

Confined Spaces





Goals: This safety session should teach employees to:

- Know the characteristics and hazards of confined spaces.
- Understand how to follow confined space rules and regulations to protect themselves.

Applicable Regulations: 29 CFR 1910.146



1. OSHA Defines Confined Spaces As Work Areas With Certain Features

- Large enough to enter and work in
- Limited entry and exit areas
- Not designed to be occupied for extended periods
- Examples include: tanks, silos, storage bins, hoppers, vaults, pits, furnaces, tunnels, sewers, pipelines, crawl spaces, process vessels, or underground areas
- Confined space tasks include: cleaning, painting, welding, scraping, performing repairs, or maintenance.
- It becomes a **permit-required confined space** if, in addition, it presents or has the potential for any recognized serious hazard.

2. Employers Must Test Confined Spaces to Determine If They're Hazardous

Failing to identify hazards and take precautions causes thousands of serious injuries, and sometimes deaths, in confined spaces.

Certain hazards create permit-required confined spaces. OSHA allows work only with written permits, entry limits, and specific employee roles and practices in spaces with one or more of the following:

- Hazardous atmosphere, or potential for one
- Material that could potentially engulf a person in the space
- Slanting walls or sloped and tapering floor that could trap or asphyxiate an entrant
- Any other recognized serious safety or health hazard

3. A Confined Space's Atmosphere May Make It Hazardous

Employees could risk death or serious illness, become incapacitated, or have trouble escaping if the confined space's atmosphere contains:

- Levels of flammable gas, vapor, or mist in excess of 10 percent of their lower flammable limits
- Airborne dust levels at or above their flammable limits or permissible exposure limits (PELs) or that prevent visibility of fewer than 5 feet
- Oxygen concentration above 23.5 percent or below 19.5 percent
- Any condition immediately dangerous to life or health that could threaten life, cause irreversible health problems, or make it difficult to escape the space without help

**4. A Confined Space's Atmosphere May Pose Fire, Explosion, and Toxicity Risks**

Anything that could burn or explode (e.g., gasoline, methane, dust) is more likely to do so in a confined space.

- These substances can be ignited by smoking, grinding or welding sparks, unapproved electrical equipment, or metal friction (even from nails in shoes).
- Inhaling toxic substances above their PELs can cause illness, suffocation, or even death (e.g., from carbon monoxide, hydrogen sulfide, or sulfur dioxide).

5. Too Much or Too Little Oxygen Is a Major Confined Space Hazard

- Oxygen levels over 23.5 percent create a serious fire or explosion risk.
- Oxygen levels below 19.5 percent are a dangerous health risk:
 - Sixteen percent can cause drowsiness and nausea; 12 percent, unconsciousness; 6 percent, death.
 - Methane, carbon dioxide, nitrogen, corrosion, or rust can displace oxygen.

6. A Confined Space May Be Hazardous Because of Engulfment Potential

A person could be covered, buried, or smothered in a space that contains a liquid, or a flowing solid such as sand or grain.

7. A Confined Space May Be Hazardous Because of an Entrapping Design

If a space's walls curve in or its floors slope and taper down, you could:

- Slip or fall into a space that is too tight to escape from
- Get pushed into machinery in the space

8. Confined Spaces May Have Physical Hazards

- Heat can build up and create the danger of exhaustion or heat stroke.
- Falls can be fatal if you're trapped with a serious injury, are in a toxic or low oxygen area, or you can't get a foothold on floors or a grip on handholds to get out.
- Noise bounces off walls in a space, making it hard to hear directions or warnings and creating a risk of hearing damage.
- Power equipment creates injury, electrocution, fire, and explosion risks:
 - That's why power is turned off, equipment locked out, and pipes and valves turned off, blocked and bled before spaces are entered.

Discussion Points:

- ! –Ask participants to name hazards of particular confined spaces in your workplace.

Conclusion: Take Confined Space Permits and Precautions Seriously

A hazardous confined space can be deadly unless the testing, entry limits, and safety precautions spelled out on the permit are followed.

