



# Confined Space Identification/Overview

Note: This article is intended to provide general information to remind workers of the dangers associated with atmospheric hazards in a confined space and does not take the place of training for entry into a confined space.

## What is Confined Space?

“Confined Space” is 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.

### Confined Space that Requires a Permit

Special testing is necessary to establish the atmosphere in a confined space. One or more of the following conditions makes the space require a permit and training.

- Contains, or has a known potential to contain, a hazardous atmosphere
- Contains material with the potential for engulfment
- Has an internal design that could entrap or asphyxiate the entrant
- Contains any recognized safety of health hazards.

### Examples of Confined Spaces:

- Storage tanks and vessels
- Sewers and manholes

- Underground utility vaults
- Agricultural silos
- Railcar tanks
- Marine vessel storage and fuel tanks
- Tunnels
- Grain elevators
- Manure pits

### Atmospheric Hazards in Confined Spaces

Atmospheric hazards in a confined space are those that expose entrants to a risk such as death, entrapment, injury, or acute illness from one of the following causes:



Special testing of the atmospheric condition are measured before entry is allowed. After entry it is continually monitored until the person that entered returns to the surface.

### Potential Effects of Oxygen Enriched and Deficient Atmospheres

Oxygen Content (% by Volume)	Effects and Symptoms (At Atmospheric Pressure)
>23.5%	Oxygen enriched, extreme fire hazard.
20.90%	Oxygen concentration in normal air.
19.50%	Minimum permissible oxygen level.
15-19%	Decreased ability to work strenuously; may impair coordination and may cause early symptoms for persons of coronary, pulmonary, or circulatory problems.
10-12%	Respiration further increases in rate and depth; poor judgement, blue lips.
8-10%	Mental failure, fainting, unconsciousness, ashen face, nausea, and vomiting.
6-8%	Recovery still possible after four to five minutes. 50% fatal after six minutes. Fatal after eight minutes.
4-6%	Coma in 40 seconds, convulsions, respiration ceases, death.



**OXYGEN** - An atmospheric oxygen concentration below 19.5% (deficiency) or above 23.5% (enrichment).

**COMBUSTIBLE GASES** - A flammable gas or vapor in excess of 10% of its lower explosive limit (LEL) yet still remaining below upper explosive limit (UEL).

- The lowest concentration (air-fuel mixture) at which a gas can ignite is called Lower explosive limit (LEL). Concentrations below this limit are too lean to burn.
- The highest concentration that can be ignited is its upper explosive limit (UEL). Above that concentration, the mixture is too rich to burn.

**TOXIC GASES**

An atmospheric concentration of any toxic containment above the permissible exposure limit established by OSHA, NIOSH, or ACGIH.

**COMBUSTIBLE GAS – Percent by Volume**

For example, the LEL of methane is 5% by volume, the UEL is 15% by volume. When the atmosphere in a confined space reaches 2.5% methane by volume, this is equal to 50% LEL. (5% methane by volume is 100% LEL.) Between 5% and 15% by volume, a spark could cause an explosion.

LEL varies by gas. That is, different gases have different percentages by volume concentration to reach 100% LEL. Some examples are:

- Propane’s LEL is 2.1% by volume
- Pentane’s LEL is 2.1% by volume
- Hexane’s LEL is 1.1% by volume
- Gasoline’s LEL is 1.3% by volume

**Conclusion**

Atmospheric testing is required for two distinct purposes: evaluation of the hazards of the permit space and verification that acceptable conditions exist for entry into that space. Testing, verifying and retesting, must be done by a suitable, trained employee who has received extensive training and has the correct monitoring equipment. No one should enter a confined space without having sufficient training and equipment.

Toxic Gases				
Toxic Gas	TWA	STEL	Ceiling	IDLH
Ammonia	25 ppm	35 ppm		500 ppm
Carbon Monoxide	25 ppm	-----	200 ppm	1,500 ppm
Chlorine	0.5 ppm	1 ppm		30 ppm
Hydrogen Cyanide	-----	-----	4.7 ppm	50 ppm
Hydrogen Sulfide	10 ppm	15 ppm	-----	300 ppm
Nitric Oxide	25 ppm	-----	-----	100 ppm
Supher Dioxide	2 ppm	5 ppm	-----	100 ppm

**NOTE:** TWA is Time Waited Average Exposure  
 STEL is Short Term Exposure Limit  
 Ceiling is the Threshold Limit Value (TLV) Ceiling  
 IDLH is Immediate Danger to Life and Health



*Confined space is at least a two man job. One that goes inside to do the work and another one outside to monitor conditions and be available for rescue if needed.*

**SAFETY TRAINING SIGN-IN SHEET**

Company Name: \_\_\_\_\_ Date: \_\_\_\_\_

Subject: Confined Space - Identification/Overview

The following employees participated in this training:

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