

## SAFETY IN CONFINED SPACE ENTRY

Occupational Safety and Health Administrations (OSHA) Permit - Required Confined Spaces Standard (29 CFR 1910.146) requires employers to identify all confined spaces that could endanger employees and establish procedures to prevent unauthorized personnel from entering these spaces. The regulation also requires a written entry permit/procedures system. OSHA estimates that exposure to permit space hazards causes 60 fatalities and 12,000 injuries and illnesses annually. Compliance with the standard is expected to reduce the risk of such hazards by 85 percent. This is a significant reduction to the 1.6 million employees who enter such spaces annually.

In defining a permit-required confined space, the standard lists the following characteristics:

1. The space must be large enough and configured so that an employee can enter and perform assigned work.
2. The space must have limited or restricted means for entry or exit.
3. It is not designed for continuous employee occupancy.
4. It contains one or more of the following hazards:
  - A. The potential to allow a hazardous atmosphere.
  - B. A material with the potential of engulfing the person entering the confined space.
  - C. An internal configuration involving inwardly converging walls or a floor that slopes downward or tapers to a small cross-section, which could trap or asphyxiate the person entering the confined space.
  - D. Any other recognized, serious safety and/or health hazards.

Examples of some confined space areas include boilers, process vessels, silos, vats, bins, pits, sewers, tanks, and vaults. You are required to identify all confined spaces in your workplace and to block access into these areas until the confined space entry program and training requirements are in place.

The program requirements include:

1. Posting all recognized confined spaces.
2. Identifying potential hazards in the confined space.
3. Developing a written confined space entry program.
4. Developing a written permit to enter.
5. Designating entrance, attendance, rescuers and employees who may authorize entry.
6. Annual training of entrants, attendants, rescuers, and supervisors.
7. Providing safety and testing equipment necessary to make a safe confined space entry.
8. Notifying contractors of the hazards of confined spaces and of the plants confined space entry permit system.

This standard calls into effect other OSHA standards as they apply to confined space entry, such as regulations on respirators, hazardous energy control (Lock-Out/Tag-Out), electrical safety, guarding of mechanical hazards, and hazard communication.

## **A Six-Step Confined Space Entry Program can be adapted to any workplace.**

### **STEP ONE: Identify the Space**

All too often, employees think of a confined space only in terms of a tank or other container. These confined spaces need to be properly identified before entering.

### **STEP TWO: Determine the Danger**

Once the employees have identified the confined space, they must be able to determine the degree of danger. The atmosphere inside the confined space must be carefully tested.

First, open the lid or door to the space just enough to allow entry of a test probe. Do not jerk open the door or lid. There may be something toxic, flammable, or explosive inside, and you may end up inhaling or igniting these gases or vapors.

Once the testing equipment starts registering the readings, take note. Our primary concern is the level of oxygen which must be at least 19.5 percent to provide safe breathing. But the possibility of a flammable or toxic atmosphere must also be considered.

Unfortunately, there is no universal tester that will instantly identify every toxic substance that might be found in a confined space. You should be aware of what substances may be found under certain conditions. Then give your crew the instruments that will detect those substances. The crew will also need to be properly taught how to use this testing equipment. This can be accomplished through the operator's manual and also from the dealer where the instrumentation was purchased.

It is very important for the crew members to understand how vital their testing equipment is to their safety. These instruments are not as durable as tools. They must be handled with care.

### **STEP THREE: The Written Entry Permit**

Once the information from the atmospheric testing has been gathered, it will need to be written on a Confined Space Entry Permit. This information will dictate what personal protective equipment is needed. This could include respiratory protection, gloves, boots, clothing, ear or eye protection, safety harness, and/or lanyard.

Only after the initial testing has been completed should approval be given to enter the confined space. The approval

should be written and signed by the supervisor of the area, the person who did the initial testing, and the supervisor of the persons entering the area. This is called an entry permit and it indicates what conditions are to be met before work may begin and what is required while the work is being performed. It also documents the assigned responsibilities of each person for each part of the safety program. Once the entry permit has been issued, it should be posted at the entry site and removed only after the job has been completed. (See sample entry permit.)

