Confined Space Safety

DEPARTMENT OF CONSUMER & BUSINESS SERVICES

Presented by the Public Education Section
Oregon OSHA
Department of Consumer and Business Services

Oregon OSHA
PUBLIC EDUCATION

Oregon OSHA Public Education Mission:

We provide knowledge and tools to advance
self-sufficiency in workplace safety and health

Consultative Services:

- Offers no-cost on-site assistance to help Oregon employers recognize and correct safety and health problems

Enforcement:

- Inspects places of employment for occupational safety and health rule violations and investigates complaints and accidents

Public Education and Conferences:

- Presents educational opportunities to employers and employees on a variety of safety and health topics throughout the state

Standards and Technical Resources:

- Develops, interprets, and provides technical advice on safety and health standards
- Publishes booklets, pamphlets, and other materials to assist in the implementation of safety and health rules

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Introduction

Because there are confined spaces in many Oregon workplaces, serious caution should be practiced to determine if any contain unique problems because of their contents and/or configuration. For example, some confined spaces pose entrapment hazards for entrants, while others restrict air circulation so that hazardous atmospheres can accumulate. Confinement itself can increase the risk of injury or death by making employees work closer to hazards than they would otherwise. Safety and health professionals have long recognized and directed employer and employee attention to the significant dangers of confined spaces.

This workshop introduces you to the basic requirements and procedures involved with *permit-required confined spaces* as described in OR-OSHA Division 2/Subdivision J 29 CFR 1910.146, Permit-Required Confined Spaces. This information is vitally important to all those who work in or have responsibility for those who work in *permit-required confined spaces (PRCS).* Please feel free to ask questions at any time. If you have experience in confined space operations, please participate so that we might all benefit from that experience!

Goals

- Review criteria for confined spaces and permit-required confined spaces
- Describe the hazards which exist in permit-required confined spaces
- Describe the steps in developing a permit-required confined space program
- Review training requirements

Please Note: This material, or any other material used to inform employers of compliance requirements of Oregon OSHA standards through simplification of the regulations should not be considered a substitute for any provisions of the Oregon Safe Employment Act or for any standards issued by Oregon OSHA. This workbook is intended for classroom use only.

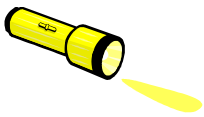
Evaluate Your Workplace

The OR-OSHA standard applies only to permit-required confined spaces. However, a permit-required confined space must be a confined space first.

1. Does your workplace contain confined spaces?

A *confined space* is...

- Large enough for the whole _____ to enter and work, **and**
- Has _____ entry or exit, **and**
- Is not _____ for continuous occupancy.



Restricted (or limited) entry or exit exists when an entrant's ability to self-rescue is hindered. Common examples include small openings, ladders, and long tunnels.

2. Does your workplace contain permit-required confined spaces?

A *permit-required confined space* is a confined space that contains one or more of the following characteristics...

- Contains or potentially contains a hazardous a_____, **or**
- Has potential for e_____, **or**
- Has dangerous c_____, **or**
- Contains any other recognized serious safety or health h_____.

If not a permit-required confined space, other rules may still apply such as Hazard Communication, Lockout/Tagout, Personal Protective Equipment, Welding, etc.

Evaluating Permit-Required Confined Spaces

Examples of permit-required confined spaces include tanks, sewers, hoppers, vaults, boilers, silos, pits, vats, bins, pipes, and manholes.

The leading cause of death in permit-required confined spaces are hazardous atmospheres.

Hazardous Atmospheres

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

- Oxygen concentration below 19.5% or above 23.5%
- Flammable gas, vapor, or mist in excess of 10% of its lower explosive limit (LEL)
- Combustible dust at a concentration that meets or exceeds its LEL
- Atmospheric concentration in excess of any substance's published dose or permissible exposure limit (PEL) which is capable of causing death, incapacitation, impairment of ability to self-rescue, injury, or acute illness due to its health effects
- Any other atmospheric condition that is immediately dangerous to life or health

* Permissible exposure limits can be found in OR-OSHA Div 2/Sub G Occupational Health and Environmental Controls and OR-OSHA Div 2/Sub Z Toxic and Hazardous Substances. Other sources include material safety data sheets.

You must do air monitoring to determine if a hazardous atmosphere exists.

Atmospheric conditions in a confined space can change very quickly.

Evaluating Hazardous Atmospheres

Oxygen Level {too high or too low?}

23.5% and above = *High*

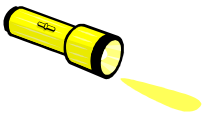
20.8 - 21% = *Normal*

19.5% and below = *Deficient*

Why might oxygen deficiency be considered the most dangerous atmospheric hazard?

_____
_____
_____
_____

What are some causes or indications of possibly having a <u>deficient</u> oxygen atmosphere inside a space?



"Inerting", or "purging", 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 non-combustible. **This procedure produces an oxygen-deficient atmosphere.**

NIG

Dangers of Low Oxygen Levels

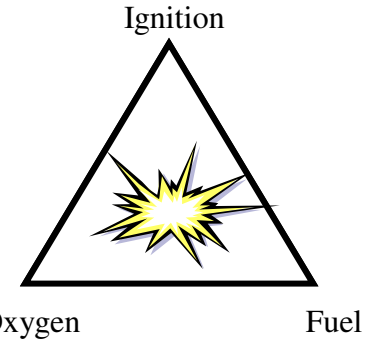
16 - 12% O_2 in air generally causes deep breathing, fast heartbeat, poor attention, poor thinking, and poor coordination.

14 - 10% O_2 in air generally causes faulty judgment, intermittent breathing, rapid fatigue (possibly causing heart damage), very poor coordination, and lips turning blue.

10% or less O_2 in air generally causes nausea (vomiting), loss of movement, and loss of consciousness followed by death.

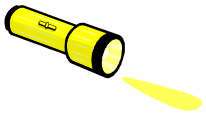
Less than 6% O_2 in air generally causes spasmodic breathing, convulsive movement, and death in approx. eight minutes. 4% - 6% O_2 in air can lead to a coma in 40 seconds.

