



OSHA Permit-Required Confined Space Standard, 29 CFR 1910.146

Introduction

This document has been developed to ensure the safety of personnel required to enter and conduct work in confined spaces. The program describes policies and procedures for any and all facilities, departments, and individuals who are associated with confined space operations. This program and all parts of 29 CFR 1910.146 shall apply to all confined space entry operations conducted on Nashville State Community College grounds. A site-specific program may be used, providing it meets or exceeds the requirements set forth in this policy.

Contents of This Document

1. Identifying Confined Spaces

Department Heads or their designated representatives should determine if any personnel under their supervision are required to enter or conduct work in confined spaces as defined in this section.

2. Identifying Confined Space Hazards

this section gives information on the types of hazards that may be present in a confined space. It should be reviewed whenever the hazards of a confined space are being evaluated.

3. Conducting a Confined Space Entry

If it is determined that department personnel are required to perform duties in confined spaces, the program outlined in The Permit System should be implemented.

4. Responsibilities and Training Requirements

This section lists the responsibilities and training requirements of each individual involved in a confined space entry.

Part 1: Identifying Confined Spaces

Recognition is an important aspect of making a safe entry into a confined space. All confined spaces located within a facility or under the facility's control should be identified. Once the space has been identified as confined, the Environmental Health and Safety Department shall determine if a permit is required. All employees shall be made aware of these confined spaces through training or instruction provided by their supervisor or designated representative. Assistance in this training shall be provided by EHS. All employees shall be instructed by their supervisor or designated representative that entry into a confined space is prohibited without an authorized permit. To clarify what constitutes a Confined Space, is any space that has the following characteristics:

1. It is large enough or so configured that an employee can bodily enter and perform assigned work.
2. It has limited or restricted means for entry or exit.

Confined-space openings are limited primarily by size and location. Openings may be small in size and may be difficult to move through easily. However, in some cases openings may be very large; for example, open-topped spaces such as pits or excavations. Entrance and exit may be required from top, bottom, or side. In some cases, having to access the work area by a fixed

ladder may constitute limited or restricted entry or exit. Size or location will generally make rescue efforts difficult.

3. It is not designed for continuous employee occupancy.
Most confined spaces are not designed for employees to enter and work on a routine basis. They may be designed to store a product, enclose materials and processes, or transport products or substances. Because they are not designed for continuous occupancy, frequently they will not have good ventilation or lighting. Therefore, occasional employee entry for inspection, maintenance, repair, cleanup, or similar tasks, can be difficult and dangerous. The danger associated with entry may come from chemical or physical hazards within the space.

Not all confined spaces will be considered permit-required confined spaces, and being able to identify the difference between the two is important.

Non-Permit Confined Space: Does not contain any hazard capable of causing death or serious physical harm. Examples of non-permit required confined spaces might include the interiors of HVAC units, certain air plenums and pipe chases, attics, walk-in freezers or refrigerators, and some building crawl spaces.

Permit-Required Confined Space: A space that is potentially hazardous. A permit-required confined space has one or more of the following characteristics:

1. Contains or has a potential to contain a hazardous atmosphere.
2. Contains a material that has the potential for engulfing an entrant.
3. 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; or
4. Contains any other recognized serious safety or health hazard. Examples of serious safety or health hazards might include:
 - Fall hazards
 - Unguarded machinery
 - Extreme heat or cold
 - Steam pipes or chemical lines
 - Hazardous noise levels
 - Electrical hazards
 - Presence of asbestos
 - Potentially hazardous levels of dust

Because of the lack of ventilation in most confined spaces, they will have the potential for a hazardous atmosphere. Therefore, they must be designated "permit-required," and the procedures for making entry into a permit-required space must be followed. Examples of permit-required confined spaces include sewers, electrical vaults, steam tunnels, sump pits, certain mechanical rooms, some excavations, and other types of enclosures. Any space that is accessed by lifting a manhole cover shall be considered a permit-required confined space.

