

Confined Space Safety



Employees who work in confined spaces face an increased risk of serious physical injury from hazards such as entrapment, engulfment and hazardous atmospheric conditions. This course will discuss the types of confined spaces an employee may enter and the type of training needed to protect them from the hazardous materials that may exist inside a confined space.

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OSHAcademy Course 605 Study Guide

Confined Space Safety

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This study guide is designed to be reviewed off-line as a tool for preparation to successfully complete OSHAcademy Course 605.

Read each module, answer the quiz questions, and submit the quiz questions online through the course webpage. You can print the post-quiz response screen which will contain the correct answers to the questions.

The final exam will consist of questions developed from the course content and module quizzes.

We hope you enjoy the course and if you have any questions, feel free to email or call:

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Course Introduction

Many workplaces contain spaces that are considered to be “confined” because their configurations hamper the activities of employees who must enter into, work in or exit from them. In many instances, employees who work in confined spaces also face increased risk of exposure to serious physical injury from hazards such as entrapment, engulfment and hazardous atmospheric conditions. Confinement itself may pose entrapment hazards and work in confined spaces may keep employees closer to hazards such as machinery components than they would be otherwise. For example, confinement, limited access and restricted airflow can result in hazardous conditions that would not normally arise in an open workplace.

The terms “permit-required confined space” and “permit space” refer to spaces that meet OSHA’s definition of a “confined space” **and** contain health or safety hazards. For this reason, OSHA requires workers to have a permit to enter these spaces.

The first four modules in this course focuses on confined space in general industry. They will discuss the types of confined spaces an employee may enter and the type of training needed to protect them from the hazardous materials that may exist inside a confined space. The final module switches gears and covers the basics of confined space in the construction industry. For more information on confined spaces in general industry, check out Course 713, and for construction, check out Course 816.

Module 1: Confined Space Basics

OSHA's Confined Space Standard

OSHA's standard for confined spaces (29 CFR 1910.146) contains the requirements for practices and procedures to protect employees in the general industry from the hazards of entering permit spaces.

General industry employers must evaluate their workplaces to determine if spaces are permit spaces.

If a workplace contains permit spaces, the employer must inform exposed employees of their existence, location and the hazards they pose.

This can be done by posting danger signs such as "DANGER-PERMIT-REQUIRED CONFINED SPACE-AUTHORIZED ENTRANTS ONLY" or using an equally effective means. If employees don't need to enter and work in permit spaces, employers must take effective measures to prevent them from entering these spaces. An employer is required to block or securely seal off the confined space so employees cannot enter the area. If employees are expected to enter permit spaces, the employer must develop a written permit space program and make it available to employees or their representatives.

What is a Confined Space?

OSHA's definition of a confined space is a space that:

- is large enough and configured so an employee can enter and perform assigned work;
- has limited or restricted means for entry or exit;
- and, is not designed for continuous employee occupancy.

Permit-Required Confined Spaces (PRCS)