Evaluating Hazardous Atmospheres



Flammable/Explosive Gases, Vapors, or Mists

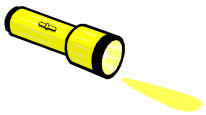
Hazardous if it exceeds 10% of its ***lower explosive limit*** (LEL)



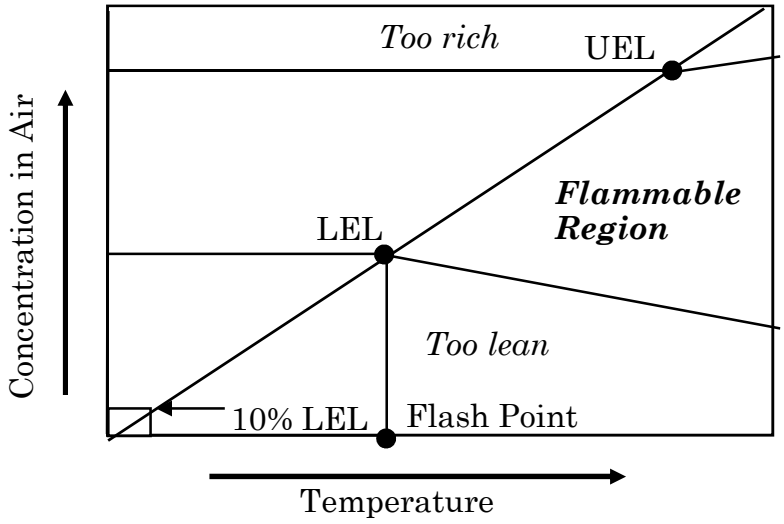
Lower explosive limit (LEL) is the lowest concentration where a material is flammable in the air. Upper explosive limit (UEL) is the highest concentration where a material is flammable in the air.

* LEL and UEL is also called LFL (lower flammable limit) and UFL (upper flammable limit).

Check your material safety data sheets or other resources for the chemical's LEL & UEL.



The 10% LEL level was adopted by OSHA from NFPA 306, Appendix A, and reflects current practices and sampling technology. OSHA believes it provides a sufficient margin of safety in making the measurement and to allow the potential for pockets of higher vapor concentrations to develop.



Don't forget airborne combustible dust. Combustible solids, when finely dispersed and raised, can explode when its concentration is between the LEL & UEL.

This diagram shows the flammable or explosive range from minimum (LEL) to maximum (UEL) limits. It also shows where 10% LEL is.

Evaluating Hazardous Atmospheres

Toxic Substances

Hazardous if exceeds dose or *permissible exposure limit* (PEL) **and** capable of causing death, incapacitation, impairment of ability to self-rescue, injury, or acute illness due to its health effects. Most chemicals have permissible exposure limits.

Sources to find exposure limits and toxic levels of chemicals:

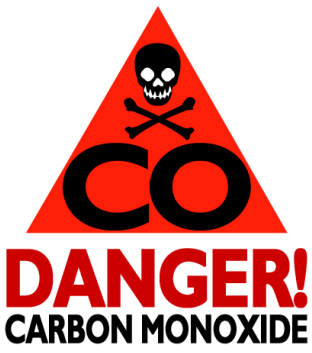
- OR-OSHA Division 2/Subdivision G *Occupational Health & Environmental Control*
- OR-OSHA Division 2/Subdivision Z *Toxic & Hazardous Substances*
- National Institute of Occupational Safety and Health (NIOSH) *Pocket Guide to Chemical Hazards*
- American Conference of Governmental Industrial Hygienists (ACGIH)
- Your material safety data sheets

* Even non-toxic or low-toxic chemicals can replace oxygen if levels are high enough.

The most common toxic chemicals in confined space fatalities are hydrogen sulfide and carbon monoxide.

Hydrogen sulfide (H2S) gas is commonly found in sewers and can be instantly fatal at higher levels in a confined spaces. Disturbing sewage sludge can release hydrogen sulfide gas. Carbon monoxide (CO) comes from operating internal combustion and propane-powered engines in or near confined spaces. Fatal levels of CO are quickly reached in confined spaces.

Other toxic chemicals can include welding fumes, vapors from liquid residues in storage tanks, or chemical products used in the confined spaces. Chemicals can quickly reach toxic levels in the air of a confined space, especially gases, solvent vapors, or sprayed products.

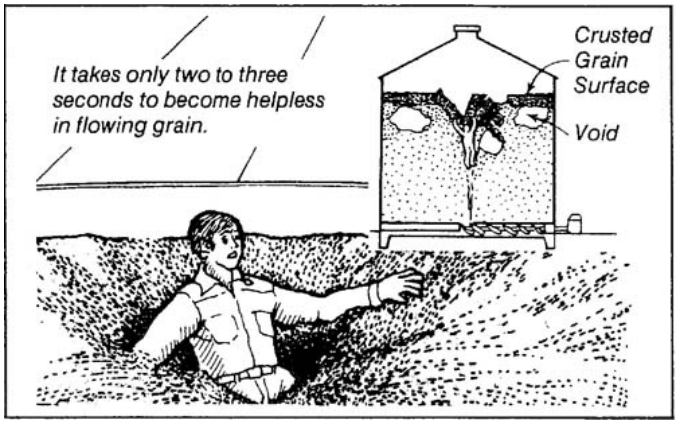


Propane-powered manlift in a large tank

Evaluating Permit-Required Confined Spaces

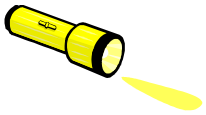
Engulfment is defined as the surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.

Engulfing materials include liquids or loose solids such as grain, seed, sand, dirt or other granular material. Workers often get engulfed when in-feed or out-feed lines are inadvertently opened or activated. Workers can suffocate because they cannot escape when caught in liquid or moving loose solids.



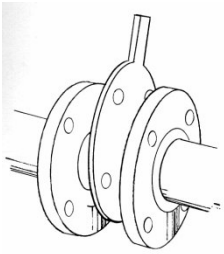
National AG Safety Database

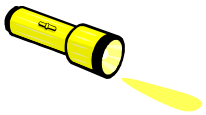
Can an engulfment hazard be isolated?



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
- double block and bleed system
- lockout or tagout of all sources of energy
- 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.

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.

Evaluating Permit-Required Confined Spaces

Hazardous Configuration is when the permit space has an internal configuration such that an entrant can be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to smaller cross-section.

Common examples include hoppers and cyclones.

The best practice of controlling this hazard is eliminating the hazardous configuration by redesign or installing an effective, permanent barrier or guard to prevent a worker from falling and becoming trapped.

Personal fall protection would not eliminate a fall hazard but rather control the hazard.

Other Recognized Serious Safety or Health Hazards

OR-OSHA's Permit-Required Confined Space standard applies when a safety or health hazard is serious enough to inhibit an entrant's ability to rescue themselves.

- Energized lines or parts
- Live steam lines
- Live hydraulic lines
- Moving parts (mechanical hazards)
- Welding
- Painting
- Fall
- Temperature
- Lighting
- Falling objects
- Noise
- Standing water obscuring openings

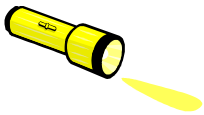
Live steam lines? Electrical lines?

Entering Permit-Required Confined Spaces

Once you have evaluated and identified the permit-required confined spaces at your workplace, **inform employees through signs and/or other equally effective means.**

If permit-required confined spaces will not be entered, you must still take all measures to prevent entry.

Note: Signs, or other equally effective means of informing, are required even if employees will not enter.



"Entry" is defined when any part of the body breaks the plane of the opening in a permit-required confined space.

When workers will enter permit-required confined spaces, OR-OSHA's Permit-Required Confined Space standard requires certain preventative measures to be taken to ensure safe entry. This is commonly referred to as a *written permit space program* and includes a written program, entry permits, entry team, rescue plan, and training. However, the OR-OSHA standard provides two additional options for permit space entry and, if employers comply with all requirements, excludes most of the elements under a *permit space program* (basically everything but training).

The two options are reclassifying permit spaces to nonpermit spaces or the use of alternative procedures to effectively control hazardous atmospheres. These two options are independent of each other – meaning they cannot be "combined" and used together.

The following page describes these two options and when they can be used.

Note: Specific requirements for Telecommunication and Electrical Generation, Transmission, and Distribution are found in OR-OSHA Div 2/Sub R.

Entering Permit-Required Confined Spaces

1. Can the hazard(s) which made the space a permit space be <u>eliminated?</u>

If **YES** The space can be reclassified as a nonpermit-required space.

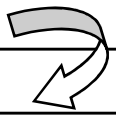
This is when the space has no actual or potential atmospheric hazards and when all other hazards (i.e. engulfment, configuration, moving parts, etc.) are eliminated without entering the space. If it's necessary to enter the permit space to eliminate the hazards, the entry must be in full compliance with the written permit space program.

Control of atmospheric hazards through forced air ventilation does not constitute *elimination* of the hazard. Question #2 below addresses this.

If hazards arise during entry into a reclassified space, the entrant must exit immediately and the space must be reevaluated.

There must be documentation detailing that the hazards were eliminated. This "certification" must contain the *date*, *location* of the space, and *signature* of the person certifying and must be available to all entrants or their representative.

If **NO** Prepare for permit entry or consider another question…



2. Is the <u>only</u> hazard of the permit space an actual or potential atmospheric hazard?

If **NO** Entry must be made under the written permit space program only.

If **YES** You can follow the alternate "(c)(5)" procedures.

This alternate procedure can only be used when (1) verification is made that using continuous forced air ventilation is safe, (2) monitoring and inspection data supports the atmospheric hazard is the only hazard and the forced air ventilation is effective, and (3) the data is documented and made available to the entrant(s).

If it's necessary to enter the permit space to obtain the monitoring data, the entry must be in full compliance with the written permit space program. When following these alternate procedures, the employer is not required to develop a written permit space program (training and employee participation are still required).

More on the alternate "(c)(5)" procedures on the next page…

Entering Permit-Required Confined Spaces

The following must also be done when using the alternate "(c)(5)" procedures

- ensure safety before removing a cover and guard opening immediately
- test internal atmosphere (Oxygen, Flammables, Toxins) - observation available to entrant
- continuous forced air ventilation
- atmosphere periodically tested - observation available to entrant
- evacuate immediately if necessary and evaluate what went wrong
- verify these procedures were conducted through a written certification

There must be documentation detailing that the space is safe for entry and the pre-entry measures were conducted. This "certification" must contain the *date*, *location* of the space, and *signature* of the person making the verification. The certification must be made before entry and must be made available to all entrants or to their authorized representative(s).

Continuous forced air ventilation (FAV) must be used as follows:

- no entry until FAV has eliminated any hazardous atmosphere
- direct FAV to ventilate immediate work area and areas where the entrant will likely be (be aware of pockets within the space)
- FAV must continue until all workers have left the space
- FAV must have clean source
- FAV must not increase the hazards in the space

Using Contractors

What does this basically involve?

The host employer must:

- Ensure compliance with permit space program
- Hazards of the permit space
- Precautions and procedures
- Coordinate entry operations (if conducted)
- Debrief when completed (hazards found or created)

The contractor must:

- Obtain information about permit space hazards & entry operations
- Coordinate entry operations (if conducted)
- Brief employer on permit space program being used
- Debrief employer on hazards confronted or created

Entering Permit-Required Confined Spaces

Written Permit Space Program

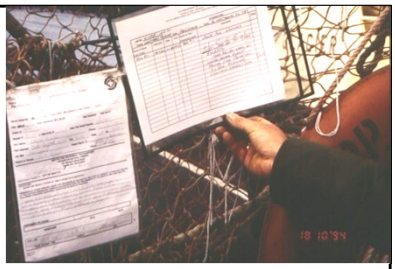
A written permit space program must be established when spaces cannot be reclassified or alternative procedures cannot be used. This permit system simply ensures that all means, practices, and procedures necessary for safe permit space entry has been conducted.

The completed permit must be made available to the entrants or their authorized representatives by posting or other effective means.

The duration of the permit must not exceed the time required to accomplish the identified task. The permit must be immediately canceled when the entry operations have been completed or a condition not allowed under the entry permit arises in or around the permit space.

Cancelled permits must be retained for one year to assist in evaluating the permit space program. Any problems during entry must be noted on the respective permit so this annual review can be effective!

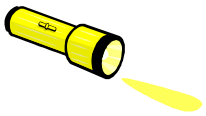
The entry permit must document:



1. Permit space to be entered;
2. Purpose of the entry;
3. Date & duration of the entry permit;
4. Authorized entrant(s) and Attendant(s);
5. Entry supervisor and place for signature;
6. Hazards of the permit space;
7. Isolation measures - hazard controls (purging, ventilating, etc.);
8. The acceptable entry conditions;
9. Test results (initial/periodic) with initials/name of tester & time;
10. Rescue/emergency services available and means to summon;
11. Communication procedures between entrant and attendant;
12. All necessary equipment (PPE, Testing/Communication equipment, etc.);
13. Other necessary information and/or additional permits (hot work, etc.).

Entering Permit-Required Confined Spaces

Written Permit Space Program



The intent of this permit space program is to manage and evaluate your permit space entries. The items on the permit address the components of your written plan to ensure safety and health of all involved.

Your written plan must include:

- ✓ The measures implemented to prevent unauthorized entry
- ✓ The identification and evaluation of all permit space hazards prior to entry
- ✓ The development and implementation of safe entry operations
- ✓ Providing and maintaining all necessary equipment (PPE, monitors, etc.)
- ✓ Evaluating permit space conditions before and during entry operations
- ✓ Providing at least one attendant and developing procedures for multiple spaces
- ✓ Designating and training all persons who have active roles
- ✓ Developing and implementing rescue and emergency procedures
- ✓ Developing and implementing the entry permit procedures (issue, use, cancel)
- ✓ Coordinating multi-employer entry procedures
- ✓ Developing procedures for concluding the entry (closing off the space)
- ✓ The review and evaluation of entry operations during the year (as needed)
- ✓ The annual permit space program review using the historic permits

What should be your goal of this written plan?

Entering Permit-Required Confined Spaces

The Entry Team and their Roles

The Entry Supervisor

- Knows the hazard(s), symptoms, and consequences
- Verifies the permit by determining if acceptable entry conditions exist
- Authorizes entry
- Oversees entry operations
- Terminates entry
- Verifies rescue services
- Removes unauthorized individuals
- Serves as attendant (if necessary)

The Attendant

- Knows the hazard(s), symptoms, and consequences
- Aware of potential behavioral effects
- Monitors entrants and maintains count
- Monitors hazards and activities in and outside of the permit space
- Remains outside entry point
- Communicates with entrant(s)
- Controls entry point
- Summons rescuers
- Initiates/performs non-entry rescue if required

The Entrant

- Knows the hazard(s), symptoms, and consequences
- Uses equipment properly
- Communicates regularly with the attendant
- If the unexpected occurs - alert the attendant
- Exits immediately if hazard(s) develops

The entrant(s) and/or their authorized representative must be given the opportunity to observe the atmospheric testing and completion of the permit.

Entering Permit-Required Confined Spaces

Atmospheric Testing

Initially and during entry.

Test for: (1) Oxygen; (2) Flammables; and (3) Toxins.

Detector Tubes

- Sealed glass tubes
- Chemical reaction results in color change
- Specific for the substance of concern
- High error rate (25-30%)

Gas Detection Instruments

- Sensors measure concentrations
- Results in a meter or digital reading; alarms
- Portable multi-gas instruments
- Calibration is critical

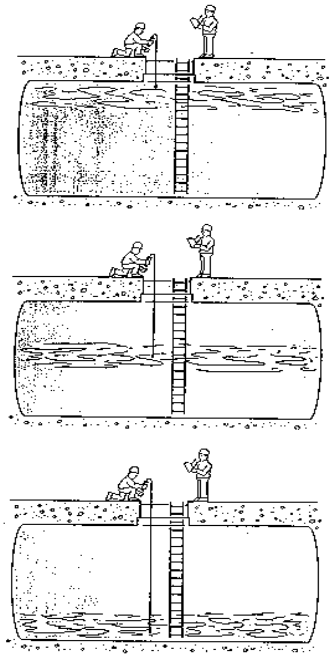
The individual conducting the air monitoring must be competent in the proper selection, use (placement, space stratification, etc.), maintenance, limitations (cross-sensitivity and chemical interference), and calibration. Be sure to read the manufacturer's specifications.

Sampling

Methane:	**0.55**
Ammonia:	**0.59**
Carbon Monoxide:	**0.96**
Nitrogen:	**0.97**
Air:	**1.0**
Hydrogen Sulfide:	**1.2**
Carbon Dioxide:	**1.5**
Gasoline:	**3- 4**
Jet Fuel, JP-8:	**4.7**

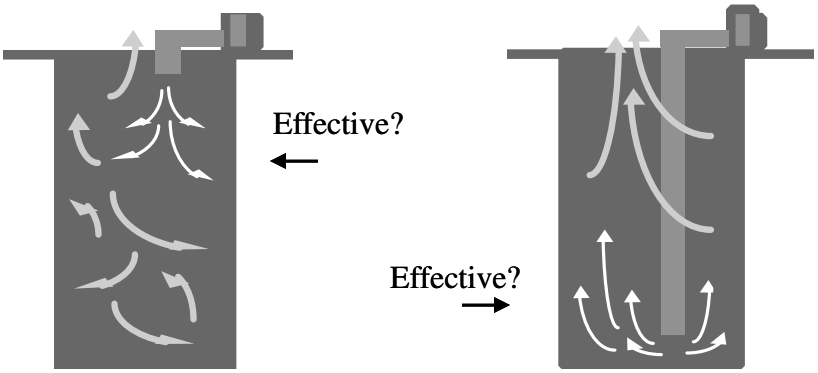
Lighter than air gases

Heavier than air gases



Entering Permit-Required Confined Spaces

Ventilation



Blowers & fans provide mechanical dilution ventilation. Be sure the blower is appropriately sized, explosion-proof, and its intake is placed far enough away from any source of contamination - *like an exhaust pipe on a vehicle!*

A space under positive pressure will eventually expel the contaminant through an opening but the time it takes is the real question.

Localized exhaust ventilation is better suited to capture fumes (welding), dust, and chemical contaminants.

Remember, purging a space with an inert gas expels a flammable but leaves no oxygen.

Ventilation must be continuous when there is an existing or potential atmospheric hazard.

Respiratory Protection

Respirators may be required at times. Respirators must be worn in oxygen deficient atmospheres or when toxins are capable of causing death, incapacitation, impairment of ability to self-rescue, injury, or acute illness due to their health effects.

A supplied air respirator is required for oxygen deficiency or toxic chemical levels that are immediately dangerous to life or health (IDLH). An air-purifying respirator (respirators that filter contaminated air) cannot be used in these atmospheres.

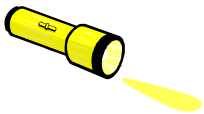
Employees must have complete training on the proper use of respirators. Please refer to OR-OSHA Div 2/Sub I 29 CFR 1910.134 for more details.

Training

All employees who work in and around permit-required confined spaces must be trained in order to acquire the understanding, knowledge, and skills necessary to safely perform their assigned duties.

Training must be provided to each affected employee:

- before their first assigned duty
- before there is a change in assigned duties
- whenever there is a change in permit space operations and the affected employee(s) has not previously been trained on the hazard(s)
- whenever there is reason to believe there are deviations from the permit space entry procedures or inadequacies in the employee's knowledge or use of the procedures



Training must establish worker proficiency and include new or revised procedures to ensure compliance with permit space standards. *Be sure to include a demonstration!*

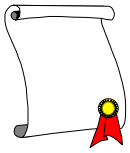
The content of the training must include:

- nature of the hazards
- procedures to take when exposed to hazards
- use of rescue and emergency equipment

What more can be included?

Verify the appropriate training was completed through a written certification. The certification must contain each employee's name, the signature(s) of the trainers, and the date(s) of the training.

Should you include more on the training record?



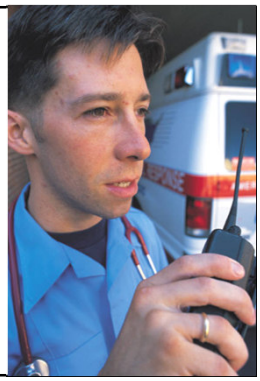
Rescue and Emergency Services

Three Options to Permit-Required Confined Space Rescue

1. Arrange for rescue service from an outside source.

Evaluate their ability to respond in a timely manner considering the hazard(s) evaluated and proficiency with rescue-related tasks and equipment.

- "timely" will vary according to the specific hazards involved
- provide the rescue service with access to all permit spaces from which rescue may be necessary so they can develop appropriate rescue plans and practice rescue operations



2. Arrange for your own employees to provide rescue.

Provide necessary PPE and training in the PPE; training in their assigned rescue duties; training in first aid & CPR; practice simulated permit space rescues at least annually in respective spaces using manikins or actual persons.

3. Provide for non-entry rescue.

Provide necessary retrieval equipment such as a full body harness and a mechanical device when permit space depths are more than five feet.

- unless the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant

If a chemical is involved during an emergency, provide the necessary MSDS immediately!

Reference

Rescue and Emergency Services
OR-OSHA Div 2/Sub J 29 CFR 1910.146(k)

Rescue and Emergency Services
OR-OSHA Div 2/Sub J 29 CFR 1910.146
Appendix F – Rescue Team or Rescue Service Evaluation Criteria (Non-Mandatory)

Confined Space and PRCS Recognition Checklist

Sample Entry Permit

Quick Reference Flow Chart

Rescue and Emergency Services

OR-OSHA Div 2/Sub J 29 CFR 1910.146(k) Rescue and emergency services.

(1) An employer who designates rescue and emergency services, pursuant to paragraph (d)(9) of this section, shall:

(i) Evaluate a prospective rescuer's ability to respond to a rescue summons in a timely manner, considering the hazard(s) identified;
Note to paragraph (k)(1)(i): What will be considered timely will vary according to the specific hazards involved in each entry. For example, §1910.134, Respiratory Protection, requires that employers provide a standby person or persons capable of immediate action to rescue employee(s) wearing respiratory protection while in work areas defined as IDLH atmospheres.

(ii) Evaluate a prospective rescue service's ability, in terms of proficiency with rescue-related tasks and equipment, to function appropriately while rescuing entrants from the particular permit space or types of permit spaces identified;

(iii) Select a rescue team or service from those evaluated that:
(A) Has the capability to reach the victim(s) within a time frame that is appropriate for the permit space hazard(s) identified;
(B) Is equipped for and proficient in performing the needed rescue services;

(iv) Inform each rescue team or service of the hazards they may confront when called on to perform rescue at the site; and

(v) Provide the rescue team or service selected 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.
Note to paragraph (k)(1): Non-mandatory Appendix F contains examples of criteria which employers can use in evaluating prospective rescuers as required by paragraph (k)(l) of this section.

(2) An employer whose employees have been designated to provide permit space rescue and emergency services shall take the following measures:

(i) Provide affected employees with the personal protective equipment (PPE) needed to conduct permit space rescues safely and train affected employees so they are proficient in the use of that PPE, at no cost to those employees;

(ii) Train affected employees to perform assigned rescue duties. The employer must ensure that such employees successfully complete the training required to establish proficiency as an authorized entrant, as provided by paragraphs (g) and (h) of this section;

(iii) Train affected employees in basic first-aid and cardiopulmonary resuscitation (CPR). The employer shall ensure that at least one member of the rescue team or service holding a current certification in first aid and CPR is available; and

Rescue and Emergency Services

OR-OSHA Div 2/Sub J 29 CFR 1910.146(k) Rescue and emergency services (con't).

(iv) Ensure that affected employees practice making permit space rescues at least once every 12 months, by means of simulated rescue operations in which they remove dummies, 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.

(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, above the entrant's head , or at another point which the employer can establish presents a profile small enough for the successful removal of the entrant. 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.

Non-mandatory Appendix F contains examples of criteria which employers can use in evaluating prospective rescuers as required by paragraph (k)(l) of this section.

Rescue and Emergency Services

OR-OSHA Div 2/Sub J 29 CFR 1910.146 Appendix F – Rescue Team or Rescue Service Evaluation Criteria (Non-Mandatory)

(1) This appendix provides guidance to employers in choosing an appropriate rescue service. It contains criteria that may be used to evaluate the capabilities both of prospective and current rescue teams. Before a rescue team can be trained or chosen, however, a satisfactory permit program, including an analysis of all permit-required confined spaces to identify all potential hazards in those spaces, must be completed. OSHA believes that compliance with all the provisions of §1910.146 will enable employers to conduct permit space operations without recourse to rescue services in nearly all cases. However, experience indicates that circumstances will arise where entrants will need to be rescued from permit spaces. It is therefore important for employers to select rescue services or teams, either on-site or off-site, that are equipped and capable of minimizing harm to both entrants and rescuers if the need arises.

(2) For all rescue teams or services, the employer's evaluation should consist of two components: an initial evaluation, in which employers decide whether a potential rescue service or team is adequately trained and equipped to perform permit space rescues of the kind needed at the facility and whether such rescuers can respond in a timely manner, and a performance evaluation, in which employers measure the performance of the team or service during an actual or practice rescue. For example, based on the initial evaluation, an employer may determine that maintaining an on-site rescue team will be more expensive than obtaining the services of an off-site team, without being significantly more effective, and decide to hire a rescue service. During a performance evaluation, the employer could decide, after observing the rescue service perform a practice rescue, that the service's training or preparedness was not adequate to effect a timely or effective rescue at his or her facility and decide to select another rescue service, or to form an internal rescue team.

A. Initial Evaluation

I. The employer should meet with the prospective rescue service to facilitate the evaluations required by §1910.146(k)(1)(i) and §1910.146(k)(1)(ii). At a minimum, if an off-site rescue service is being considered, the employer must contact the service to plan and coordinate the evaluations required by the standard. Merely posting the service's number or planning to rely on the 911 emergency phone number to obtain these services at the time of a permit space emergency would not comply with paragraph (k)(1) of the standard.

II. The capabilities required of a rescue service vary with the type of permit spaces from which rescue may be necessary and the hazards likely to be encountered in those spaces. Answering the questions below will assist employers in determining whether the rescue service is capable of performing rescues in the permit spaces present at the employer's workplace.

1. What are the needs of the employer with regard to response time (time for the rescue service to receive notification, arrive at the scene, and set up and be ready for entry)?

Rescue and Emergency Services

OR-OSHA Div 2/Sub J 29 CFR 1910.146 Appendix F – Rescue Team or Rescue Service Evaluation Criteria (Non-Mandatory)

For example, if entry is to be made into an IDLH atmosphere, or into a space that can quickly develop an IDLH atmosphere (if ventilation fails or for other reasons), the rescue team or service would need to be standing by at the permit space. On the other hand, if the danger to entrants is restricted to mechanical hazards that would cause injuries (e.g., broken bones, abrasions) a response time of 10 or 15 minutes might be adequate.

2. How quickly can the rescue team or service get from its location to the permit spaces from which rescue may be necessary? Relevant factors to consider would include: the location of the rescue team or service relative to the employer's workplace, the quality of roads and highways to be traveled, potential bottlenecks or traffic congestion that might be encountered in transit, the reliability of the rescuer's vehicles, and the training and skill of its drivers.

3. What is the availability of the rescue service? Is it unavailable at certain times of the day or in certain situations? What is the likelihood that key personnel of the rescue service might be unavailable at times? If the rescue service becomes unavailable while an entry is underway, does it have the capability of notifying the employer so that the employer can instruct the attendant to abort the entry immediately?

4. Does the rescue service meet all the requirements of paragraph (k)(2) of the standard? If not, has it developed a plan that will enable it to meet those requirements in the future? If so, how soon can the plan be implemented?

5. For off-site services, is the service willing to perform rescues at the employer's workplace? (An employer may not rely on a rescuer who declines, for whatever reason, to provide rescue services.)

6. Is an adequate method for communications between the attendant, employer and prospective rescuer available so that a rescue request can be transmitted to the rescuer without delay? How soon after notification can a prospective rescuer dispatch a rescue team to the entry site?

7. For rescues into spaces that may pose significant atmospheric hazards and from which rescue entry, patient packaging and retrieval cannot be safely accomplished in a relatively short time (15-20 minutes), employers should consider using airline respirators (with escape bottles) for the rescuers and to supply rescue air to the patient. If the employer decides to use SCBA, does the prospective rescue service have an ample supply of replacement cylinders and procedures for rescuers to enter and exit (or be retrieved) well within the SCBA's air supply limits?

Rescue and Emergency Services

OR-OSHA Div 2/Sub J 29 CFR 1910.146 Appendix F – Rescue Team or Rescue Service Evaluation Criteria (Non-Mandatory)

8. If the space has a vertical entry over 5 feet in depth, can the prospective rescue service properly perform entry rescues? Does the service have the technical knowledge and equipment to perform rope work or elevated rescue, if needed?

9. Does the rescue service have the necessary skills in medical evaluation, patient packaging and emergency response?

10. Does the rescue service have the necessary equipment to perform rescues, or must the equipment be provided by the employer or another source?

B. Performance Evaluation

Rescue services are required by paragraph (k)(2)(iv) of the standard to practice rescues at least once every 12 months, provided that the team or service has not successfully performed a permit space rescue within that time. As part of each practice session, the service should perform a critique of the practice rescue, or have another qualified party perform the critique, so that deficiencies in procedures, equipment, training, or number of personnel can be identified and corrected. The results of the critique, and the corrections made to respond to the deficiencies identified, should be given to the employer to enable it to determine whether the rescue service can quickly be upgraded to meet the employer's rescue needs or whether another service must be selected. The following questions will assist employers and rescue teams and services evaluate their performance.

1. Have all members of the service been trained as permit space entrants, at a minimum, including training in the potential hazards of all permit spaces, or of representative permit spaces, from which rescue may be needed? Can team members recognize the signs, symptoms, and consequences of exposure to any hazardous atmospheres that may be present in those permit spaces?

2. Is every team member provided with, and properly trained in, the use and need for PPE, such as SCBA or fall arrest equipment, which may be required to perform permit space rescues in the facility? Is every team member properly trained to perform his or her functions and make rescues, and to use any rescue equipment, such as ropes and backboards, that may be needed in a rescue attempt?