Supervisors are directly responsible for ensuring the safety of their employees in regards to confined spaces. It is their responsibility to evaluate potentially hazardous spaces within their facilities and areas to ensure that the proper precautions are taken for safety. This includes clearly marking permit-required confined spaces, training employees, and ensuring proper entry procedures are followed. These responsibilities may be delegated to another competent person provided he/she is qualified.

Identifying Confined Space Hazards

Once a space has been identified as confined, the hazards that may be present within the confined space must be identified. Confined-space hazards can be grouped into the following categories:

1. Oxygen-deficient atmospheres
2. Flammable atmospheres
3. Toxic atmospheres
4. Mechanical and physical hazards

Oxygen-Deficient Atmospheres

The normal atmosphere is composed of 21% oxygen and 79% nitrogen. An atmosphere containing less than 19.5% oxygen shall be considered oxygen-deficient. The oxygen level inside a confined space may be decreased as the result of either consumption or displacement.

Flammable Atmospheres

Flammable atmospheres are generally the result of flammable gases, vapors, dust mixed in certain concentrations with air, or an oxygen-enriched atmosphere. Oxygen-enriched atmospheres are those atmospheres that contain an oxygen concentration greater than 22%. An oxygen-enriched atmosphere will cause flammable materials such as clothing and hair to burn violently when ignited. Combustible gases or vapors can accumulate within a confined space when there is inadequate ventilation. Gases that are heavier than air will accumulate in the lower levels of a confined space. Therefore, it is especially important that atmospheric tests be conducted near the bottom of all confined spaces.

The work being conducted in a confined space can generate a flammable atmosphere. Work such as spray painting, coating, or the use of flammable solvents for cleaning can result in the formation of an explosive atmosphere. Welding or cutting with oxyacetylene equipment can also be the cause of an explosion in a confined space and shall not be allowed without a hot work permit. Oxygen and acetylene hoses may have small leaks in them that could generate an explosive atmosphere and, therefore, should be removed when not in use. The atmosphere shall be tested continuously while *any* hot work is being conducted within the confined space.

Toxic atmosphere

When a product is stored in a confined space, the product can be absorbed by the walls and give off toxic vapors when removed or when cleaning the residual material. The product can also produce toxic vapors that will remain in the atmosphere due to poor ventilation.

Toxic atmospheres can be generated as the result of work being conducted inside the confined space. Examples of such work include: Welding or brazing with metals capable of producing toxic vapors, painting, scraping, sanding, etc. Many of the solvents used for cleaning and/or degreasing produce highly toxic vapors.

Mechanical and Physical Hazards

Problems such as rotating or moving mechanical parts or energy sources can create hazards within a confined space. All rotating or moving equipment such as pumps, process lines, and electrical sources within a confined space must be identified. Physical factors such as heat, cold, noise, vibration, and fatigue can contribute to accidents.

Conducting a Confined Space Entry

When a confined space must be entered, a permit shall be completed and authorized by department heads, supervisors, or their designated representatives prior to entry of the confined space. This permit shall serve as certification that the space is safe for entry. The permit shall contain the date, the location of the

space, and the signature of the person providing the permit. A permit shall not be authorized until all conditions of the permit have been met. Supervisors or their designated representatives shall instruct all employees to list their names on the authorized permit before they will be allowed to enter a confined space.

Plan the Entry

The first step towards conducting a safe confined-space entry is to plan the entry. This will allow for the identification of all hazards and for the determination of all equipment necessary to complete the project.

1. Gather general data:
 - a) Identify the confined space. Give the name or location of the confined space.
 - b) Give the reason for entering the confined space. Be specific. Also, identify if hot work will be done.
 - c) Identify the contents of the confined space. This refers to any chemicals or other materials and energy that are usually present in the confined space.

2. Identify the Hazards

NOTE: Atmospheric testing shall be conducted prior to entering permit-required confined spaces. It is recommended that the entry supervisor conduct these tests; however, any competent person certified in confined space entry may do so.