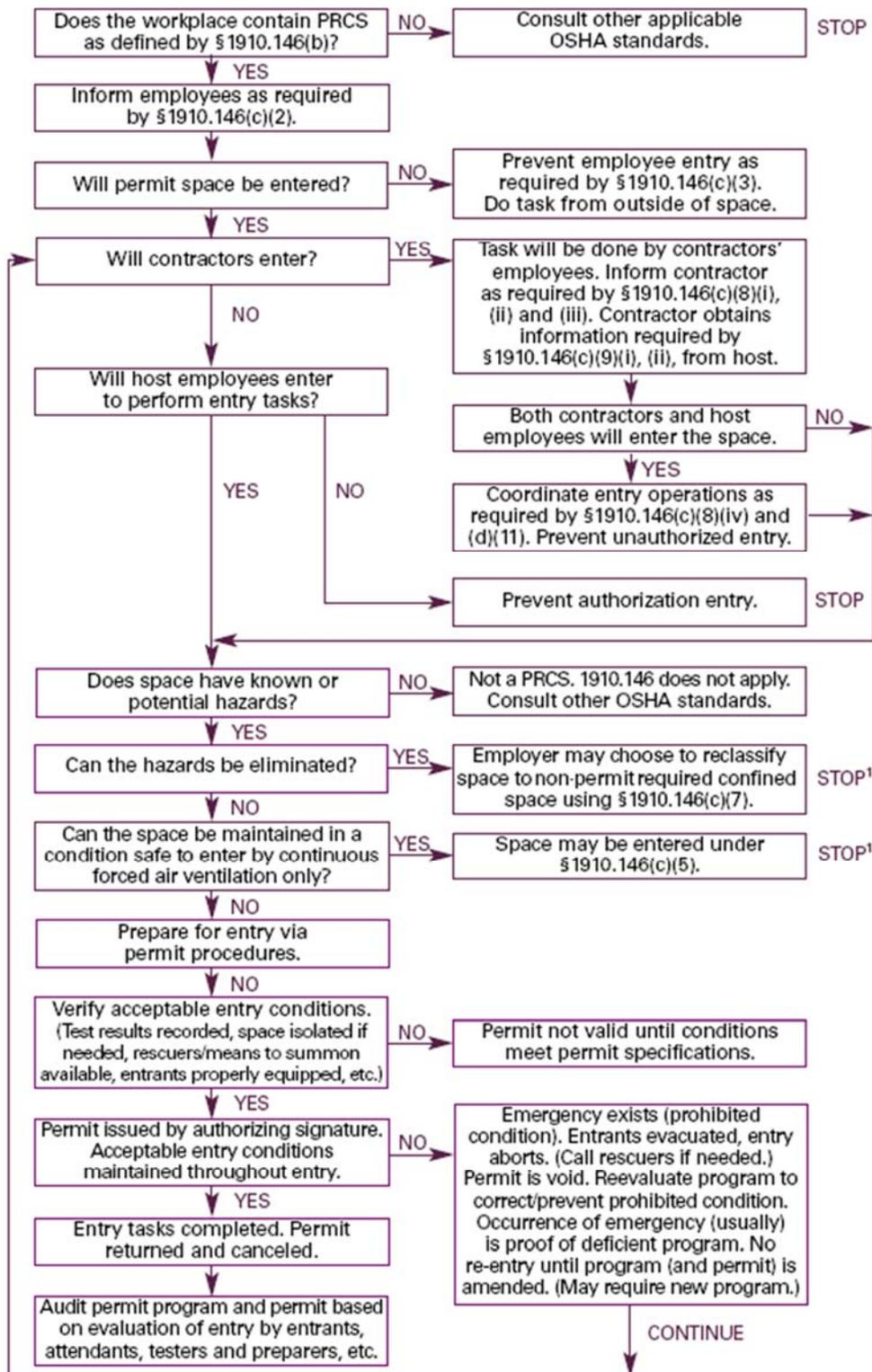
Some confined spaces require a permit to enter. By definition, a permit-required confined space is a space that meets the criteria for a confined space and has one or more of the following characteristics:

1. It contains or has the potential to contain a hazardous atmosphere;
2. It contains a material with the potential to engulf someone who enters the space;

3. It has an internal configuration that might cause an entrant to be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross section; or
4. It contains any other recognized serious safety or health hazards.

OSHA requires employers to determine if a permit is required when entering a confined space. To do that, they can use OSHA's Confined Space Entry Decision Flow Chart below.

Permit-Required Confined Space Decision Flow Chart



¹ Spaces may have to be evacuated and re-evaluated if hazards arise during entry.

Source: 29 CFR 1910.146 Appendix A.

Here are some examples of spaces that usually meet the criteria for confined spaces:

- Tanks
- Manholes
- Boilers
- Furnaces
- Sewers
- Silos
- Hoppers
- Vaults
- Pipes
- Trenches
- Tunnels
- Ducts
- Bins
- Pits

Why Confined Spaces are Hazardous

Confined spaces are deceiving. A confined space often appears to be harmless; no danger signs are apparent and the space may have been entered on prior occasions without incident. However, a worker cannot assume conditions have not changed and the space is safe for entry each time. Some materials may pose an immediate threat to the life and health of the worker entering the space. However, the dangerous materials, such as hydrogen fluoride gas, may cause a sudden or fatal collapse 12-72 hours after exposure. The victim “feels normal” after recovery from transient effects until collapse. Such materials in hazardous quantities are considered to be “immediately” dangerous to life or health.

Below is a list of other hazards that could be encountered while working in a confined space:

- Space configurations such as small openings and inwardly converging walls, which can trap an entrant, restrict easy entry and exit, or impede rescue.
- Atmospheric hazards such as gasoline tank vapors, combined with limited ventilation. Such conditions can cause asphyxiation or explosion.
- Physical hazards, such as unstable grain contained in silos, which can engulf a worker.
- All other serious hazards associated with general industry, such as electrical equipment, moving machinery, falling objects, and wet or slippery surfaces.

Below is a list of potential hazards to be aware of when working in a confined space:

- No ventilation (pits and vaults seldom opened).
- Leaking chlorine gas (which is heavier than air) can accumulate in low-lying spaces.
- Oxygen depletion; which can be caused by:
 - rotting vegetation and decaying dead animals
 - corroding or rusting machinery

Real-Life Accident

A worker suffocated inside of a chemical tank at the Port of New Orleans. The Occupational Safety and Health Administration (OSHA) said the company sent the worker and two others into a tank without first testing the air quality or providing them lifelines. As a result, the worker was killed and the others were hospitalized.

Penalties

OSHA proposed \$226,000 in fines against the company in connection with nine safety violations. Two of the nine proposed violations were classified as "willful," which is the most serious category. This category is reserved for situations where an employer knows of an unsafe condition or practice, but does nothing about it.

