

6. CONFINED SPACE ENTRY

Introduction

The following sections provide general guidelines and procedures for confined space entry. This chapter covers the following topics:

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6.1 Types of Confined Spaces

A confined space is any enclosed area with the following characteristics:

- Limited means of entry or exit
- Structure that is not designed for extended human occupation
- Atmosphere that is actually or potentially hazardous
- Potential for other hazards

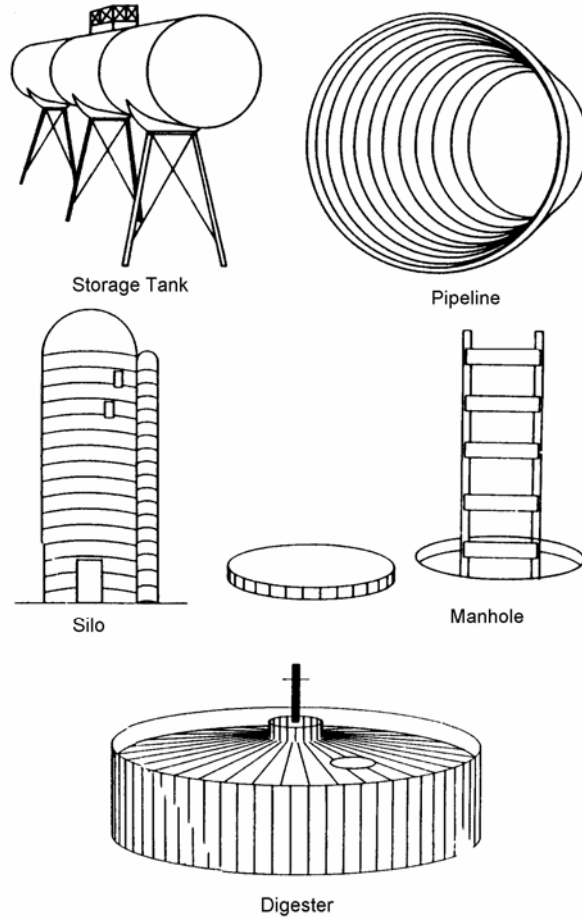
Because confined spaces offer limited means of entry or exit and may contain hazards, employees must comply with 29 CFR 1910.146 and the Texas State University - San Marcos Confined Space Entry Program when working in these areas. The Confined Space Entry Program is available from the Facilities Department.

Most confined spaces are actually or potentially hazardous. These confined spaces require work permits because they have one or more of the following:

- Hazardous atmosphere or the potential to contain hazardous atmosphere
- Materials that could engulf workers
- Internal structure or contents that could trap or asphyxiate employees
- Other recognizable hazards

Examples of confined spaces include the following:

- Manholes
- Crawl spaces
- Tunnels
- Tanks
- Trenches



Types of Confined Spaces

Definitions

- **Confined Space:**
Any enclosed space with limited means of entry or egress, which is not designed for continuous occupation.
- **Permit-Required Confined Space:**
Confined space that contains actually or potentially hazardous atmosphere, or the potential for engulfment by particulate matter or liquid.
- **Entry:**
Physical act of entering a confined space. An entry occurs when a worker's face breaks the plane of the confined space opening.

- **Authorized Entrants:**
Properly trained workers with the authorization to enter confined spaces.
- **Authorized Attendant:**
Properly trained worker who is positioned outside a confined space. This person monitors the entrants within a confined space and the external surroundings.
- **Person Authorizing Entry:**
Worker who is properly trained in administrative, technical, and managerial aspects of confined space entry. This person authorizes entry and has the authority to terminate entry when conditions become unfavorable.
- **Hazardous Atmosphere:**
Atmosphere that is oxygen enriched, oxygen deficient, combustible, toxic, or otherwise immediately dangerous to life or health.
- **Hotwork:**
Operations that could provide a source of ignition, such as riveting, welding, cutting, burning, or heating.

6.2 Employee Responsibilities

All employees and contractors must follow the guidelines in the Texas State University - San Marcos Confined Space Entry Program and other required programs to ensure safe entry into confined spaces.

In addition, Departments and Supervisors are responsible for the following:

- Selecting a person to authorize entry
- Authorizing entrants and attendants, as appropriate
- Providing atmospheric monitoring equipment, personal protective equipment, and other necessary equipment
- Training the people who authorize entry and the people who enter and attend confined spaces

The Facilities Department is responsible for the following:

- Assisting with identifying confined spaces, as necessary
- Assisting with training employees, as appropriate
- Monitoring program compliance

6.3 Safety Procedures

The following sections cover proper procedures and guidelines for safely working within confined spaces.