3. Are team members trained in the first aid and medical skills needed to treat victims overcome or injured by the types of hazards that may be encountered in the permit spaces at the facility?

4. Do all team members perform their functions safely and efficiently? Do rescue service personnel focus on their own safety before considering the safety of the victim?

Rescue and Emergency Services

OR-OSHA Div 2/Sub J 29 CFR 1910.146 Appendix F – Rescue Team or Rescue Service Evaluation Criteria (Non-Mandatory)

5. If necessary, can the rescue service properly test the atmosphere to determine if it is IDLH?

6. Can the rescue personnel identify information pertinent to the rescue from entry permits, hot work permits, and MSDSs?

7. Has the rescue service been informed of any hazards to personnel that may arise from outside the space, such as those that may be caused by future work near the space?

8. If necessary, can the rescue service properly package and retrieve victims from a permit space that has a limited size opening (less than 24 inches (60.9 cm) in diameter), limited internal space, or internal obstacles or hazards?

9. If necessary, can the rescue service safely perform an elevated (high angle) rescue?

10. Does the rescue service have a plan for each of the kinds of permit space rescue operations at the facility? Is the plan adequate for all types of rescue operations that may be needed at the facility? Teams may practice in representative spaces, or in spaces that are "worst-case" or most restrictive with respect to internal configuration, elevation, and portal size. The following characteristics of a practice space should be considered when deciding whether a space is truly representative of an actual permit space:

(1) Internal configuration.

(a) **Open** – there are no obstacles, barriers, or obstructions within the space. One example is a water tank.

(b) **Obstructed** – the permit space contains some type of obstruction that a rescuer would need to maneuver around. An example would be a baffle or mixing blade. Large equipment, such as a ladder or scaffold, brought into a space for work purposes would be considered an obstruction if the positioning or size of the equipment would make rescue more difficult.

(2) Elevation.

(a) **Elevated** – a permit space where the entrance portal or opening is above grade by 4 feet or more. This type of space usually requires knowledge of high angle rescue procedures because of the difficulty in packaging and transporting a patient to the ground from the portal.

(b) **Non-elevated** – a permit space with the entrance portal located less than 4 feet above grade. This type of space will allow the rescue team to transport an injured employee normally.

Rescue and Emergency Services

OR-OSHA Div 2/Sub J 29 CFR 1910.146 Appendix F – Rescue Team or Rescue Service Evaluation Criteria (Non-Mandatory)

(3) Portal size.

- **(a) Restricted** – A portal of 24 inches or less in the least dimension. Portals of this size are too small to allow a rescuer to simply enter the space while using SCBA. The portal size is also too small to allow normal spinal immobilization of an injured employee.
- **(b) Unrestricted** – A portal of greater than 24 inches in the least dimension. These portals allow relatively free movement into and out of the permit space.

(4) Space access.

- **(a) Horizontal** – The portal is located on the side of the permit space. Use of retrieval lines could be difficult.
- **(b) Vertical** – The portal is located on the top of the permit space, so that rescuers must climb down, or the bottom of the permit space, so that rescuers must climb up to enter the space. Vertical portals may require knowledge of rope techniques, or special patient packaging to safely retrieve a downed entrant.

Teams may practice in representative spaces, or in spaces that are "worst-case" or most restrictive with respect to internal configuration, elevation, and portal size.

CONFINED SPACE AND PRCS RECOGNITION CHECKLIST

PART I

____ 1. Is the space large enough so an employee can bodily enter and perform work?

____ 2. Does the space have limited or restricted means of entry and exit?

____ 3. Is the space not designed for continuous occupancy?

If the answer is yes to all items in Part I, continue to Part II. If the answer is no to any of the items in Part I, the space is not considered a confined space.

PART II

____ 1. Does the space contain or potentially contain a hazardous atmosphere?

____ 2. Does the space contain any chemicals or chemical residues?

____ 3. Does the space contain any flammable/combustible substances?

____ 4. Does the space contain or potentially contain any decomposing organic matter?

____ 5. Does the space have any pipes which bring chemicals into it?

____ 6. Does the space have any materials that can trap or potentially trap, engulf, or drown an entrant?

____ 7. Is vision obscured by dust at 5 feet or less?

____ 8. Does the space contain any mechanical equipment servicing the space?

____ 9. Does the space have converging walls, sloped floors or tapered floor to smaller cross-sections which could trap or asphyxiate an entrant?

____ 10. Does the tank or vessel contain rusted interior surfaces?

____ 11. Does the space contain thermal hazards (e.g. cold, hot)?

____ 12. Does the space contain excessive noise levels which could interfere with communication with an attendant?

____ 13. Does the space present any slip, trip, or fall hazards?

____ 14. Are there any operations conducted near the space opening which could present a hazard to the entrant?

____ 15. Are there any hazards from falling objects?

____ 16. Are there lines under pressure servicing the space?

____ 17. Are cleaning solvents or paints going to be used in the space?

____ 18. Is welding, cutting, brazing, riveting, scraping, or sanding going to be performed in the space?

____ 19. Is electrical equipment located in or required to be used in the space?

____ 20. Does the space have poor natural ventilation which would allow an atmospheric hazard to develop?

____ 21. Are there any corrosives which could irritate the eyes in the space?

____ 22. Are there any conditions which could prevent any entrant's self rescue from the space?

____ 23. Are there any substances used in the space which have acute hazards?

____ 24. Is mechanical ventilation needed to maintain a safe environment?

____ 25. Is air monitoring necessary to ensure the space is safe for entry due to a potential hazardous atmosphere?

____ 26. Will entry be made into a diked area where the dike is 5 feet or more in height?

____ 27. Are residues going to be scraped off the interior surfaces of the vessel?

____ 28. Are non-sparking tools required to remove residues?

____ 29. Does the space restrict mobility to the extent that it could trap an irritant?

____ 30. Is respiratory protection required because of a hazardous atmosphere?

____ 31. Does the space present a hazard other than those noted above which would make it a permit space?

If any other questions in PART II have been checked yes, the confined space is likely a Permit-Required Confined Space (PRCS). As such, entry into these spaces must be performed under the protection of your PRCS program. *Note: In some situations, alternative procedures or reclassifying to a non-PRCS may be possible in lieu of a full PRCS program.*