Before the worker's death, OSHA cited the company for almost 30 violations. Many of those violations were related to failure to take proper precautions when sending workers into confined spaces filled with dangerous chemicals.

Non-Permit Required Confined Space

This is a confined space that does NOT contain or have the potential to contain any hazard capable of causing death or serious physical harm.

Here are some examples of a non-permit required confined space:

- drop ceiling
- motor control cabinets

Location of Confined Spaces

Confined spaces are found not only in industrial settings but also in public places such as shopping malls and large public swimming pools. Waterfalls and water fountain displays used in malls for beautification may have pump vaults or valve pits that are seldom entered. Some

swimming pool pumps are placed in vaults below ground. There have been reports of maintenance employees entering these areas and losing consciousness.

What is Confined Space "Entry"?

A confined space entry is considered to have occurred when any part of a person's body crosses the plane of an opening into the space. Each employer should ask these two questions at the onset of each project:

1. Is confined space entry always necessary for this task?
2. Is it possible to complete the task from the outside?

If possible, avoid entering a confined space. Every consideration should be given to completing the task from the outside.

Using Alternative Entry Procedures

Under certain conditions, you may use alternate procedures for worker entry into a permit space. For example, if you can demonstrate with monitoring and inspection data that the only hazard is an actual or potential hazardous atmosphere that can be made safe for entry using continuous forced air ventilation, you may be exempted from some entry requirements, such as permits and attendants.

However, even in these circumstances, you must test the internal atmosphere of the space for oxygen content, flammable gases and vapors, and the potential for toxic air contaminants before any employee enters it. You must also provide continuous ventilation and verify that the required measurements are performed before entry.

Module #1 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

- 1. What must an employer do if workers need to enter permit confined spaces?**
 - a. develop a written permit space program
 - b. authorize the entrance
 - c. require workers to enter the confined space with a “buddy”
 - d. enter themselves first

- 2. Which of the following does NOT meet one of the three criteria for a confined space?**
 - a. Tanks
 - b. Manholes
 - c. Vaults
 - d. 55-gallon drum

- 3. Dangerous materials in a confined space may cause a sudden or fatal collapse _____ after exposure.**
 - a. 6 hours
 - b. 12-72 hours
 - c. 5 hours
 - d. the next day

- 4. When does confined space entry occur?**
 - a. When the entire body has entered the confined space
 - b. When the head has crossed the plane of the opening
 - c. When any part of the body crosses the plane of an opening
 - d. When the hatch to the confined space has been opened

5. In which of the following situations may alternative procedures be considered to enter a confined space?

- a. When the only possible hazard is biological and can be controlled
- b. When only an actual or potential hazardous atmosphere exists and successfully removed
- c. If an entry team attendant is continually present
- d. If the entry supervisor deems it safe to do so

Module 2: Confined Space Entry Team

Introduction

Entry into a permit-required confined space is a team effort and it's important that entry team members have the knowledge, skills, and abilities (KSAs) to safely enter and work in the confined space. The entry team is composed of the entrant, the attendant, the entry supervisor, and designated rescue personnel. It is the responsibility of the employer to identify and train entry team members. Line and staff managers should:

- identify and assign entry team members;
- make sure hands-on training of entry team members is completed prior to first entry;
- make sure medical evaluations, fit testing, and respirator training is conducted; and
- ensure entry and rescue teams have adequate personal protective and rescue equipment.

Confined Space Entry Supervisor Responsibilities

The Confined Space Entry Supervisor holds a key position with important responsibilities. This position is in charge of confined space work and should:

- Ensure requirements for entry have been completed before entry is authorized.
- Authorize entry and overseeing entry operations.
- Ensure confined space monitoring is performed by personnel qualified and trained in confined space entry procedures.
- Ensure a list of monitoring equipment and personnel qualified to operate the equipment is maintained by the employer.
- Ensure that the rescue team has simulated a rescue in a confined space within the past twelve months.
- Know the hazards that may be faced during entry, including the mode, signs or symptoms, and consequences of exposure.
- Fill out a permit when it is required.

- Determine the entry requirements and that conditions are acceptable for entry.
- Notify all involved employees of the permit requirements.
- Post the permit in a conspicuous location near the job.
- Renew the permit or have it reissued as needed (a new permit is required every shift).
- Determine the number of attendants required to perform the work.
- Perform duties as the confined space attendant if required.
- Ensure the attendant knows how to communicate with the entrants and how to obtain assistance.
- Ensure measures are in place to keep unauthorized personnel clear of the area.
- Post any required barriers and signs.
- Remain alert to changing conditions that might affect the conditions of the permits (i.e., require additional atmospheric monitoring or changes in personal protective equipment).
- Serve as an attendant, as long as the person is trained and equipped appropriately for that role.
- Change and reissue the permit, or issue a new permit as necessary.
- Ensure periodic atmospheric monitoring is done according to permit requirements.
- Ensure that personnel doing the work and all support personnel adhere to permit requirements.
- Ensure the permit is canceled when the work is done.
- Ensure the confined space is safely closed and all workers are cleared from the area.
- Check the work at least twice a shift to verify and document permit requirements are being observed (more frequent checks should be made if operations or conditions are anticipated that could affect permit requirements).