- a) The entry supervisor will determine the oxygen content and record this on the entry permit.
- b) The entry supervisor will determine flammable gas content and record this on the entry permit.
- c) The entry supervisor will determine levels of H₂S and Carbon Monoxide and record this on the entry permit.
- d) If a toxic substance is determined to be in the confined space during testing by the entry supervisor, Environmental Health & Safety shall be contacted to assist in obtaining a Material Safety Data Sheet or other chemical information to determine what type of personal protective equipment is required, the potential health effects, the Permissible Exposure Limits, and any other information needed to safely conduct the work.
- e) Entry supervisors will determine mechanical and physical hazards. They should list all items and energy that will require lockout/tagout, blanking and bleeding, disconnecting, or securing. Physical hazards should also be listed.

3. Ventilate the Confined Space

Indicate whether mechanical or natural ventilation will be used. Describe the procedures to be used.

NOTE: If mechanical ventilation is to be used, the exhaust must be pointed away from personnel or ignition sources. Also, mechanical ventilators should be bonded to the confined space.

4. Isolate the Confined Space

Describe the procedures for disconnecting equipment or lockout and tagout. All mechanical, electrical, or heat-producing equipment should be disconnected or locked and tagged out. This would also include any pumps that pull fluid from, or pump fluid into, the confined space.

5. Purge/Clean the Confined Space

Indicate if the confined space will be purged. Purging with inert gas is not recommended. If the space must be purged, describe the procedures.

Indicate the type of cleaning methods to be used. If chemical cleaners are to be used, name the type and describe the procedures. The MSDS for the chemical should be consulted prior to use.

NOTE: When introducing a chemical into a confined space, the compatibility of that chemical with the contents of the confined space must be checked. If in doubt, consult Environmental Health & Safety. If steam is to be used, the hose should be bonded to the confined space.

6. Place Warning Signs
Indicate if warning signs or barriers will be needed to prevent unauthorized entry or to protect workers from external hazards. If the confined space will be left open and unattended for any length of time, warning signs, and barriers such as barricades and/or caution tape will be required.
7. Identify All Personnel
List all employees that will be required to prepare the confined space and complete the work inside the space.
8. Identify Necessary Equipment
List all equipment that will be necessary to complete the project.
Where practical, all personnel entering a confined space should be equipped with a retrieval line secured at one end to the entrant by a full-body harness with its other end secured to a tripod lifting hoist.

B. Conduct Pre-Entry Training

Once the entry has been planned, supervisors or their designated representatives must train all employees who will be involved in the entry. The training should be conducted no earlier than one day before entry is to be made following the procedure outlined below.

1. Identify the confined space, the reason(s) for entry, and the work detail.
 - a) Assign each employee the job(s) he/she is to perform in the entry project (entrant, standby person, etc.).
 - b) If an employee is required to use a piece of equipment, be sure that he/she is capable of using the equipment properly.
 - c) Inform all personnel that no one is to enter the confined space unless the attendant is present at the work site
2. Inform entrants of all known and/or suspected hazards
 - a) Inform personnel of any access or exit problems.
 - b) Inform personnel of all equipment that must be locked out or tagged out.
 - c) Inform personnel of the contents of the confined space.
 - d) Inform personnel of all atmospheric levels that must be maintained before entering and while working in the confined space.
If a toxic atmosphere or substance is present or could become present, the following additional training must be completed:
 - e) If respiratory protection is not going to be used, inform personnel of the maximum permissible exposure level (PEL) that can exist within the confined space, and the method used to monitor PEL.
 - f) Inform personnel of the potential health effects of exposure to the toxic atmosphere or substance.
 - g) Inform personnel of the signs and symptoms of exposure to the toxic fume.
 - h) Inform personnel of the personal protective equipment (PPE) that they will be required to wear.
 - i) If entrants are unaware of the proper use of the PPE, they must be trained in the proper use of this equipment.

NOTE: Supervisors may request assistance from Environmental Health & Safety in providing the above-mentioned training.

