

## Confined Space Awareness

### **Compliance with 29 CFR 1910.146 permit-Required Confined Spaces**

**The regulation is divided as follows:**

#### **1910.146 permit required confined spaces.**

- a. Scope and application.
- b. Definitions.
- c. General requirements
- d. Permit required confined space program.
- e. Permit system.
- f. Entry permit.
- g. Training.
- h. Duties of authorized entrants.
- i. Duties of attendants.
- j. Duties of entry supervisors.
- k. Rescue and emergency services.

#### **Appendices**

- Permit-Required Confined Space Decision Flow Chart.
- B. Procedures for Atmospheric Testing
- C. Examples of Permit-Required Confined Space Programs
- D. Sample Permits
- E. Sewer System Entry

## Confined Space Awareness

### **29 CFR 1910.146 (a) Scope**

Paragraph (a) of the standard explains that the regulation was promulgated to protect employees in general industry from the hazards associated with entry into permit-required confined spaces. It specifically excludes industries covered by other regulations. They are:

- Agriculture (part 1928)
- Construction (part 1926)
- Shipyard employment (part 1915)

### **29 CFR 1910.146 (b) Definitions**

This paragraph gives definitions for terms used in the standard.

#### **Confined Spaces**

**"Confined space,"** means a space that:

- (1) Is large enough and so configured that an employee can bodily enter and perform assigned work; and
- (2) Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry.); and
- (3) Is not designed for continuous employee occupancy.

**"Permit-required confined space (permit space,)"** means a confined space that 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;

## Confined Space Awareness

- (3) Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or
- (4) Contains any other recognized serious safety or health hazard.

**"Non-permit confined space,"** means a confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

**"Entry"** means the action by which a person passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.

### **Key Personnel**

**"Authorized entrant"** means an employee who is authorized by the employer to enter a permit space

**"Attendant"** means an individual stationed outside one or more permit spaces who monitors the authorized entrants and who performs all attendant's duties assigned in the employer's permit space program.

**"Entry supervisor"** means the person (such as the employer, foreman, or crew chief) responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required by this section.

NOTE: An entry supervisor also may serve as an attendant or as an authorized entrant, as long as that person is trained and equipped as required by this section for each role he or she fills. Also, the duties of entry supervisor may be passed from one individual to another during the course of an entry operation.

**"Acceptable entry conditions"** means the conditions that must exist in a permit space to allow entry and to ensure that employees involved with a

## Confined Space Awareness

permit-required confined space entry can safely enter into and work within the space.

**"Emergency"** means any Occurrence (including any failure of hazard control or monitoring equipment) or event internal or external to the permit space that could endanger entrants.

**"Engulfment"** means the surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory

System or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.

**"Hazardous atmosphere"** means an atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (that is, escape unaided from a permit space), injury, or acute illness from one or more of the following causes:

- (1) Flammable gas, vapor, or mist in excess of 10 percent of its lower flammable limit (LFL);
- (2) Airborne combustible dust at a concentration that meets or exceeds its LFL;

NOTE: This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 feet (1.52 m) or less.

- (3) Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent;
- (4) Atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in Subpart G, Occupational Health and Environmental Control, or in Subpart Z, Toxic and

## Confined Space Awareness

Hazardous Substances, of this Part and which could result in employee exposure in excess of its dose or permissible exposure limit.

NOTE: An atmospheric concentration of any substance that is not capable of causing death, incapacitation, impairment of ability to self-rescue, injury, or acute illness due to its health effects is not covered by this provision.

- (5) Any other atmospheric condition that is immediately dangerous to life or health.

NOTE: For air contaminants for which OSHA has not determined a dose or permissible exposure limit, other sources of information, such as Material Safety Data Sheets that comply with the Hazard Communication Standard, section 1910.1200 of this Part, published information, and internal documents can provide guidance in establishing acceptable atmospheric conditions.

**"Immediately dangerous to life or health (IDLH)"** means any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a permit space

NOTE: Some materials hydrogen fluoride gas and cadmium vapor, for example may produce immediate transient effects that, even if severe, may pass without medical attention, but are followed by sudden, possibly fatal collapse 12-72 hours after exposure. The victim "feels normal" from recovery from transient effects until collapse. Such materials in hazardous quantities are considered to be "immediately" dangerous to life or health.

**"Oxygen deficient atmosphere"** means an atmosphere containing less than 19.5 percent oxygen by volume.

**"Oxygen enriched atmosphere,"** means an atmosphere containing more than 23.5 percent oxygen by volume.

## Confined Space Awareness

**"Prohibited condition,"** means any condition in a permit space that is not allowed by the permit during the period when entry is authorized.