- Ensure that necessary information on chemical hazards is kept at the work site for the employees or rescue team.
- Ensure a rescue team is available and instructed in their rescue duties (e.g., an on-site team or a prearranged outside rescue service).
- Ensure at least one member of the rescue team has current certification in first aid and CPR.
- Terminate entry procedures as required.

Confined Space Entrant Responsibilities

Employees who are granted permission to enter a confined space should:

- Read and observe the entry permit requirements.
- Stay alert to the hazards that could be encountered in a confined space.
- Use the protective equipment required by the permit.

Confined space entrants must immediately exit the confined space when:

- Attendants order them to do so.
- Automatic alarms sound.
- They perceive they are in danger.
- They notice physiological stresses or changes in themselves or co-workers (e.g., dizziness, blurred vision, shortness of breath).

Confined Space Attendant Responsibilities

The Attendant should be stationed outside the work space and should:

- Be knowledgeable of, and be able to recognize, potential confined space hazards.
- Maintain a sign-in/sign-out log with a count of all persons in the confined space and ensure all entrants sign in/sign-out.

- Monitor surrounding activities to ensure the safety of personnel.
- Maintain effective and continuous communication with personnel during confined space entry, work and exit.
- Order personnel to evacuate the confined space if he/she:
 - observes a condition which is not allowed on the entry permit
 - notices the entrants acting strangely, possibly as a result of exposure to hazardous substances
 - notices a situation outside the confined space which could endanger personnel;
 - notices within the confined space a hazard which has not been previously recognized or taken into consideration
 - must leave his/her work station
 - must focus attention on the rescue of personnel in some other confined space that he/she is monitoring
- Immediately summon the Rescue Team if crew rescue becomes necessary.
- Keep unauthorized persons out of the confined space, order them out, or notify authorized personnel of the unauthorized entry.

Confined Space Rescue Team Responsibilities

The Rescue Team members should:

- Complete a training drill using mannequins or personnel in a simulation of the confined space prior to the issuance of an entry permit for any confined space and at least annually thereafter.
- Respond immediately to rescue calls from the Attendant or any other person recognizing a need for rescue from the confined space.
- In addition to emergency response training, receive the same training as required of the authorized entrants.

- Have current certification in first-aid and CPR.

In the next module, we will go more in-depth about confined space rescues. But first, it's time for your module quiz.

Module #2 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

- 1. The _____ is in charge of authorizing entry and overseeing entry operations at a confined space site.**
 - a. entry supervisor
 - b. entrant
 - c. attendant
 - d. rescue team

- 2. The entrant must stay alert to the hazards in a confined space.**
 - a. True
 - b. False

- 3. The rescue team should respond to rescue calls from the attendant _____.**
 - a. the next day
 - b. as soon as possible
 - c. immediately
 - d. within an hour

- 4. Who must ensure the confined space permit is cancelled when the work is done?**
 - a. Entry supervisor
 - b. Entrant
 - c. Attendant
 - d. Rescue team

- 5. Confined space entrants must immediately exit the confined space when _____.**
 - a. ordered to do so by the attendant
 - b. an alarm sounds
 - c. they perceive they are in danger
 - d. all of the above

Module 3: Confined Space Rescues

Introduction

Two-thirds of all confined space fatalities occur among would-be rescuers. To prevent deaths, it is critical to use good confined space entry practices so there is no need for rescue operations. Remember, even a well-planned rescue can end up as a body retrieval. Rescues can be performed by any employee or a professional rescuer so long as he or she has been fully trained and qualified to act as a rescuer. Qualifications include knowledge of and experience working with all hazards associated with rescue and confined space entry operations.

Before a Rescue Attempt

At a minimum, employers and workers should treat all confined spaces as hazardous. Before entering a confined space to attempt a rescue, a person trained in the proper use of a calibrated, direct-reading instrument must also test for oxygen content, flammable gases and vapors, and potential toxic air contaminants in a confined space. You should never trust your senses to determine if the air in a confined space is safe. You cannot see or smell many toxic gases and vapors, nor can you determine if sufficient oxygen is present.

Employers and workers should also:

- Ensure that adequate atmospheric conditions are maintained in the spaces at all times through proper ventilation.
- In those situations, in which safe atmospheric conditions cannot be maintained, evaluate if entry is absolutely necessary and/or if the work can be completed from outside the confined space. When entry is necessary, the appropriate respirator should be evaluated and worn by workers with thorough training in the use and limitations of respirators.
- Make sure that an attendant is present immediately outside the space in case the person in the space needs assistance, and ensure that an emergency retrieval or rescue method is available. Make sure a safe method of communication is available between the person entering the space and the attendant.
- Exit the space immediately if an unsafe condition develops.
- Ensure that structures are sound (safe) from collapse prior to entering confined spaces.