Test Your Knowledge

Have your employees take the confined space hazards quiz. By testing their knowledge, you can judge their ability to understand confined space hazards and whether they need to review this important topic again soon.



CONFINED SPACE HAZARDS

Take special work precautions in a confined space that contains one or more of these hazards:



- Flammable gas, vapor, mist, dust, or oxygen levels high enough to cause a fire or explosion
- Toxic gas, vapor, mist, or dust levels high enough to cause illness, suffocation, or death if inhaled
- Oxygen levels below what you need to breathe
- Liquids or flowing solids (e.g., sand or grain) that could cover, bury, or smother
- Entrapping design (e.g., walls that curve in, floors that slope and taper down)
- Heat high enough to cause exhaustion or heat stroke
- Fall potential worsened by damp floors, handholds, and entrapping spaces
- Noise that could damage hearing or make it hard to hear directions or warnings
- Power and equipment injury, electrocution, fire, and explosion potential due to failure to turn off, lock out, block and bleed equipment before entry
- Any condition immediately dangerous to life or health that threatens life, causes irreversible health problems, or makes it hard to escape without help



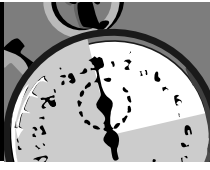
HAZARDS OF CONFINED SPACES QUIZ

1. Which of the following is not listed by OSHA as a feature of a confined space?
 - a. Limited entry and exit areas
 - b. More than 100 feet from a first aid station
 - c. Not designed for extended occupancy periods
2. A confined space atmosphere may be hazardous if flammable gas, vapor, or mist levels top their flammable limits by more than 10 percent.
 - a. True
 - b. False
3. An ignition source like grinding or welding sparks could cause a fire in a confined space.
 - a. True
 - b. False
4. The worst that can happen if you inhale toxic substances in a confined space is:
 - a. Skin irritation
 - b. Suffocation or death
 - c. Dizziness
5. A confined space is hazardous if oxygen levels are below:
 - a. 19.5 percent
 - b. 24.5 percent
 - c. 5 percent
6. You could be smothered or buried in a confined space if it contains liquid or:
 - a. High levels of oxygen
 - b. A damp atmosphere
 - c. Sand, grain, or any flowing solid
7. Entrapping design means a space that's very deep or dark.
 - a. True
 - b. False
8. Heat stroke or heat-related exhaustion is hazardous because it limits your ability to get out of a confined space.
 - a. True
 - b. False
9. Noise is a hazard in confined spaces because you may not be able to:
 - a. Wear earmuffs or other hearing protection
 - b. Hear warnings or directions
 - c. Get out of the space quickly
10. Confined space conditions that could pose a threat to life, cause irreversible health problems, or hinder ability to escape without help are called:
 - a. Immediately dangerous to life or health
 - b. Atmospheric hazards
 - c. Physical hazards

When you have completed this quiz, turn it in to your supervisor.

Name: _____

Date: _____



ANSWERS TO QUIZ

1. b. More than 100 feet from a first aid station.
2. a. True.
3. a. True.
4. b. Suffocation or death.
5. a. 19.5 percent.
6. c. Sand, grain, or any flowing solid.
7. b. False. Entrapping design means a space whose walls curve in or whose floors slope and taper down.
8. a. True.
9. b. Hear warnings or directions.
10. a. Immediately dangerous to life or health.



Goals: This safety session should teach employees to:

- Understand confined space permit program requirements.
- Follow permit-required confined space precautions.

Applicable Regulations: 29 CFR 1910.146



1. OSHA Requires Employers to Test Confined Spaces for Hazards

Confined spaces are tanks, vessels, and similar spaces large enough to work in, but difficult to get in and out of and not designed for continuous occupancy.

- Before a space can be entered, special instruments test for levels of:
 - Oxygen
 - Flammable gases and vapors
 - Toxic air contaminants
- Before employees can enter the space, breathing or fire hazards must be removed or controlled with ventilation, fresh air, flushing or other methods.