NOTE:

Electrical manholes and other confined spaces with high voltage electrical hazards are covered by 29 CFR 1910.269. Please refer to the code for more information.

A. Inspecting the Space and Completing the Checklist

Before entering a confined space, evaluate the area and complete a *Confined Space Checklist Form and Entry Document*. A sample form addressing OSHA requirements is included after this section.

To complete the form, determine the following information:

- Identity and location of the confined space
- Purpose for entering the area
- Known and potential hazards
- Required isolation methods (e.g., lockout/tagout)
- Environmental conditions of the confined space
- Atmospheric readings to verify that acceptable environmental conditions are met and maintained
- Rescue services, procedures, and equipment that may be necessary in case of an emergency
- Communication procedures to be used
- Personal protective equipment to be used
- Any additional information relating to the specific circumstances of the confined space
- Names of the following:
 - Person authorizing entry
 - Supervisor
 - Authorized entrants
 - Authorized attendants

IMPORTANT!

If you intend to perform hotwork within the confined space, you must note this on the form

B. Obtaining Entry Permission

Employees must notify the person who authorizes entry before working in confined spaces.

The person who authorizes entry refers to any records on file and identifies the actual or potential hazards of the area in question. If no file exists for the specific space, a new one is developed.

The person who authorizes entry then reviews and approves the entry form as appropriate. A copy of the form is filed for future reference.

CONFINED SPACE CHECKLIST

Date of Entry: _____ Time: _____

Date of Completion: _____ Time: _____

Site Location (Identity): _____

I. PURPOSE OF ENTRY INTO SPACE

II. SITE PREPARATION

- | | |
|--|-----------------|
| 1. Work area isolated with signs/barriers? | Y _____ N _____ |
| 2. All power sources tagged/locked/tried? | Y _____ N _____ |
| 3. All input discharge lines capped/plugged? | Y _____ N _____ |
| 4. Contents drained/flushed/neutralized? | Y _____ N _____ |
| 5. Space cleaned of contaminant/purged? | Y _____ N _____ |
| 6. Space ventilated before entering? | Y _____ N _____ |

III. ATMOSPHERIC TESTING (pre-entry)

1. Has all test equipment been calibrated? Y _____ N _____

	Reading	Time	Initials
2. Oxygen Content:	_____ %	_____	_____
3. Flammable Concentration:	_____ % LEL	_____	_____
4. Toxic Concentration:	_____ PPM	_____	_____
5. Toxic Contaminant:	_____ PEL	_____	_____
6. Temperature Inside Space	_____	_____	_____

IV. EMERGENCY RESCUE PROCEDURES

PHONE 911 () RADIO CHANNEL ()
 PAGE PHONE () # _____

Type of emergency/rescue equipment required:

V. SAFETY EQUIPMENT REQUIRED FOR ENTRY (check those required)

- | | |
|------------------------|-------------------------|
| SCBA () | Protective Clothing () |
| Respirator () | Escape Harness () |
| Fire Extinguisher () | Lifeline () |
| Tripod Escape Unit () | Gloves () |
- Additional requirements:

Portable atmospheric monitor required? Y _____ N _____

VI. HOT WORK

To be Performed Y _____ N _____

Type: _____

ENTRY DOCUMENT

I CERTIFY THAT I HAVE INSPECTED THE WORK AREA FOR SAFETY AND REVIEWED ALL PRECAUTIONS RECORDED ON THE CONFINED SPACE CHECKLIST.

Person Authorizing Entry x _____

Supervisor x _____

Entrant(s) x _____

x _____

x _____

x _____

Attendant(s) x _____

x _____

C. Preparing the Entry Team

Before entering a confined space, all employees involved with the entry must attend a preparation meeting. The agenda for this meeting includes the following:

- Discussion of actual and potential hazards
- Review of emergency procedures including rescue and evacuation
- Completion of the entry form by all team members to acknowledge their understanding of the hazards involved with the confined space
- Issuance of personal protective equipment
- Discussion of site location and other essential information

D. Monitoring the Atmosphere

Due to poor ventilation and physical structure, the atmosphere in confined spaces may be actually or potentially hazardous. Atmospheric hazards include the following:

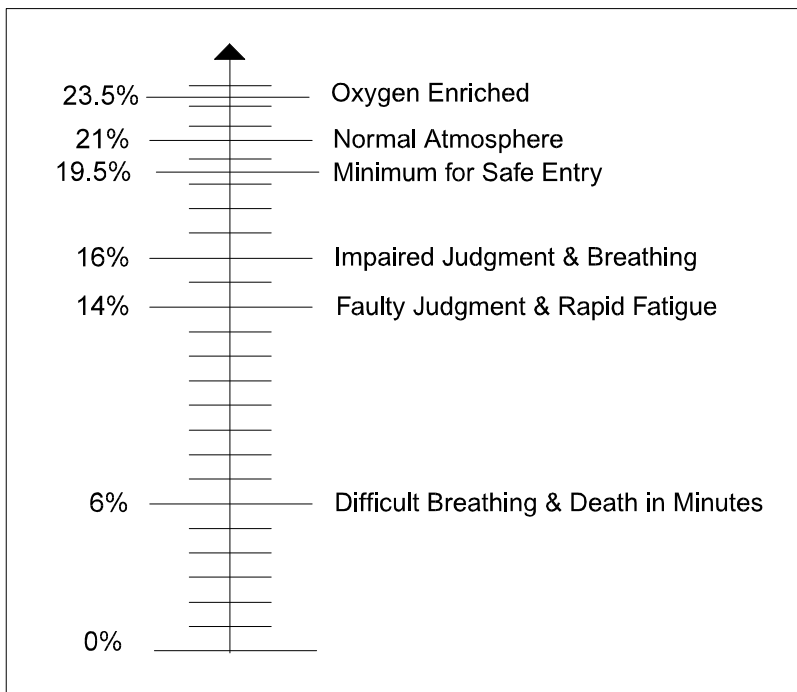
- Oxygen deficient or oxygen enriched atmospheres
- Combustible atmospheres
- Toxic atmospheres
- Any other atmosphere that is immediately dangerous to life or health

Employees trained in atmospheric monitoring will test several points in a confined space for the following:

- Oxygen content
- Combustible atmosphere
- Potential toxic contaminants

OXYGEN ATMOSPHERES

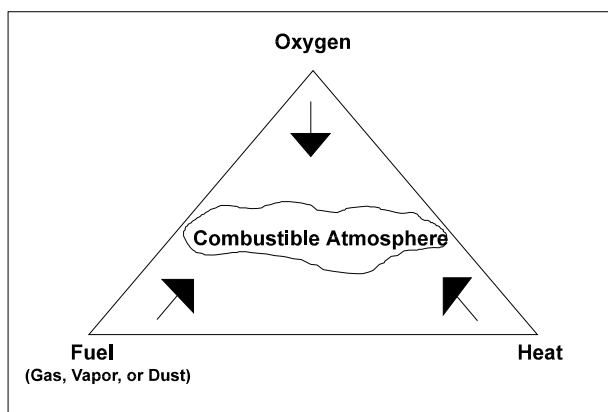
Oxygen enriched atmospheres are more than 23.5% oxygen; oxygen deficient atmospheres are less than 19.5% oxygen. Certain chemical or biological reactions may reduce oxygen over time, but employee operations such as cutting or welding may reduce oxygen content very quickly. Oxygen levels must be tested regularly whenever hotwork is performed within a confined space. The following graph outlines human reaction to various oxygen levels.



Human Reaction to Oxygen Concentrations

COMBUSTIBLE ATMOSPHERES

Combustible atmospheres have enough oxygen and flammable vapor, gas, or dust to ignite and support a fire or explosion if exposed to flames, sparks, or heat. Oxygen-enriched atmospheres and hazardous atmospheres in excess of their lower flammable limits are extremely combustible and dangerous. The following graphic illustrates the relationship between oxygen, heat, and fuel.



TOXIC ATMOSPHERES

Toxic atmospheres can cause injury, illness, or death. Safety concerns include inhalation and skin exposure. If the identity of the toxic atmosphere is known, check all appropriate Material Safety Data Sheets (MSDSs) for threshold limit values and recommended personal protective equipment. If the identity of the toxic atmosphere is not known, use maximum PPE (i.e., SCBA).

E. Ventilation

Ventilation controls the atmospheric hazards of a confined space by replacing unsafe air with clean, breathable air. There are several methods for ventilating a confined space. The method and equipment used depend on the following factors:

- Size of the confined space
- Atmosphere
- Source of the makeup air

For most confined spaces, fans or other air-moving equipment can provide adequate ventilation. Two common types of mechanical ventilation include local exhaust ventilation and general ventilation.