- Use proper personal protective equipment, which will be determined by the hazards that will be encountered in the confined space.
- Once confined spaces are identified, post warning signs to warn other response personnel, clean-up workers, and the public. When possible, physically block entry.
- Never enter a confined space to attempt an emergency rescue unless you have been trained in safe confined space entry and rescue procedures and have the proper tools and personal protective equipment.

Reasons for Entering Confined Spaces

Entering a confined space may be done for various reasons. It is done usually to perform a necessary function, such as inspection, repair, maintenance (cleaning or painting), or similar operations which would be an infrequent or irregular function of the total industrial activity.

Entry may also be made during new construction. One of the most difficult confined space entries to control is that of unauthorized entry, especially when there are large numbers of workers and trades involved, such as welders, painters, electricians, and safety monitors.

A final and most important reason for entry would be emergency rescue. This, and all other reasons for entry, must be well planned before initial entry is made and the hazards must be thoroughly reviewed.

Since deaths in confined spaces often occur because the atmosphere is oxygen deficient or toxic, confined spaces should be tested prior to entry and continually monitored. More than 60% percent of confined space fatalities occur among would-be rescuers; therefore, a well-designed and properly executed rescue plan is a must.

Fatalities can occur when the rescuers are:

- overcome by their emotions
- taking unnecessary chances
- unknowledgeable about the hazards involved
- lacking a plan of action
- lacking confined space rescue training

It is important to know that the period of time for successful rescue is very limited. Otherwise, a rescue attempt will become body retrieval. After only four minutes without oxygen, it is very likely a worker will experience asphyxiation, which may result in brain damage or death.

Preventing Confined Space Rescuer Fatalities

Planning the rescue is paramount. Make sure rescue team members understand their duties, and practice, practice, practice!

Ensure that the rescuer does not travel a greater distance than allowed by the air supply, self-contained breathing apparatus (SCBA), and escape cylinders. Analyze distance, space configurations, physical obstacles, and total time needed to enter the space, perform rescue operations, and leave the space. Leave the space immediately whenever a problem arises with respiratory protection equipment or whenever the attendant orders evacuation. Everyone involved in a rescue should assume that the space is deadly and that entry rescue may be required in the worst case!

Rescue Equipment

The importance of having the right rescue equipment on hand can't be stressed enough. Rescue equipment may include:

- full body harness with retrieval line attached
- wristlets (may be used in rescue when it can be shown that they are the safest and most effective means of rescue)
- hand-cranked mechanical winch and tripod (required when entrant is five feet or more below the entrance)
- ladder
- explosion-proof lighting
- stretcher
- approved head protection
- first aid equipment

Full Body Harness and Retrieval Lines

All authorized entrants and rescuers entering permit spaces are required to use full body harnesses and retrieval lines, unless it is determined that the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue operation.

Lowering and Lifting Entrants

Only devices designed by the manufacturer and approved for moving humans should be used. The equipment must enable a rescuer to remove the injured employee from the space quickly without injuring the rescuer or further harming the victim.

Respiratory Protection

If there is even a remote possibility of other atmospheric contaminants, even though monitoring equipment readings appear to be within the normal ranges, rescuers should still use appropriate respiratory protection. Play it safe: Do not use air purifying respirators for confined space rescue.

If a hazardous atmosphere exists in the confined space such as toxic gases, an appropriate air-purifying respirator may be used. However, if the confined space has a lack of oxygen, an air-purifying respirator will do no good – there is no supply of oxygen to breath in the first place. In this situation, an entrant would need to wear an air-supplying respirator. An air-supplying respirator will supply breathable air and will protect the entrant from breathing in hazardous air from the atmosphere of the confined space.

Real-Life Scenario

A volunteer fire fighter died after being overcome by low oxygen and sewer gases while climbing down into a sewer manhole to rescue a village utility worker. The utility worker had entered the manhole to investigate a reported sewer problem and was overcome by low oxygen and sewer gases.

The incident occurred behind the fire station in an underground sewer line that ran under the fire station. The local utility company contacted the chief of the village's volunteer fire department and requested that a piece of fire apparatus be moved out of the station so they would not block it in while accessing a manhole.

The fire chief responded to the station to move fire apparatus so it would not be blocked by the utility trucks. The fire fighter arrived at the station to assist. A utility worker entered the manhole behind the station to clear a sewer backup and was overcome by a lack of oxygen and sewer gases and then fell unconscious inside the manhole. The fire fighter then entered the manhole without any personal protective equipment to help the utility worker and was also overcome by the low oxygen level and sewer gases. The fire fighter and the utility worker were later removed from the sewer manhole by fire department personnel and transported to a local hospital where they were pronounced dead.

The medical examiner reported the cause of death as asphyxia due to low oxygen and exposure to sewer gases.