#### **Key elements in a written permit:**

1. Time
2. Date
3. Place
4. Names and signatures of entrants
5. Names and signatures of attendants
6. Names and signatures of entry supervisor
7. Hazards of the space
8. Measures used to eliminate or control hazards
9. Acceptable entry conditions
10. Results of initial and periodic monitoring
11. Equipment that must be provided at the time of entry

### **STEP FOUR: Ventilate the Space**

If the initial test is not within acceptable limits, the confined space should be vented to improve the atmosphere. Some spaces have a built in ventilator and all that is required is to flip a switch. But in many cases, the crew must insert a ventilator tube and connect a blower to force air into the confined space.

This forced-air ventilation cleans out toxic gases and puts oxygen into the space. However, there are several factors you must take into consideration to ensure that a space is safely vented:

Size. The size of the confined space will dictate how long it should be vented before entry.

Hose Placement. Don't just drop the blower hose into the space. The hose must be positioned against a wall so that the air circulation bounces from wall to wall. If the hose is just hung in the middle, air pockets containing toxic gases may linger in the corners even though the blower has been operated for a specified time.

Blower Location. Since it is taking in air from the surrounding atmosphere, it is important to position the blowers so that it does not suck in the very air that it is blowing out of the space. Also make sure that the blower is placed away from processes that generate harmful gases, such as chemicals or vehicle exhaust. You want to pull breathable air into this space. You also must consider ignition possibilities when finding a spot for the blower. The blower itself can be a source of ignition. You will want to place it away from flammable objects and gases.

Entry Blockade. While the confined space is being ventilated, make sure entry isn't possible. It's good to require one crew member to stay near the opening.

#### **STEP FIVE: Retest**

After ventilating an area, test the atmosphere again. The atmosphere will either be ready to sustain human life or it won't. A different course of action is required for each situation.

Once the conditions in the confined space are considered safe, the crew chief must fill in the entry permit stating exactly what was done to prepare the space for entry. This is very important. The readings obtained from the test equipment must be legible. For the safety of the crew, the instrument itself must be calibrated at frequent intervals to ensure accurate readings. A wrong reading can cause death or serious injury. The entry permit will be checked by the supervisor and the area superintendent to be sure that it is completely and accurately filled out for every entry into a confined space.

If the ratings still indicate a problem after ventilating the space, the employees must notify their supervisors. With more atmospheric testing, the supervisor and employees determine what dangerous contaminants are in the confined space. They then develop a written list of the contaminants and the hazards they can cause. With this information in hand, they then can choose the appropriate respiratory protection and personal protective equipment. These can include escape harness, protective clothing, respirators or self-contained breathing apparatus, or whatever is needed to protect the workers from the hazards of the space.

#### **STEP SIX: Follow Entry and Emergency Procedures**

Once the preceding steps are completed, your workers are almost ready for entry. They just need to follow a few more safety procedures. Some very simple procedures take on great importance when working in confined spaces. With these procedures, the workers are not only ready for safe entry but they are also prepared for an accident, should one occur. Specifically, these procedures would include:

Choosing a buddy. When someone enters the space, someone else always stands by outside to help in an emergency. This safety partner is trained to:

- Recognize the effects of hazards on entrants.
- Communicate with the entrant
- Perform rescue duties
- Summon rescue and emergency services
- Perform CPR

Wearing respiratory protection. If the work crew knows that the space may have been contaminated with something dangerous or that the oxygen level is low, they must wear respiratory protective equipment. This also applies to the buddy remaining outside the entrance. We are well aware that many deaths do occur when rescuers themselves are overcome because they entered a dangerous area without proper breathing apparatus. The only time respirators are not required is when the space is known to contain nothing but healthy, oxygen-sufficient air.

Establishing communication. The buddy and the person entering the confined space must be able to communicate. However, limited visibility sometimes makes hand communication impossible. Other spaces are so large, voice communication is not practical.

To keep communication open even with these obstacles, some entrants and buddies are equipped with two-way radios. Some workers also learn the fire department's system of signalling by means of a rope tied around the waist. With these two methods, employees are always able to communicate.

For further safety, the buddy must also have communication with another outside worker. As an extra precaution against the unexpected, one other individual is required to remain within shouting or signaling distance to assist in a rescue effort.

Strapping on the harness. The person entering the confined space wears a safety harness and lanyard so that he or she can be removed quickly if overcome by vapors. Don't use a safety belt. If a person is wearing a belt becomes unconscious, he or she will bend at the waist while being pulled out and perhaps become stuck in a narrow passage.

Checking the Space. Always note the physical obstructions before entering a space. Something as routine as making sure that a ladder is correctly placed can make the difference between a safe entry and a dangerous fall.

Bringing in the testing equipment. Even when good readings are taken, the crew should always take their test equipment into the confined space with them. It has an audible alarm that will alert them if the accumulation of toxic or flammable gases or vapors begin to accumulate. It is good safety practice to teach your workers to recheck their equipment and the confined space atmosphere frequently. You can't depend on your nose to tell you something is wrong. Many toxic substances do not have an odor and some actually deaden the sense of smell.

In general, it is good to teach your employees never to take chances, to use the proper equipment for the job, and to treat testing equipment with care since employee life depends on its accuracy. It is also a good idea to stress testing and retesting at all times.

Confined space accidents can be prevented if permits and/or procedures identify hazards that require control. All employees should be made aware of potential problems when entering any confined space. These efforts expended in alerting, training, and developing a program of safe confined space entry for the employees will minimize the potential for tragedy.

**Sources:**

- Specific entry procedures are detailed in OSHA Regulations. The National Institute for Occupational Safety and Health (NIOSH) has published a criteria document, "Working in Confine Spaces," No. 80-106, which is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
- You may also refer to OSHA Permit, Required Confined Spaces Standard 29-CFR 1910.146.
- Wisconsin Council of Safety.

*The information and recommendations contained in this material have been obtained from sources believed to be reliable. However, SECURA accepts no legal responsibility for the accuracy, sufficiency, or completeness of such information. Additional safety and health procedures may be required under particular circumstances.*

**CONFINED SPACE ENTRY PERMIT# \_\_\_\_\_**

Issued To \_\_\_\_\_

Location \_\_\_\_\_

Duration: From \_\_\_\_\_ AM/PM to \_\_\_\_\_ AM/PM (Cannot be issued for  
(Date) (Hours) (Date) (Hours) more than 1 shift.)

Work To Be Done \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Circle Equipment To Be Used:

Gas Torch  
Grinder  
Drill

Welding  
Impact Wrench  
Sandblast

Electrical Cords  
Lamps  
Ladder

Other \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Previous Contents of Confined Space \_\_\_\_\_

Decontamination Procedure Used:

Steam

Water

Inert Gas

Forced Ventilation

Other (Indicate) \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Testing:

Oxygen: Amount \_\_\_\_\_  
Performed By \_\_\_\_\_ Time \_\_\_\_\_  
Periodic Requirement  Yes  No Frequency \_\_\_\_\_  
Person Assigned \_\_\_\_\_

Toxic Material(s): \_\_\_\_\_ Amount \_\_\_\_\_ TLV \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Performed By \_\_\_\_\_ Time \_\_\_\_\_  
Periodic Requirement  Yes  No Frequency \_\_\_\_\_  
Person Assigned \_\_\_\_\_

Explosive Gas: \_\_\_\_\_ %Amount \_\_\_\_\_ LEL \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Performed By \_\_\_\_\_ Time \_\_\_\_\_  
Periodic Requirement  Yes  No Frequency \_\_\_\_\_

Inlet Piping Blanked Off or Broken Out  Yes  No

Location(s) & Any Special Provisions \_\_\_\_\_  
\_\_\_\_\_

Watchperson Assigned \_\_\_\_\_

Signatures: Supervisor of Area to be Entered \_\_\_\_\_

Supervisor of Person(s) to Enter \_\_\_\_\_

Person Issuing Permit \_\_\_\_\_