A Sample Permit

XYZ Inc., Confined Space Entry Permit (Example)

Date & Time Issued _____ Date & Time Expires _____
Job site/space I.D. _____ Job Supervisor _____
Equipment to be worked on _____ Work to be performed _____
Entrants _____ _____ _____
Stand-by personnel _____ _____ _____

1. Atmospheric checks Time _____
Oxygen _____%
Explosive _____% LFL
Toxic _____ PPM

2. Tester's signature _____

3. Source isolation (No Entry) NA Yes No
Pumps or lines blinded, disconnected or blocked ___ ___ ___

4. Ventilation Modification
Mechanical ___ ___ ___
Natural Ventilation only ___ ___ ___

5. Atmospheric check after isolation and ventilation
Time _____
Oxygen _____% > 19.5%
Explosive _____%LFL < 10%
Toxic _____PPM < 10 PPM H_2S
Tester's signature _____

6. Communication procedures _____
_____

7. Rescue procedures: _____
_____
_____

8. Entry, standby, backup persons
Training completed? Yes ___ No ___
Training current? Yes ___ No ___

9. Equipment NA Yes No
Direct reading gas monitor tested? ___ ___ ___
Safety harnesses/lifelines for entrants/standby crew? ___ ___ ___
Hoists ___ ___ ___
Powered communications? ___ ___ ___
SCBA's for entrants and standby crew? ___ ___ ___
Protective clothing? ___ ___ ___
All electric equipment listed Class I, Div I, Group D and non-spark producing? ___ ___ ___

10. Periodic atmospheric tests

Time ____O^2 ___% Explosive ___% Toxic ___%
Time ____O^2 ___% Explosive ___% Toxic ___%
Time ____O^2 ___% Explosive ___% Toxic ___%
Time ____O^2 ___% Explosive ___% Toxic ___%
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Time ____O^2 ___% Explosive ___% Toxic ___%

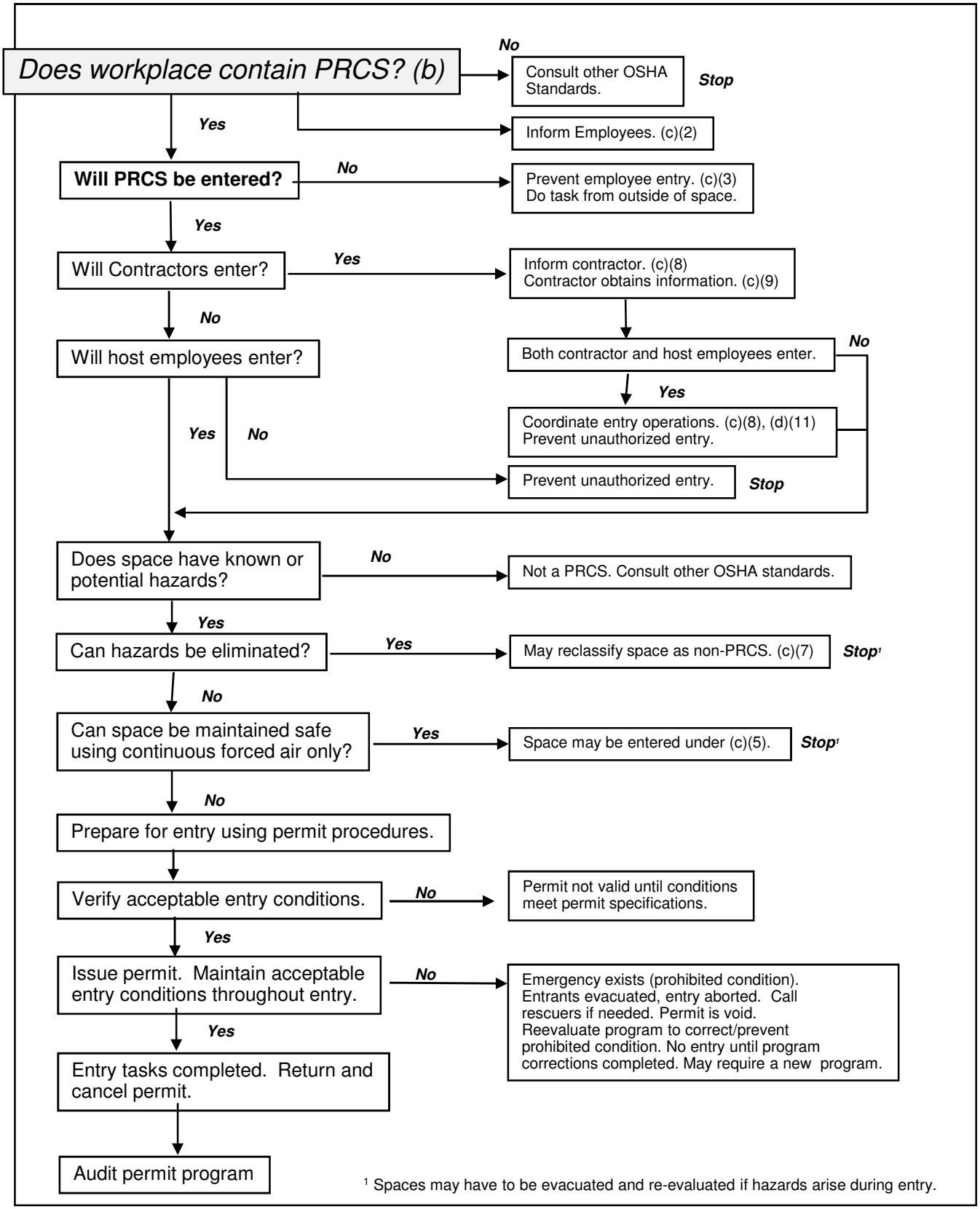
We have reviewed the work authorized by this permit and the information contained herein. Written instructions and safety procedures have been received and are understood. Entry cannot be approved if any column is marked "no". This permit is not valid unless all appropriate items are completed.

Permit prepared by: (Supervisor) _____ _____

Approved by: (Unit Supervisor) _____ _____

Reviewed by: (CS Ops Personnel) _____ _____
(Printed Name) (Signature)

A quick reference to the Permit-Required Confined Space Standard



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

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