Key Recommendations

- Ensure that workers are properly trained and equipped to recognize the hazards of and participate in a confined space technical rescue operation
- Ensure that standard operating procedures regarding technical rescue capabilities are in place and a risk benefit analysis is performed to protect the safety of all responders
- Ensure that an effective incident management system is in place that supports technical rescue confined space operations
- Ensure that a safety officer properly trained in the technical rescue field being performed is on scene and integrated into the command structure.

Module #3 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

1. _____ of all confined space fatalities occur among would-be rescuers.
 - a. One-half
 - b. Two-thirds
 - c. Three-fourths
 - d. One-tenth

2. What must happen before attempting a confined space rescue?
 - a. test for oxygen content
 - b. ensure adequate atmospheric conditions are maintained at all times
 - c. exit the space immediately if an unsafe condition develops
 - d. all of the above

3. Employers and workers should treat all confined spaces as _____.
 - a. unsafe
 - b. hazardous
 - c. easily accessible
 - d. safe

4. After only _____ without oxygen, a worker will experience _____, which may result in brain damage or death.
 - a. 2 minutes, choking
 - b. 1 minute, lack of oxygen
 - c. 4 minutes, asphyxiation
 - d. 5 minutes, dizziness

5. Rescue equipment includes which of the following?

- a. ladder
- b. partial body harness
- c. helmet
- d. gloves

Module 4: Confined Space Training Requirements

Introduction

It's important the employer provides training so all employees who are required to perform confined space entry operations acquire the understanding, knowledge, and skills necessary for the safe performance of their duties in confined spaces.

The employer must provide training to all employees whose work involves confined spaces to gain the understanding, knowledge, and skills necessary to prepare their work safely.

Training should be provided to each employee who wishes to enter a confined space:

- before the employee starts work
- before there is a change in assigned duties
- whenever there is a change in permit space operations that presents a hazard about which an employee has not previously been trained
- whenever the employer finds changes in the permit space entry procedures
- if there are inadequacies in the employee's knowledge

General Training Topics

All employees who will enter confined spaces must be trained in entry procedures. Personnel responsible for supervising, planning, entering or participating in confined space entry and rescue must be trained in their duties prior to any confined space entry.

Training should include:

- explanation of the general hazards associated with confined spaces
- discussion of specific confined space hazards associated with the facility, location or operation
- reason for, proper use, and limitations of PPE and other safety equipment required for entry into confined spaces;
- explanation of permits and other procedural requirements for conducting a confined space entry

- a clear understanding of what conditions would prohibit entry
- how to respond to emergencies
- duties and responsibilities as a member of the confined space entry team
- description of how to recognize symptoms of overexposure to probable air contaminants in themselves and co-workers as well as methods for alerting attendants

Refresher training should be conducted to maintain employee competence in entry procedures and precautions. If employees do not enter a confined space to perform work for an extended period of time (at least annually); they should be provided an opportunity to practice entry procedures.

Specific Training

Those entry team members who are responsible for monitoring confined space atmospheres should receive training on the proper use of monitoring and testing instruments. Training should include proper use of monitoring instruments such as:

- proper use of the equipment
- knowledge of calibration
- knowledge of sampling strategies and techniques

Training should include the following:

- procedures for summoning rescue or other emergency services
- proper utilization of equipment used for communicating with entry and emergency/rescue personnel

Training for Emergency Response Personnel

Training should include:

- rescue plan and procedures developed for each type of confined space that are anticipated to be encountered
- use of emergency rescue equipment

- first aid and CPR techniques
- work location and confined space configuration to minimize response time

Module #4 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

- 1. Training should be provided to each affected employee after he/she has started work in a confined space.**
 - a. True
 - b. False

- 2. _____ training should be conducted to maintain employee competence in entry procedures and precautions.**
 - a. Refresher
 - b. Annual
 - c. Weekly
 - d. Bi-weekly

- 3. Emergency response personnel training should include which of the following topics?**
 - a. Use of emergency rescue equipment
 - b. First aid and CPR techniques
 - c. Work location to minimize response time
 - d. All of the above

- 4. When should the training be provided to employees who want to enter a confined space?**
 - a. After a change in assigned duties
 - b. Whenever the employer finds changes in the permit space entry procedures
 - c. Whenever there are inadequacies in the employee's knowledge
 - d. Both (b) and (c)

Module 5: Confined Spaces in Construction

As the title of this module indicates, this module covers the basics of confined spaces in the construction industry. The general industry confined space standard does not apply to construction employers and does not specify the appropriate level of employee protection based on the hazards created by construction activities performed in confined spaces. Compared to general industry, the construction industry experiences higher employee turnover rates, with construction employees more often working at multiple worksites performing short-term tasks.

Unlike most general industry worksites, construction worksites are continually evolving, with the number and characteristics of confined spaces changing as work progresses. Multiple contractors and controlling contractors are found more often at construction worksites than at general industry worksites.

Also, in contrast to general industry, OSHA believes many contractors who perform construction work in sewer systems are unfamiliar with the hazards associated with these worksites. Therefore, OSHA's new construction confined space standard places more emphasis in this standard on assessing hazards at sewer worksites than it did in the general industry confined-spaces standard.

New Confined Space Standard

The new standard, [Subpart AA of 29 CFR 1926](#) will help prevent construction workers from being hurt or killed by eliminating and isolating hazards in confined spaces at construction sites similar to the way workers in other industries are already protected.

The standard applies to both new construction within an existing sewer and alterations and/or upgrades. For example:

- installing or upgrading a manhole
- altering or upgrading sewer lines
- making nonstructural upgrades to joints, pipes, or manholes
- demolition work
- installing new or upgraded pump equipment, cables, wires, or junction boxes

The new construction rule requires employers to determine:

- what kinds of spaces their workers are in,
- what hazards could be there,
- how those hazards should be made safe,
- what training workers should receive, and
- how to rescue those workers if anything goes wrong.

If there is a confined space, the employer should determine if there are existing or potential hazards in the space. If there are such hazards, the employer should classify the space according to the physical and atmospheric hazards found in it.

The four classifications are:

- Isolated-Hazard Confined Space
- Controlled-Atmosphere Confined Space
- Permit-Required Confined Space
- Continuous System-Permit-Required Confined Space

Each type of confined space is tailored to control the different types of hazards. You can learn more about the different types of construction confined spaces in [29 CFR 1926.1203 – Definitions](#).

Construction Employer Classifications

The **host employer** owns or manages the property on which construction is taking place.

The **controlling contractor** is the employer that has overall responsibility for construction at the worksite.

If a host employer has overall responsibility for construction at the worksite, then it is both a host employer and controlling contractor.

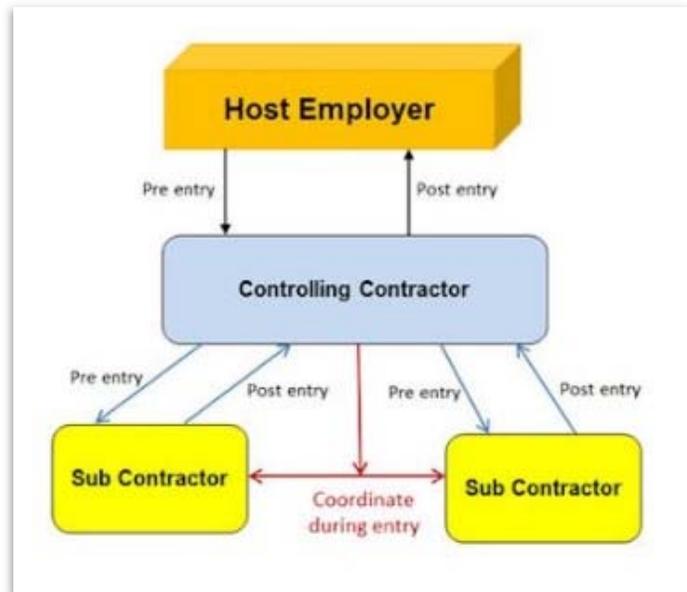
The **subcontractor** is the junior or secondary contractor who contracts with the controlling or “prime” contractor perform some or all of contractual-obligations under the prime contract.

The **entry employer** is usually a subcontractor who directs workers to enter a confined space for work or rescue.

Coordinating Confined Space Entry

The rule makes the controlling contractor, rather than the host employer, the primary point of contact for information about permit spaces at the work site. The host employer must provide information it has about permit spaces at the work site to the controlling contractor, who then passes it on to the employers whose employees will enter the spaces (entry employers).

Likewise, entry employers must give the controlling contractor information about their entry program and hazards they encounter in the space, and the controlling contractor passes that information on to other entry employers and back to the host. As mentioned above, the controlling contractor is also responsible for making sure employers outside a space know not to create hazards in the space, and that entry employers working in a space at the same time do not create hazards for one another's workers.



This diagram shows the information flow and coordination among employers.

Key Requirements

There are 5 key requirements in the new construction rule, and several areas where OSHA has clarified existing requirements. The five new requirements include:

1. There are more detailed provisions that require coordinated activities when there are multiple employers at the worksite. This will ensure hazards are not introduced into a confined space by workers performing tasks outside the space. An example would be a generator running near the entrance of a confined space causing a buildup of carbon monoxide within the space.
2. It requires a competent person to evaluate the work site and identify confined spaces, including permit spaces.
3. It requires continuous atmospheric monitoring whenever possible.

4. It requires continuous monitoring of engulfment hazards. For example, when workers are performing work in a storm sewer, a storm upstream from the workers could cause flash flooding. An electronic sensor or observer posted upstream from the work site could alert workers in the space at the first sign of the hazard, giving the workers time to evacuate the space safely.
5. It allows for the suspension of a permit, instead of cancellation, in the event of changes from the entry conditions list on the permit or an unexpected event requiring evacuation of the space. The space must be returned to the entry conditions listed on the permit before re-entry.

