Attachment point has now been changed to allow an upper-chest attachment point, which rescuers often prefer for comfort and convenience.