**"Testing"** means the process by which the hazards that may confront entrants of a permit space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit space.

NOTE: Testing enables employers both to devise and implement adequate control measures for the protection of authorized entrants and to determine if acceptable entry conditions are present immediately prior to, and during, entry.

### **Permit System**

**"Entry permit (permit)"** means the written or printed document that is provided by the employer to allow and control entry into a permit space and that contains the information specified in paragraph (f) of this section.

**"Hot work permit"** means the employer's written authorization to perform operations (for example, riveting, welding, cutting, burning, and heating) capable of providing a source of ignition.

**"Permit-required confined space program (permit space program)"** means the employer's overall program for controlling, and where appropriate, for protecting employees from, permit space hazards and for regulating employee entry into permit spaces.

**"Permit system,"** means the employer's written procedure for preparing and issuing permits for entry and for returning the permit space to service following termination of entry.

**"Rescue service"** means the personnel designated to rescue employees from permit spaces.

**"Retrieval system"** means the equipment (including a retrieval line, chest or full-body harness, wristlets, if appropriate, and a lifting device or anchor) used for non-entry rescue of persons from permit spaces.

## Confined Space Awareness

### Space Isolation

**"Isolation"** means the process by which a permit space is removed from service and completely protected against the release of energy and material into the space by such means as: blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; a double block and bleed system; lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages.

**"Blanking or blinding"** means the absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or a skillet blind) that completely covers the bore and that is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.

**"Double block and bleed"** means the closure of a line, duct, or pipe by closing and locking or tagging two in-line valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves.

**"Inerting"** means the displacement of the atmosphere in a permit space by a noncombustible gas (such as nitrogen) to such an extent that the resulting atmosphere is noncombustible.

NOTE: This procedure produces an IDLH oxygen-deficient atmosphere.

**"Line breaking"** means the intentional opening of a pipe, line, or duct that is or has been carrying flammable, corrosive, or toxic material, an inert gas, or any fluid at a volume, pressure, or temperature capable of causing injury.

### 29 CFR 1910.146 (c) General Requirements

- (1) Employers must conduct a survey of the business site to determine whether confined spaces exist.

## Confined Space Awareness

The confined spaces must be evaluated for the presence of hazards. Hazardous spaces are then classified as permit-required confined spaces. Spaces without hazards may be classified as non-permit spaces.

OSHA provides a decision flow chart (Appendix A of the standard) to help employers evaluate confined spaces in the workplace.

(2) Employees must be informed of the existence, location, and danger of permit-required confined spaces by posting signs or by any other equally effective means

(3) If the employer decides that employees will not enter permit spaces, the employer is required to:

Evaluate the workplace to determine if any spaces are Permit-required confined spaces.

Take effective measures must be taken to prevent employees from entering them. NOTE: Warning signs may qualify but permanent barriers are the safest method to prevent entry. Reevaluate spaces when there are changes in use or Configuration. Inform contractors of the presence of permit-required confined spaces.

(4) If the employer decides that its employees will enter permit spaces, a written permit space program must be developed and implemented. Employees and their representatives must make the written program available for inspection.

OSHA gives specific guidance for establishing the written program in paragraph (d).

(5) An employer may use alternative procedures for confined space entry when it can be demonstrated that the only hazard posed by the permit space is an actual or potential hazardous atmosphere and continuous forced-air ventilation is sufficient to maintain that permit space safe for entry.



## Confined Space Awareness

- i. When using alternative procedures for confined space entry, the employer need not comply with the following paragraphs of the permit-required confined space standard.
  - (d) Permit-required confined space program
  - (e) Permit system
  - (f) Entry permits
  - (h) Duties of authorized entrants in
  - (i) Duties of attendants
  - (j) Duties of entry supervisors
  - (k) Rescue and emergency services
- ii. The following requirements apply to entry into permit spaces using alternative procedures:
  - A. Any conditions making it unsafe to remove an entrance cover shall be eliminated before the cover is removed.
  - B. When entrance covers are removed, the opening shall be promptly guarded by a railing, temporary cover, or other temporary barrier that will prevent an accidental fall through the opening and that will protect each employee working in the space from foreign objects entering the space.
  - C. Before an employee enters the space, the internal atmosphere shall be tested, and with a calibrated direct reading instrument, for the following conditions in the order given:
    - A. Oxygen content,
    - B. Flammable gases and vapors, and
    - C. Potential toxic air contaminants
  - D. There may be no hazardous atmosphere within the space whenever any employee is inside the space.
  - E. Continuous forced air ventilation shall be used, as follows:

## Confined Space Awareness

1. An employee may not enter the space until the forced air ventilation has eliminated any hazardous atmosphere;
  2. The forced air ventilation shall be so directed as to ventilate the immediate areas where an employee is or will be present within the space and shall continue until all employees have left the space;
  3. The air supply for the forced air ventilation shall be from a clean source and may not increase the hazards in the space.
- F. The atmosphere within the space shall be periodically tested as necessary to ensure that the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere.
- G. If a hazardous atmosphere is detected during entry:
1. Each employee shall leave the space immediately;
  2. The space shall be evaluated to determine how the hazardous atmosphere developed; and
  3. Measures shall be implemented to protect employees from the hazardous atmosphere before any subsequent entries take place.
- H. The employer shall verify that the space is safe for entry and that the pre-entry measures required by paragraph (c)(5)(ii) of this section have been taken, through a written certification that contains the date, the location of the space, and the signature of the person providing the Certification.
- The certification shall be made before entry and shall be made available to each employee entering the space.

## Confined Space Awareness

- (6) When the use or configuration of the non-permit confined space changes, potentially increasing its hazards, the employer is required to reevaluate and reclassify it as a permit-required confined space.
- (7) A space classified by the employer as a permit-required confined space may be reclassified as a non-permit confined space under the following procedures:
- i. If the permit space poses no actual or potential atmospheric hazards and if all hazards within the space are eliminated without entry into the space, the permit space may be reclassified as a non-permit confined space for as long as the non-atmospheric hazards remain eliminated.
  - ii. If it is necessary to enter the permit space to eliminate hazards, such entry shall be a permit-required confined space entry. If testing and inspection during that entry demonstrate that the hazards within the permit space have been eliminated, the permit space may be reclassified as a non-permit confined space for as long as the hazards remain eliminated.

NOTE: Control of atmospheric hazards through forced air ventilation does not constitute elimination of the hazards.

- iii. The employer shall document the basis for determining that all hazards in a permit space have been eliminated, through a certification that contains:
  - The date,
  - The location of the space, and
  - The signature of the person making the determination.

## Confined Space Awareness

The certification shall be made available to each employee entering the space.

- iv. If hazards arise within a permit space that has been declassified to a non-permit space each employee in the Space shall exit the space. The employer shall then reevaluate the space and determine whether it must be reclassified as a permit space, in accordance with other applicable provisions of this section
- (8) When an employer hires an independent contractor to enter permit the host employer is required to: required confined spaces,
- i. Inform the contractor of permit program requirements.
  - ii Inform the contractor of permit-space hazards.
  - iii. Inform the contractor of Safety precautions and procedures that have been implemented by the host employer
  - iv. Develop and implements procedures to coordinate entry operations so those employees of one employer do not endanger employees of any other employer.
  - v. Following the entry, the host employer must debrief the contractor on the entry operation.
- (9) In addition to complying with the permit space requirements that apply to all employers, each contractor who is retained to perform permit space entry operations shall:
- i. Obtain any available information regarding permit space hazards and entry operations from the host employer.
  - ii. Coordinate entry operations with the host employer, when both host employer personnel and contractor personnel will be working in or near permit spaces, as required by paragraph (d)(1 1) of this section; and

## Confined Space Awareness

- iii. Inform the host employer of the permit space program that the contractor will follow and of any hazards confronted or created in permit spaces, either through a debriefing or during the entry operation.

### **29 CFR 1910.146 (d) Permit-required confined space program (permit space program).**

All employers are required identify permit-required confined spaces in the workplace. Any employer that intends to have employees or contractors enter those spaces must implement a permit space program. Under the permit space program the employer is required to:

- (1) Implement the measures necessary to prevent unauthorized entry;
- (2) Identify and evaluate the hazards of permit spaces before employees enter them;
- (3) Develop and implement the means, procedures, and practices necessary for safe permit-space entry operations, including, but not limited to, the following:
  - i. Specifying acceptable entry conditions;
  - ii. Isolating the permit space;
  - iii. Purging, inerting, flushing, or ventilating the permit space as necessary to eliminate or control atmospheric hazard
  - iv. Providing pedestrian, vehicle, or other barriers as necessary to protect entrants from external hazards; and
  - v. Verifying that conditions in the permit space are acceptable for entry throughout the duration of an authorized entry.

## Confined Space Awareness

- (4) The employer is required to provide equipment at no cost to employees, maintain that equipment properly, and ensure that employees use that equipment properly. Equipment that must be provided includes:
- i. Testing and monitoring equipment needed to determine if acceptable entry conditions exist before and during entry.
  - ii. Ventilating equipment needed to obtain acceptable entry conditions.
  - iii. Communications equipment necessary for maintaining communication between the attendant and the entrant(s).
  - iv. Personal protective equipment insofar as feasible engineering and work practice controls do not adequately protect employees.
  - v. Lighting equipment needed to enable employees to see well enough to work safely and to exit the space quickly in an emergency.
  - vi. Barriers and prevent accidental entry;
  - vii. Equipment, such as ladders, needed for safe ingress and egress by authorized entrants;
  - viii. Rescue and emergency equipment needed to comply with the requirement for rescue from a permit-required confined space, except to the extent that the equipment is provided by rescue services; and
  - ix. Any other equipment necessary for safe entry into and rescue from permit spaces.
- (5) The employer is required to evaluate permit space conditions as follows whenever entry operations are conducted:
- i. Test conditions in the permit space to determine if acceptable entry conditions exist before entry is authorized to begin.

## Confined Space Awareness

- If isolation of the space is infeasible because the space is large or is part of a continuous system (such as a sewer), pre-entry testing shall be performed to the extent feasible before entry is authorized and, if entry is authorized, entry conditions shall be continuously monitored in the areas where authorized entrants are working.
- ii. Test or monitor the permit space as necessary to determine if acceptable entry conditions are being maintained during the course of entry operations.
- iii. When testing for atmospheric hazards test in the following order:
- Oxygen, then
  - Combustible gases and vapors, and
  - Toxic gases and vapors.
- (6) Provide at least one attendant outside the permit space into which entry is authorized for the duration of entry operations.
- Attendants may be assigned to monitor more than one permit space provided the duties described in paragraph (i) of this section can be effectively performed for each permit space that is monitored.
  - Likewise, attendants may be stationed at any location outside the permit space to be monitored as long as the duties described in paragraph (i) of this section can be effectively performed for each permit space that is monitored.
- (7) If multiple spaces are to be monitored by a single attendant, the permit program must provide the means and procedures to enable the attendant to respond to an emergency affecting one or more of the permit spaces

## Confined Space Awareness

being monitored without distraction from the attendant's responsibilities under paragraph (i) of this section;

(8) The employer must:

- Designate the persons who are to have active roles (as, for example, authorized entrants, attendants, entry supervisors, or persons who test or monitor the atmosphere in a permit space) in entry operations.
- Identify the duties of each such employee.
- Provide each such employee with the training required by paragraph (g) of this section.

(9) The employer is required to develop and implement procedures: For summoning rescue and emergency services.

- For rescuing entrants from permit spaces.
- For providing necessary emergency services to rescued employees.
- For preventing unauthorized personnel from attempting a rescue.

(10) The employer is required to develop and implement a system for the preparation, issuance, use, and cancellation of entry permits as required by this section.

(11) The employer is required to develop and implement procedures to coordinate entry operations when employees of more than one employer are working simultaneously as authorized entrants in a permit space, so that employees of one employer do not endanger the employees of any other employer.

(12) The employer is required to develop and implement procedures (such as closing off a permit space and canceling the permit) necessary for concluding the entry after entry operations have been completed.



## Confined Space Awareness

(13) The employer is required to review entry operations when the employer has reason to believe that the measures taken under the permit space program may not protect employees and revise the program to correct deficiencies found to exist before subsequent entries are authorized. Examples of circumstances requiring the review of the permit space program are any unauthorized entry of a permit space.

- The detection of a permit space hazard not covered by the permit.
- The detection of a condition prohibited by the permit.
- The occurrence of an injury or near misses during entry.
- A change in the use or configuration of a permit space.
- An employee complaints about the effectiveness of the Program.

(14) Review the permit space program, using the canceled permits within 1 year after each entry and revise the program as necessary, to ensure that employees participating in entry operations are protected from permit space hazards.

NOTE: Employers may perform a single annual review covering all entries performed during a 12-month period. If no entry is performed during a 12-month period, no review is necessary.

## Confined Space Awareness

### **29 CFR 1910.146 (e) Permit system,**

The single most important feature of the permit system is the authorize employees to enter permit spaces and to document the measures taken to protect authorized entrants from permit space hazards.

- (1) Before entry is authorized, the employer shall document the completion of measures necessary to make the permit space safe by preparing an entry permit.
- (2) Before entry begins, the entry supervisor identified on the permit shall sign the entry permit to authorize entry.
- (3) The completed permit shall be made available at the time of entry of all authorized entrants, by posting it at the entry portal or by any other equally effective means, so that the entrants can confirm that pre-entry preparations have been completed.
- (4) The duration of the permit may not exceed the time required to complete the assigned task or job identified on the permit.

NOTE: The employer need not, but may, state a specific time period (a number of hours or days) on the permit. For instance, the permit's duration could be stated in terms of the removal and installation of a relief valve or the cleaning of the inside surfaces of a tank. OSHA's intent here is merely to place some reasonable limitation on permit validity.

- (5) The entry supervisor shall terminate entry and cancel the entry permit when:
  - i. The entry operations covered by the entry permit have been completed.
  - ii. A condition that is not allowed under the entry permit arises in or near the permit space.

## Confined Space Awareness

(6) The employer shall retain each canceled entry permit for at least 1 year to facilitate the review of the permit-required confined space program required.

- Any problems encountered during an entry operation shall be noted on the pertinent permit so that appropriate revisions to the permit space program can be made.

**SAMPLE**

**29 CFR 1910.146 (f) Entry Permit.**

## Confined Space Awareness

The entry permit documents that everything required by the permit system is completed before permit-required confined space entry. The permit is considerably more than a simple checklist; it requires careful thought and planning to make the particular permit space safe for entry. The permit-required confined space standard gives an example of a confined space entry permit in appendix D, but any format is acceptable that includes the following information:

1. The permit space to be entered.
2. The purpose of the entry.
3. The date and the authorized duration of the entry permit.

NOTE: The duration of the entry permit need not be stated in terms of actual time, but may be stated in terms of the completion of the task for which permit space entry is being performed,

4. The authorized entrants within the permit space, by name or by such other means (for example, through the use of rosters or tracking systems) as will enable the attendant to determine quickly and accurately which authorized entrants are inside the permit space.
5. The personnel, by name, currently serving as attendants.
6. The individual, by name, currently serving as entry supervisor, with a space for the signature or initials of the entry supervisor who originally authorized entry.

NOTE: The primary basis for proposing to require the names of the attendants and entry supervisors on the permit was that it is important for all affected employees to be able to know who the persons responsible for the safety of entrants is.

Whenever new attendants or entry supervisors assume their roles, they are required to have their names placed on the permit. This provides a

## Confined Space Awareness

sure means of distinguishing these important individuals quickly and easily. It also provides the opportunity for these individuals to review the permit and entry conditions to ensure that entry conditions remain safe.

7. The hazards of the permit space to be entered.
8. The measures used to isolate the permit space and to eliminate or control permit space hazards before entry.
9. The acceptable entry conditions.
10. The results of initial and periodic tests performed accompanied by the names or initials of the testers and by an indication of when the tests were performed.
11. The rescue and emergency services that can be summoned and the means (such as the equipment to use and the numbers to call) for summoning those services.
12. The communication procedures used by authorized entrants and attendants to maintain contact during the entry.
13. Equipment, such as personal protective equipment, testing equipment, communications equipment, alarm systems, and rescue equipment, to be provided for compliance with this section.
14. Any other information whose inclusion is necessary, given the circumstances of the particular confined space, in order to ensure employee safety.
15. Any additional permits, such as for hot work that has been issued to authorize work in the permit space.

### **29 CFR 191.0146 (g) Training.**

## Confined Space Awareness

Many confined space accident descriptions indicate that one of the major factors causing accidents is a lack of employee awareness of the dangers involved in entry into permit spaces. Employees who entered these spaces were unaware of the possibility that the atmosphere inside could be immediately dangerous to life or health.

In some cases, they also did not recognize the symptoms of exposure to certain life-threatening atmospheres. In other cases, they did not realize that sometimes there are no obvious symptoms. Employees who attempted to rescue fallen coworkers inside permit spaces were also unaware of the hazards involved and of the procedures for safe rescue. The result of this lack of training was often the deaths of these employees.

- (1) The employer is required to provide training so that all employees whose work is regulated by this section acquire the understanding, knowledge, and skills necessary for the safe performance of the duties assigned under this section.
- (2) Training shall be provided to each affected employee:
  - i. Before the employee is first assigned duties under this section.
  - ii. Before there is a change in assigned duties.
  - iii. Whenever there is a change in permit space operations those presents a hazard about which an employee has not previously been trained?
  - iv. Whenever the employer has reason to believe either that there are deviations from the permit space entry procedure required by paragraph (d)(3) of this section or that there are inadequacies in the employee's knowledge or use of these procedures.
- (3) The employer is required to identify and implement the training necessary to establish employee proficiency in the duties required for safe permit-required confined space entry.

## Confined Space Awareness

- (4) The employer shall certify that the required training has been accomplished. The certification shall contain each employee's name, the signatures or initials of the trainers, and the dates of training. The certification shall be available for inspection by employees and their authorized representatives.

**SAMPLE**

### **29 CFR 1910.146 (h) Duties of authorized entrants.**

An authorized entrant is an employee authorized by the employer to enter a permit space. This is the person who faces the greatest risk of death or injury

## Confined Space Awareness

from exposure to the hazards contained within the space. Although the permit program is intended to provide protection to authorized entrants during permit space entry operations, the entrants themselves must also perform duties to assure their own safety. The employer is responsible to ensure that authorized entrants perform these duties.

The employer shall ensure that all authorized entrants:

(1) Know the hazards that may be faced during entry, including:

- Information on the modes of exposure.

NOTE: For toxic substances, the mode of exposure (route of entry) could be by inhalation or by dermal absorption. Unless employees are knowledgeable about the mode of exposure, they may not fully understand the nature of the hazard involved.

- Understand signs or symptoms of exposure, particularly the early warning signs and symptoms so self-rescue can start before help from the outside is needed.
- Understand the consequences of any exposure.

(2) Properly use equipment provided by the employer to facilitate safe entry into a permit-required confined space.

(3) Communicate 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.

NOTE: Successful permit space programs currently in effect use such systems as two-way radios, television or other continuous electronic monitoring equipment in combination with alarms, and voice contact as effective methods of communication between attendants and authorized entrants.



## Confined Space Awareness

While these types of systems are acceptable, the exact type and extent of communication needed to meet the requirements of the final rule are dependent on the hazards that might arise and the operations being performed within the permit space.

For example, work that must be performed in IDLH atmospheres might necessitate the use of continuous monitoring equipment. In contrast, authorized entrants performing work in spaces that pose only mechanical hazards would need a communication system that provides only periodic monitoring.

(4). Alert the attendant whenever:

- i. The entrant recognizes any warning sign or symptom of exposure to a dangerous situation.
- ii. The entrant detects a prohibited condition.

(5) Exit from the permit space as quickly as possible whenever:

- i. An order to evacuate is given by the attendant or the entry supervisor,
- ii. The entrant recognizes any warning sign or symptom of exposure to a dangerous situation,
- iii. The entrant detects a prohibited condition, or
- iv. An evacuation alarm is activated.

NOTE: Given the speed with which permit space hazards can incapacitate and kill entrants, it is essential that the entrants evacuate permit spaces as soon as any one of the four conditions set out above exists. OSHA believes that self-rescue will often provide the entrant's best chance of escaping a permit space when a hazard is present.

**SAMPLE**

**29 CFR 1910.146 (i) Duties of attendants.**

One of the major problems in permit space entry operations is that, if an entrant within the space is injured or incapacitated, he or she cannot normally be seen from outside the space. For example, if an employee working inside a storage tank were to lose consciousness because of oxygen deficiency, employees working nearby might not see that the entrant is

## Confined Space Awareness

incapacitated, and the unconscious employee would probably die before anyone realized that something was wrong.

Many confined space accident summaries describe an employee who entered a permit space alone, was overcome by hazards within the space, and was not found until it was too late for rescue. Providing an attendant outside a permit space is a widely accepted method of monitoring the status of authorized entrants within the space, as well as conditions (relative to safety) within the space, and of providing for the summoning of rescue services.

The attendant is stationed outside one or more permit-required confined spaces with the primary responsibility of monitoring the condition and location of authorized entrants. At least one trained attendant must remain on duty for the duration of all permit entries.

The employer shall ensure that each attendant:

(1) Know the hazards that may be faced during entry, including:

- Information on the routes of entry for chemical hazards.
- Understand signs or symptoms of exposure, particularly the early warning signs and symptoms so self-rescue can start before help from the outside is needed.
- Understand the consequences of any exposure.

(2) Is aware of possible behavioral effects of hazard exposure in authorized entrants.

- Knowing the behavioral effects of hazard exposure gives the attendant the ability to order evacuation of entrants if any signs or symptoms of exposure are detected.

(3) Continuously maintains an accurate count of authorized entrants in the permit space and accurately identifies who is in the permit space.

## Confined Space Awareness

- (4) Remains outside the permit space during entry operations until relieved by another attendant.

NOTE: When the employer's permit entry program allows attendant entry for rescue, attendants may enter a permit space to attempt a rescue if they have been trained and equipped for rescue operations. Prior to entry, another person who has been trained to perform the duties of the attendant must relieve the attendant.

- (5) Communicates with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the space if a prohibited condition arises inside or outside of the space.
- (6) Monitors activities inside and outside the space to determine if it is safe for entrants to remain in the space and orders the authorized entrants to evacuate the permit space immediately under any of the following conditions;
  - i. If the attendant detects a prohibited condition.
  - ii. If the attendant detects the behavioral effects of hazard exposure in an authorized entrant.
  - iii. If the attendant detects a situation outside the space that could endanger the authorized entrants.
  - iv. If the attendant cannot effectively and safely perform all the duties required under paragraph (i) of this section.
- (7) Summon rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from permit space hazards;
- (8) Takes the following actions when unauthorized persons approach or enter a permit space while entry is underway:

## Confined Space Awareness

- i. Warn the unauthorized persons that they must stay away from the permit space.
  - ii. Advise the unauthorized persons that they must exit immediately if they have entered the permit space.
  - iii. Inform the authorized entrants and the entry supervisor if unauthorized persons have entered the permit space.
- (9) Performs non-entry rescues as specified by the employer's rescue procedure; and
- (10) Performs no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants.
- Passing tools to authorized entrants and monitoring the atmosphere of the permit space are among the types of duties that would be permitted, provided the attendant does not break the plane of an opening into the space.
  - The repair of equipment, on the other hand, would distract an attendant, so that he or she could not adequately monitor or protect authorized entrants, and would be prohibited.
  - If the attendant is monitoring entry into more than one permit space and must perform non-entry rescue in one of them, the attendant should immediately order evacuation of the other space(s).

**SAMPLE**

**29 CFR 1910.146 (j) Duties of entry supervisors.**

Many confined space accidents resulted from the employer's lack of enforcement of confined space entry rules. Under the OSH Act, employers bear the primary responsibility for their employees' safety. Employers must take responsibility to ensure that acceptable entry conditions exist before entry begins and during entry operations and to enforce work practices necessary for employee safety. Too many times, a permit space entrant has been made responsible for his or her own safety, even when that employee was dependent on others to ensure the presence of acceptable entry conditions. In order to place the burden of employee safety on employers,

## Confined Space Awareness

the final rule requires each permit space entry to have an entry supervisor, who has overall accountability for safe entry operations.

The entry supervisor is anyone selected by the employer to authorize entry operations in a permit- required confined space.

The employer shall ensure that each entry supervisor:

(1) Know the hazards that may be faced during entry, including:

- Information on the routes of entry for chemical hazards. Understand signs or symptoms of exposure, particularly the early warning signs and symptoms so self-rescue can start before help from the outside is needed.
- Understand the consequences of any exposure.

(2) Verifies, by checking that the appropriate entries have been made on the permit, that all tests specified by the permit have been conducted and that all procedures and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin.

(3) Terminates the entry and cancels the permit when:

- Entry operations covered by the entry permit have been completed.
- A condition that is not allowed under the entry permit arises in or near the permit space.

(4) Verifies that rescue services are available and that the means for summoning them are operable.

- Whether on-site or off-site rescue services are used, they must be available in time to affect a rescue.
- The attendant must be able to summon help without leaving the entrance to the space.

## Confined Space Awareness

- (5) Removes unauthorized individuals who enter or who attempt to enter the permit space during entry operations; and
- (6) Determines that entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained.
  - If the responsibility for a permit space entry is transferred to another person, the outgoing entry supervisor must determine that acceptable conditions still exist before transfer operational responsibility to the incoming entry supervisor.

NOTE: For entries lasting more than one work shift, the original entry supervisor will normally have to be relieved at the end of his or her shift. The responsibilities of the entry supervisor will then be passed on to someone else. OSHA believes that it is important for the new entry supervisor to review the permit and to determine that acceptable entry conditions have been maintained. The final rule specifies that reevaluation of conditions within the space must occur whenever responsibility for a permit space entry operation is transferred and at intervals dictated by the hazards and operations performed within the space.

### **29 CFR 1910.146 (k) Rescue and Emergency Services.**

Most of the requirements of the permit-required confined space standard are in place to ensure that employees can safely enter and work inside permit spaces. The hazards within the space must be eliminated or controlled before entry is allowed.

Testing and monitoring must be performed in order to ensure that entry conditions are acceptable before entry and that they remain so during the entire entry operation. Authorized entrants, attendants, entry supervisors must be trained to perform those duties safely and to recognize permit space hazards if they arise. Attendants must be stationed outside the space to keep unauthorized persons out of the space and to monitor the status of entrants to



## Confined Space Awareness

ensure that hazards do not arise and that employees are evacuated quickly if they do.

Unfortunately, in spite of all these precautions, hazards may arise so quickly or unexpectedly that authorized entrants are unable to escape from the permit space without assistance. Paragraph (k) of the final rule addresses the rescue and emergency services needed in such an event.

The final rule requires employers to arrange for rescue and emergency services. Some employers may prefer to establish an on-site rescue service. The on-site service normally provides the fastest response in an emergency. Other employers may prefer to rely on off-site rescue services, perhaps because they believe that they do not have the resources to train employees to perform rescue or because the ready availability of an adequate off-site rescue service makes an on-site capability unnecessary. The final rule allows employers to make arrangements for either on-site or off-site services.