In addition, OSHA has added provisions to the construction rule that clarifies existing requirements in the General Industry standard. These include:

1. Requiring that employers who direct workers to enter a space without using a complete permit system prevent workers' exposure to physical hazards through elimination of the hazard or isolation methods such as lockout/tagout.
2. Requiring that employers who are relying on local emergency services for emergency services arrange for responders to give the employer advance notice if they will be unable to respond for a period of time (because they are responding to another emergency, attending department-wide training, etc.).
3. Requiring employers to provide training in a language and vocabulary that the worker understands.

Crawl Spaces and Attics

Crawl spaces and attics can be both confined spaces and permit-required confined spaces under the new standard. For instance, working in an attic and applying a large amount of spray foam (or another chemical) in a short period of time can expose a worker to low oxygen levels or a hazardous atmosphere.

In addition, changes to the entry/exit, the ease of exit, and air flow could create a confined space or cause the space to become permit-required.

Hazards in Crawl Spaces and Attics

Crawl spaces can present many confined space hazards, including:

- atmospheric hazards (e.g., flammable vapors, low oxygen levels)

- electrocution (e.g., using electrical equipment in wet conditions, unprotected energized wires)
- standing water
- poor lighting
- structural collapse
- asbestos insulation

Working in attics can also present confined space hazards, such as:

- atmospheric hazards (e.g., poor ventilation)
- heat stress
- mechanical hazards (e.g., attic ventilators, whole house fans)
- electrical hazards (e.g., damaged or frayed wires, open electrical boxes)
- slip, trip and fall hazards
- asbestos insulation

Confined Spaces in Pits

Even though a pit is typically open on top and over 4 feet deep, it can still be a confined space or permit-required confined space. Additionally, pits can be completely underground or below grade, such as a utility vault within a sewer system or a pit within a pit in a wastewater treatment plant.

Pits are found in many environments. Examples include:

- sump pits
- valve pits or vaults (e.g., wastewater treatment plants, municipal water systems)
- electrical pits/vaults
- steam pits/vaults

- vehicle service/garage pits
- elevator pits
- dock leveler pits
- industrial chemical waste pits

Many of these spaces qualify as permit-required confined spaces.

Employers must take all necessary steps to keep workers safe in confined spaces, including following the OSHA Construction Confined Spaces standard. This standard applies to both new construction in a pit and alterations and/or upgrades. Among the pit-related tasks covered by the standard are:

- opening or closing valves during renovation work
- installing or upgrading pump equipment, cables, or junction boxes

Construction work can create confined spaces, even if there are none at the start of a project. Changes to the entry/exit, the ease of exit, and air flow could produce a confined space or cause one to become permit-required.

Confined Spaces in Sewer Systems

Types of sewer systems include sanitary (domestic sewage), storm (runoff), and combined (domestic sewage and runoff). Sewer systems are extensive and include many different components that are considered confined spaces, including pipelines, manholes, wet wells, dry well vaults, and lift/pump stations. Therefore, employers conducting work in sewer systems will likely have workers who will encounter confined spaces.

Sewer systems also consist of wastewater treatment plants, where confined spaces include digestion and sedimentation tanks, floating covers over tanks, sodium hypochlorite tanks, and wastewater holding tanks, among others. Many of these components may also qualify as permit-required confined spaces.

Hazards Associated with Sewer Systems

Sewer systems can present a host of confined space hazards, including:

- atmospheric hazards (low oxygen, toxic or flammable gases)

- chemicals in piping and from roadway runoff (may harm lungs, skin, or eyes)
- engulfment and drowning
- electrocution (e.g., using electrical equipment in wet working conditions)
- slips, trips, and falls
- falling objects
- high noise levels, low visibility, limits to communication, and long distances to exits

For more information about hazards in the construction industry read OSHA's [Anatomy of Confined Spaces in Construction](#).

For a more complete discussion of confined space safety, be sure to take [OSHAcademy Course 713, Confined Space Program](#).

Module #5 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

- 1. Who has overall responsibility for construction at the worksite?**
 - a. Worksite supervisor
 - b. Controlling contractor
 - c. Host employer
 - d. Entry employer

- 2. Which of the following should occur in the event of changes from the entry conditions list on the permit or an unexpected event requiring evacuation of the space?**
 - a. The host employer should ensure the confined space is eliminated
 - b. The confined space should be redesigned
 - c. The confined space should be suspended
 - d. The confined space should be designated as dangerous

- 3. Employers should present confined space training in ____.**
 - a. a language the worker understands
 - b. English only
 - c. the local language
 - d. in English with interpreters

- 4. Which of the following hazards is typically NOT found in crawl spaces?**
 - a. Poor lighting
 - b. Fall to lower level
 - c. Heat stress
 - d. Structural collapse

- 5. High level noise is just one hazard in this type of confined space on a construction site?**
- a. Pits
 - b. Sewer systems
 - c. Crawl spaces
 - d. Vaults