Local exhaust ventilation captures contaminants at their point of origin and removes them. This type of ventilation method is ideal for flammable and toxic materials produced at a single point (e.g., hotwork and work involving cleaning solvents). When using this type of ventilation system, keep the exhaust intake close to your work. Do not use this type of ventilation system for contaminants that are widely dispersed or for confined spaces that make ventilation difficult. Instead, use general ventilation.

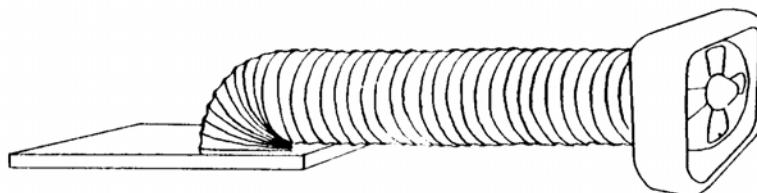
General ventilation flushes the atmosphere by supplying and exhausting large volumes of air. Because this system does not reduce the amount of contaminants released, it is not recommended for highly toxic atmospheres. General ventilation is ideal for providing oxygen and controlling low concentrations of materials that are not highly toxic. When using this type of ventilation system during hotwork, monitor the atmosphere continuously and wear a SCBA, as necessary.

IMPORTANT:

Ventilation alone cannot reduce some atmospheric hazards to safe levels. Use atmospheric testing to confirm whether the ventilation system has been successful.

Follow these guidelines for ventilating confined spaces:

- Begin ventilation in time to assure that the space is safe before entry.
- Test the atmosphere before entry to confirm that the ventilation system is working properly and that the space is safe.
- Continue ventilation as long as the space is occupied, or at least until the oxygen levels and hazardous concentrations are within safe limits.
- If work inside the space can make the air unsafe (e.g., hotwork, painting, using solvents, sandblasting, etc.) continue v



Ventilation System Example

F. Preparing the Site for Entry

Employees must complete the following steps to prepare confined spaces for entry:

1. Isolate the confined space entry site from the surrounding area using guards and barriers (including signs, rope, or tape).
2. Drain, clean, ventilate, and/or purge the confined space, as necessary, to prevent flammable, toxic, and corrosive hazards.
3. Isolate all electrical, mechanical, and pneumatic energy sources as outlined in the Lockout/Tagout section of this manual.
4. Ensure that all workers are wearing appropriate personal protective equipment, and that all persons wearing respirators have been properly trained in their usage.

5. Provide continuous ventilation, as necessary.
6. Ensure that non-sparking tools and explosion proof equipment are used when working in a potentially combustible atmosphere.
7. Position gas cylinders for cutting or burning outside the confined space.
8. Ensure that a standby SCBA is available.
9. Obtain personal protective equipment, including lifelines, winches, and harnesses, as required. Ensure that the equipment has been inspected as scheduled.
10. Take precautions to ensure against engulfment hazards, such as water, dirt, grain, etc.

G. Safeguarding Confined Space Operations

Life support safety is critical during confined space operations. The following items are requirements for safeguarding confined spaces:

- Employees must wear appropriate personal protective equipment at all times.
- Employees must use harnesses, lifelines, and/or winches, as appropriate.

The Authorized Safety Attendant is specifically responsible for the following:

- Keeping a log of all authorized entrants working within the confined space
- Maintaining constant verbal contact with the authorized entrants within a confined space
- Taking necessary precautions and measures to prevent unauthorized persons from entering a confined space
- Initiating evacuation procedures whenever conditions within or outside the confined space pose a new hazard

All employees must evacuate a confined space when one or more of the following conditions occur:

- Authorized Safety Attendant orders evacuation
- Automatic atmospheric alarm sounds
- Authorized entrants believe they are in danger

H. Emergency Procedure

If a worker is unable to evacuate the confined space during an emergency, the Authorized Safety Attendant will contact rescue personnel by radio or other means.

The Authorized Safety Attendant and other workers outside the confined space should attempt to hoist the worker out of the confined space using a lifeline.

IMPORTANT:

Under no circumstances should unauthorized employees enter a confined space during an emergency.

6.4 Trenching and Shoring

Some operations such as trenching result in confined spaces. Shoring systems are necessary to protect these spaces and reduce the chance for cave-ins.

A trench is a narrow excavation below the ground. Trenches are typically deeper than they are wide; however, the width of a trench is less than 15 feet.

A shoring system consists of a structure that supports the sides of an excavation and is designed to prevent cave-ins.

Employees must follow all the requirements associated with confined spaces when working within trenches.