- j) Persons should not be assigned to tasks requiring use of respirators unless it has been determined that they are physically able to perform the work and use the equipment. A local physician shall determine what health and physical conditions are pertinent. The respirator user's medical status should be reviewed periodically (annually).
3. Identify Isolation Procedures
 - a) Inform the personnel responsible for the lockout/tagout of all equipment that must be isolated.
 - b) Inform the personnel responsible for performing this function of the methods to be used.
 4. Identify Purging and/or Ventilation Procedures
inform all personnel responsible for performing this function of the methods to be used.
 5. Identify All Equipment Needed
 - a. Inform personnel involved in the project of all equipment that will be necessary to complete the project.
 - b. Make sure that all employees are capable of using their assigned equipment properly.
 - c. Determine Necessary Personal Protective Equipment
 - d. Inform personnel of all PPE that must be used to ensure their safety.
 - e. Make sure that all personnel required to use PPE are trained in the proper use of the equipment.
 6. Protect from External Hazards
Inform personnel where signs and barriers will be placed to prevent unauthorized entry and protect entrants from external hazards.
 7. Pre-Plan Rescue Procedures
 - a) The designated attendant(s) should be informed of the rescue procedures to be followed.
 - b) The attendant should be informed that he/she can have no other duty but to maintain contact with personnel inside the confined space.
 - c) Inform the attendant(s) that they must not enter the confined space under any circumstances.
 8. Placing the Confined Space Back Into Service
Inform personnel of the steps to be taken to place the confined space back into service.

C. Preparing the Confined Space for Entry

Once the entry has been planned and personnel have been trained, the next step is to prepare the confined space for entry.

The following steps are to be followed when preparing the confined space for entry:

1. Place warning signs or barriers around the confined space to prevent unauthorized entry as necessary.
2. Place all tools, safety equipment, monitoring equipment, etc., near the confined space.
3. Isolate all mechanical and/or electrical hazards as necessary.

4. Purge/ventilate the confined space as necessary.
5. Test the atmosphere using an appropriate gas monitor.
 - a) If oxygen content is less than 19.5% or greater than 21.5%, perform additional ventilation. Then shut off ventilation equipment and re-test the oxygen content.
 - b) If oxygen content is between 19.5% and 21.5%, continue entry preparation.
6. Test for flammable gases.
 - a) If the meter reading is less than 10% of the lower explosive limit (LEL), continue entry preparations.
 - b) If the meter reading is above 10% of the LEL, continue ventilation of the confined space. Then shut off the ventilation and have the atmosphere re- tested.
 - c) If the meter reading is still above 10% of the LEL, the confined space must be cleaned before entry is permitted. If the confined space must be entered for cleaning purposes, the procedures outlined in Item 9 of this section must be followed.
7. Test for toxics (If a toxic atmosphere is present, no person should be permitted to enter the confined space at a level exceeding the Permissible Exposure Limit without proper Personal Protective Equipment. Environmental Health & Safety should be called to assist in identifying proper precautions and the protective measures to be taken.
8. Assemble all personnel involved and review rescue procedures. The entry supervisor will then add any needed information, then complete and sign the permit.
9. Notify Department Head or supervisor that entry is commencing. If Department Head or supervisor is unavailable, notify EHS Department.

Part 4. Personnel Responsibilities and Training

Everyone involved in a confined-space entry project has certain responsibilities and requires a certain amount of training. It is very important that every individual is familiar with his/her responsibilities. This section outlines the responsibilities and training requirements of each individual involved in a project.

Environmental Health & Safety Engineer or his/her designated representative shall be responsible for the following:

1. Reviewing and updating the Confined Space Entry Program to conform to current standards.
2. Ensuring compliance with standards set forth in the program by periodic inspection of entry sites and canceling permits where unsafe conditions are present.
3. Assisting Supervisors with:
 - a) providing training as set forth in the program,
 - b) identification of confined spaces,
 - c) identifying spaces that require a permit for entry,
 - d) labelling Permit-Required Confined Spaces.
4. Performing a single annual review covering all entries performed during a 12-month period to ensure employees participating in entry operations are protected from permit space hazards.