2. Hazardous Confined Spaces Require Detailed Precautions

The employer must:

- Develop and use a written permit program
- Create a written permit detailing conditions for working in the space
- Train workers to work safely in and around the space
- Use warnings and barriers to keep unauthorized workers away from the space:

DANGER: PERMIT-REQUIRED CONFINED SPACE—DO NOT ENTER

3. Only Trained, Authorized Workers Can Perform Confined Space Duties

Employee training covers confined space hazards, signs of danger, safe work practices, communication methods, and rescue procedures.

- Authorized entrants are assigned and trained to work in a permit space.
- Attendants are stationed outside the space to maintain contact with and monitor authorized entrants.
- Entry supervisors determine if work conditions and confined space permits allow entry; and they authorize, oversee, and, when appropriate, stop work in the space.

4. Written Confined Space Permits Detail Hazards and Safety Precautions

Before beginning work, authorized entrants and attendants have to read the signed entry permit that must be posted at or near the space entrance. This permit covers:

- Reason for entering the space (e.g., repair work)
- Hazards of the space (e.g., design or shape of space, flammable atmosphere)
- Results of tests performed in the space
- Actions taken to remove or control hazards (e.g., ventilation)
- Acceptable conditions for entering the space



- Permit date and length of time the permit is applicable
- Names of authorized entrants, attendants, and entry supervisors
- Equipment employees must use in or around the space (e.g., communications, rescue, and personal protective equipment)
- Communication methods to be used by workers in and outside the space
- Available rescue procedures and equipment
- Any specific safety precautions and instructions
- Additional permits related to the job (e.g., hot work)

5. Testing and Other Precautions Continue While Space Is Occupied

- An employee cannot enter a space with a hazardous atmosphere.
- Forced air ventilation removes hazards before entry and during work in the space.
- Atmosphere testing continues while the space is occupied.
- Employees must leave the space immediately if tests reveal atmospheric hazards.

6. Rescue and Emergency Services Must Be Available When Employees Enter Permit Spaces

Rescue team members must:

- Be trained in permit space hazards, rescue techniques, basic first aid, and CPR
- Have necessary personal protective equipment and rescue retrieval systems
- Practice confined space rescues at least yearly

Discussion Points:

- ! – Use a confined space entry permit and warning sign to illustrate this training session.
- ! – Ask participants why they think OSHA requires such caution and detail for work in confined spaces.

Conclusion: Read and Follow Confined Space Permit Requirements

Perform work in and around a permit-required space only if you're trained, authorized, and fully informed. Otherwise, obey warning signs and stay away.

Test Your Knowledge



Have your employees take the confined spaces permit requirements quiz. By testing their knowledge, you can judge their ability to understand confined space permit requirements and whether they need to review this important topic again soon.



**A confined space that's
considered hazardous
must have:**

- Testing to identify and evaluate the hazards
- Warning signs and barricades to keep unauthorized employees out
- Ventilation and other methods to remove atmospheric hazards before anyone enters
- A detailed written entry permit, signed by the entry supervisor and posted at or near the entrance to the space

**Confined space entry
permits identify:**

- The space and its hazards
- Results of atmospheric testing in the space
- How space hazards are isolated, removed, or controlled
- Permit date and the length of time the permit is applicable
- Names of authorized entrants, attendants, and entry supervisors
- How employees in the space will communicate with each other and with those outside the space
- Personal protective equipment necessary for working in the space
- Available rescue procedures and equipment
- Any special safety precautions or instructions
- Additional permits required for the job



CONFINED SPACE PERMIT REQUIREMENTS QUIZ

- 1. Confined spaces are tested for hazards before anyone can enter them:**
 - a. True
 - b. False
- 2. There's no way for unauthorized workers to know which confined spaces may be hazardous.**
 - a. True
 - b. False
- 3. Employees trained and authorized to work in and around permit spaces are called:**
 - a. Authorized entrants, attendants, and entry supervisors
 - b. Authorized entrants, communications specialists, and permit supervisors
 - c. Authorized entrants, guards, and supervisors
- 4. A confined space entry permit is posted:**
 - a. At or near the entrance to the building
 - b. At or near areas containing personal protective equipment
 - c. At or near the entrance to the space
- 5. A confined space entry permit contains information that includes:**
 - a. Training schedules for authorized entrants
 - b. Reason for entering the space
 - c. Where to file copies of the permit
- 6. Confined space entry permits are undated and good for an indefinite period of time.**
 - a. True
 - b. False
- 7. Authorized entrants learn about necessary personal protective equipment from the confined space entry permit.**
 - a. True
 - b. False
- 8. Employees can enter a space with a hazardous atmosphere as long as a permit is posted.**
 - a. True
 - b. False
- 9. While employees are working in a space:**
 - a. Instruments continue to test the atmosphere for hazards
 - b. Atmospheric testing equipment is turned off
 - c. Attendants make notes of any hazards identified by testing
- 10. Training for confined space rescue team members must cover:**
 - a. Lockout/tagout procedures
 - b. How to write out a confined space entry permit
 - c. Rescue techniques, first aid, and CPR

When you have completed this quiz, turn it in to your supervisor.

Name: _____

Date: _____



ANSWERS TO CONFINED SPACE REQUIREMENTS QUIZ

1. a. True.
2. b. False. The spaces are barricaded and posted with warning signs.
3. a. Authorized entrants, attendants, and entry supervisors.
4. c. At or near the entrance to the space.
5. b. Reason for entering the space.
6. b. False. They're dated and include length of time the permit applies.
7. a. True.
8. b. False. Employees can enter the space only when tests find the atmosphere is not hazardous.
9. a. Instruments continue to test the atmosphere for hazards.
10. c. Rescue techniques, first aid, and CPR.



Goals: This safety session should teach employees to:

- Understand the different roles and responsibilities associated with work in and around permit-required confined spaces.

Applicable Regulations: 29 CFR 1910.146



1. OSHA Requires Detailed Safety Precautions for Work in Confined Spaces

When employees must enter confined spaces to paint, scrape, perform maintenance, etc., employers must:

- Identify space hazards and remove or control them with ventilation, etc.
- Develop and post a detailed entry permit
- Use barriers and warnings to keep unauthorized employees out of permit spaces
- Determine and maintain safe conditions for entering and working in the space
- Train employees to perform jobs in and around permit spaces

2. Only Trained Employees Can Work in Permit-Required Spaces

Confined Space Tasks Employees are trained to understand and safely perform the jobs of:

- Authorized entrants
- Attendants
- Entry supervisors

3. Authorized Entrants Enter and Work in Permit-Required Spaces

They must be able to:

- Identify the space's hazards and potential consequences, as well as signs and symptoms of exposure
- Properly use any necessary equipment to:
 - Test, monitor, and ventilate the atmosphere in the space
 - Communicate with others working in and outside the space
 - Protect themselves from exposure to dangerous levels of toxins, power, equipment, etc.
- Wear chest or full body harnesses, or, when appropriate, wristlets, to permit rescue
- Stay in constant contact with the attendant to assure fast attention to problems
- Alert the attendant to signs of personal exposure or danger in the space
- Leave the space quickly after identifying a problem or getting a signal or order from the attendant or entry supervisor

**4. Attendants Stand Outside the Space to Monitor and Protect Authorized Entrants**

They must be able to:


- Remain outside the space during entry operations
- Maintain accurate count of authorized entrants in the space
- Identify the space's hazards, exposure consequences, and signs that authorized entrants have been exposed to hazards
- Stay in constant contact with workers in the space
- Monitor activities in and outside the space that could affect entrant safety
- Order entrants to evacuate the space immediately if:
 - Conditions in or outside the space endanger authorized entrants
 - Workers in the space show signs of dangerous exposure
 - The attendant can't safely and effectively perform all his/her duties
- Summon rescue or emergency services or perform permitted non-entry rescues
- Keep unauthorized persons away from the space and alert authorized entrants and entry supervisor if such people enter the permit space

5. Entry Supervisors Take Responsibility for Permits and Safety Procedures

They:

- Identify the space's hazards, consequences, and signs of exposure
- Make sure the entry permit is complete and that:
 - Listed tests and hazard removal/controls have been completed
 - Listed procedures are followed
 - Listed safety, communications, and rescue equipment is in place
 - Rescue services are available
- Sign the permit and allow entry into the space
- Cancel the entry and permit when operations are completed or the permit expires or a dangerous condition arises
- Remove unauthorized individuals from the permit area

Discussion Points:

-  – Ask participants to describe how authorized entrants, attendants, and entry supervisors would work together in the event of a confined space emergency.

Conclusion: All Three Roles Are Essential to Safety

Authorized entrants, attendants, and entry supervisors must know how to perform work safely in permit-required confined spaces.

Test Your Knowledge

Have your employees take the quiz on employee roles in confined space operations. By testing their knowledge, you can judge their ability to understand these roles and whether they need to review this important topic again soon.



WORKING TOGETHER FOR SAFETY IN CONFINED SPACES

Authorized Entrants Work Safely in a Confined Space by:

- Following safety procedures
- Making sure the atmosphere is tested, monitored, and well-ventilated
- Maintaining contact with co-workers and attendants
- Using personal protective equipment, including harnesses and retrieval lines
- Alerting the attendant immediately to hazardous conditions or exposure symptoms
- Evacuating immediately if danger develops or the attendant signals

Attendants Monitor and Help Assure Entrants' Safety by:

- Remaining outside an occupied permit space and knowing who's in it
- Warning unauthorized people to stay away
- Staying in constant contact with authorized entrants
- Ordering entrants to leave the space immediately if they lose contact, show signs of exposure, or face danger from changing conditions
- Alerting needed rescue services and performing permitted non-entry rescues

Entry Supervisors Oversee Safe Operations by:

- Checking that the space has been tested and hazards controlled or eliminated
- Making sure permit-listed communication and safety equipment and rescue services are present
- Signing the permit and allowing entry when all precautions are in place
- Removing unauthorized people from the permit area
- Canceling the permit (and operation) when the job ends or conditions become unsafe

If You're Assigned to Any of These Roles,
You Must Know:

- Permit-required confined space hazards and their consequences
- Signs and symptoms of hazards and dangerous exposures



EMPLOYEE ROLES IN CONFINED SPACES QUIZ

- 1. Before employees can work in permit-required confined spaces, employers must test the atmosphere and remove or control hazards.**
 - a. True b. False
- 2. The employees who enter and work in permit-required confined spaces are:**
 - a. Entry supervisors
 - b. Authorized entrants
 - c. Entry level employees
- 3. All employees involved with confined space entry must know about the spaces:**
 - a. Hazards, hazard consequences, and signs and symptoms of exposure
 - b. Previous uses and history
 - c. Temperature
- 4. One responsibility of authorized entrants is to:**
 - a. Fill out confined space permits
 - b. Stay in constant contact with attendants
 - c. Practice rescuing other entrants from confined spaces
- 5. Authorized entrants wear harnesses with retrieval lines to permit rescue if they get in trouble.**
 - a. True b. False
- 6. Attendants decide if and when entrants need to evacuate quickly from a confined space.**
 - a. True b. False
- 7. Attendants can enter the space only to check on or rescue authorized entrants.**
 - a. True b. False
- 8. Entry supervisors' responsibilities include:**
 - a. Rescuing entrants from the space
 - b. Training authorized entrants
 - c. Signing entry permits and allowing entry into the space
- 9. An authorized entrant may remove unauthorized people from the permit area.**
 - a. True b. False
- 10. All three roles are essential to safe operations in permit-required confined spaces.**
 - a. True b. False

When you have completed this quiz, turn it in to your supervisor.

Name: _____

Date: _____



ANSWERS TO EMPLOYEE ROLES IN CONFINED SPACES QUIZ

1. a. True.
2. b. Authorized entrants
3. a. Hazards, hazard consequences, and signs and symptoms of exposure
4. b. Stay in constant contact with attendants
5. a. True.
6. a. True.
7. b. False. They never enter the space; if entry rescue is needed, they alert the rescue team.
8. c. Signing entry permits and allowing entry into the space
9. b. False. An entry supervisor removes unauthorized people; an attendant may warn them to leave the area.
10. a. True.