The employer is responsible for providing rescue services to permit required confined space entrants. Whether on-site or off-site rescue services are used, they must be available in time to affect a rescue.

- (1) The following requirements apply to employers who have employees enter permit spaces to perform rescue services.
- i. The employer shall ensure that each member of the rescue service is provided with, and is trained to use properly, the personal protective equipment and rescue equipment necessary for making rescues from permit spaces.
  - ii. Each member of the rescue service shall be trained to perform the assigned rescue duties. Each member of the rescue service shall also receive the training required of authorized entrants.
  - iii. Each member of the rescue service shall practice making permit space rescues at least once every 12 months, by means of simulated rescue operations in which they remove dummies,

## Confined Space Awareness

manikins, or actual persons from the actual permit spaces or from representative permit spaces.

Representative permit spaces shall, with respect to opening size, configuration, and accessibility, simulate the types of permit spaces from which rescue is to be performed.

- iv. Each member of the rescue service shall be trained in basic first aid and in cardiopulmonary resuscitation (CPR). At least one member of the rescue service holding current certification in first aid and in CPR shall be available.
- (2) When an employer (host employer) arranges to have persons other than the host employer's employees perform permit space rescue, the host employer shall:
- i. Inform the rescue service of the hazards they may confront when called on to perform rescue at the host employer's facility, and
  - ii. Provide the rescue service with access to all permit spaces from which rescue may be necessary so that the rescue service can develop appropriate rescue plans and practice rescue operations.
- (3) To facilitate non-entry rescue, retrieval systems or methods shall be used whenever an authorized entrant enters a permit space, unless the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant.

Retrieval systems shall meet the following requirements.

- i. Each authorized entrant shall use a chest or full body harness, with a retrieval line attached at the center of the entrant's back near shoulder level, or above the entrant's head.

## Confined Space Awareness

Wristlets may be used in lieu of the chest or full body harness if the employer can demonstrate that the use of a chest or full body harness is infeasible or creates a greater hazard and that the use of wristlets is the safest and most effective alternative.

- ii. The other end of the retrieval line shall be attached to a mechanical device or fixed point outside the permit space in such a manner that rescue can begin as soon as the rescuer becomes aware that rescue is necessary.

A mechanical device shall be available to retrieve personnel from vertical type permit spaces more than 5 feet (1.52 m) deep.

- (4) If an injured entrant is exposed to a substance for which a Material Safety Data Sheet (MSDS) or other similar written information is required to be kept at the worksite, that MSDS or written information shall be made available to the medical facility treating the exposed entrant.

OSHA believes that the need to respond as quickly as possible to an emergency within a permit space indicates a preference for on-site rescue teams wherever it is practical for the employer to provide a rescue capability. The response times of on-site rescuers will usually be much shorter than those for typical off-site rescue and emergency services.

Unfortunately, the response of on-site teams is not always sufficient to ensure rescue of entrants within the 4-minute time period acknowledged as the goal for successful rescue of entrants overcome by oxygen deficiency. Additionally, the Agency realizes that some employers (small business employers in particular) will not be able to provide the type of in-house rescue expertise required by the final standard. Furthermore, because they are dedicated to responding to all types of medical emergencies, off-site rescue services are typically better equipped to treat injured employees.

## Confined Space Awareness

OSHA realizes that oxygen deficiency is not the only hazard faced by authorized entrants, through, as noted earlier, it is the leading cause of death of permit space entrants. Some hazards will require a quicker response in order to save the entrant, other hazards need not be responded to as quickly. OSHA does believe that a 4-minute time limit on removing an incapacitated entrant from a permit space should be the goal of every rescue plan.

OSHA realizes that even the best rescue methods can barely respond to an emergency or retrieve an incapacitated employee from a permit space within 4 minutes and that many cannot respond that quickly. The Agency believes that it is simply not reasonable for to require employers to develop capability to provide rescue within 4 minutes of an emergency alert, regardless of cost or practicality.

More importantly, OSHA is concerned that requiring employers to provide any set response time would encourage the attempted rescue of entrants before all precautions necessary to ensure the safety of rescue personnel were taken. The Agency believes that emergency conditions may induce rescuers (especially those who are not full time rescuers) to rush into the permit space, in spite of the training required under the final rule.

Considering that most of those killed in permit space entries are would be rescuers, the Agency believes that the final rule should stress non-entry rescue methods and provisions for the safety of rescue personnel rather than the time for such personnel enter a permit space and to remove an entrant.