Supervisors or their Designated Representatives are responsible for:

1. Identifying confined spaces within facilities or areas under their control.

2. Identifying hazards within a confined space under their control.
3. Documenting that all training requirements for a specific confined space entry have been met by signing the pre- entry authorization space on the entry permit.

Entry Supervisors shall be responsible for the following:

1. Ensuring that the required atmospheric tests are performed at the confined space and results recorded on the permit prior to entry authorization.
2. Obtaining and maintaining all equipment necessary to complete the confined-space entry project.
3. Authorizing entry by signing the Entry Authorization space on the entry permit after all conditions for a safe entry have been met.
4. Terminating the entry and canceling the permit when:
 - a) Entry operations covered by the entry permit have been completed.
 - b) A condition that is not allowed under the entry permit arises in or near the permit space.
5. Determining, whenever responsibility for a permit space entry operation is transferred, and at intervals dictated by the hazards and operations performed within the space, that entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained.

Authorized Entrants are Responsible for and shall receive training in the Following:

1. The knowledge of hazards that may be faced during entry, including the mode, signs or symptoms, and consequences of the exposure.
2. Proper use of equipment, which includes:
 - a. Atmospheric testing and monitoring equipment.
 - b. Ventilating equipment needed to obtain acceptable entry conditions.
 - c. Communication equipment necessary to maintain contact with the attendant.
 - d. Personal protective equipment as needed.
 - e. Lighting equipment as needed.
 - f. Barriers and shields as needed.
 - g. Equipment, such as ladders, needed for safe ingress and egress.
 - h. Rescue and emergency equipment as needed.
 - i. Any other equipment necessary for safe entry into and rescue from permit spaces.
3. Communication with the attendant as necessary to enable the attendant to monitor entrant status and to enable the attendant to alert entrants of the need to evacuate the space if required.
4. Alert the attendant (standby person) whenever:
 - a) The entrant recognizes any warning sign or symptom of exposure to a dangerous situation, or
 - b) The entrant detects a prohibited condition.
5. Exiting the permit space as quickly as possible whenever:
 - a) An order to evacuate has been given by the attendant or the entry supervisor;
 - b) The entrant recognizes any warning sign or symptom of exposure to a dangerous situation;
 - c) The entrant detects a prohibited condition; or

d) An evacuation alarm is activated.

Persons authorized to perform duties as attendant shall be responsible for and receive training in the following:

1. Knowing the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of exposure.
2. Awareness of possible behavioral effects of hazard exposure in authorized entrants.
3. Continuously maintaining an accurate count of authorized entrants in the permit space and ensuring that the means used to identify authorized entrants accurately identifies who is in the permit space.
4. Remains outside the permit space during entry operations until relieved by another attendant.
5. Attempting non-entry rescue if proper equipment is in place and the rescue attempt will not present further hazards to the entrant or attendant.
6. Communicating with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the space when conditions warrant.
- a) Monitoring activities inside and outside the space to determine if it is safe for entrants to remain in the space and ordering the authorized entrants to evacuate the permit space immediately under any of the following conditions:
 - a) If the attendant detects a prohibited condition.
 - b) If the attendant detects the behavioral effects of hazard exposure in an authorized entrant.
 - c) If the attendant detects a situation outside the space that could endanger the authorized entrants.
 - d) If the attendant cannot effectively and safely perform all the duties required by this program.
7. Summoning rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from permit space hazards.
8. Taking the following actions when unauthorized persons approach or enter a permit space while entry is underway:
 - a) Warning the unauthorized persons that they must stay away from the permit space.
 - b) Advising the unauthorized persons that they must exit immediately if they have entered the permit space.
 - c) Informing the authorized entrants and the entry supervisor if unauthorized persons have entered the permit space.
9. Performing no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants.