

**The  
Oregon OSHA  
Confined Space Rule  
Applicable  
to  
General Industry  
and  
Construction**



**Student Workbook**

# 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.

Notes for the instructor for this class are found in the Instructor's Guide, in text boxes with dashed lines. Answers to all activities are found in Appendix F of the Student Workbooks as well as in the Instructor's Guide.

In addition to this workbook, guidance is available in the form of materials on the Oregon OSHA website [www.orosha.org](http://www.orosha.org), and through Oregon OSHA Consultation.

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# Introduction

The objective of this class is to raise the awareness level of attendees regarding practices intended to protect workers from the hazards of working in a confined space. This will be accomplished through the use of discussion, activities and resources including the Oregon OSHA Confined Space Rule applicable to General Industry and Construction, OAR 437-002-0146.

But what is our real goal? To save lives—maybe a co-worker or an employee, certainly someone's son or daughter. We have all heard of fatalities related to confined space work that included the people who originally entered the space and also the person or persons who tried to rescue them. It is because of this grim reality that Oregon OSHA has developed the Confined Space Rule.



# Purpose and Application

## What is the purpose of this rule?

The purpose of this rule is to provide requirements to protect employees from the hazards of entering and working in confined spaces.

## Who does this rule apply to?

OAR 437-002-146 applies to the state of Oregon. It covers all activities in confined spaces for employers covered by the Oregon OSHA regulations for General Industry (Division 2) and Construction (Division 3).

It is not the Federal OSHA standard 29 CFR 1910.146.

## When does this rule go into effect?

The rule amendments are effective as of January 1, 2015 for General Industry, and for Construction on March 1, 2015.



# What is Not Covered?



Pipe in Excavation

**Activity:**  
**Look at the photos in this section. Are they of exempted activities? Why or why not?**

Some work may appear to be covered by the Confined Space Rule, but is actually covered by another rule:

- (a) Construction work regulated by Division 3/P Excavations, except for entry into sewer spaces that are large enough to bodily enter.
- (b) Construction work regulated by Division 3/S Underground Construction, Caissons, Cofferdams and Compressed Air, except for sewers.
- (c) Enclosed spaces regulated by 1910.269 in Division 2/R Electric Power Generation, Transmission And Distribution, except when that standard requires compliance with this standard.
- (d) Enclosed spaces regulated by 1926.953 in Division 3/V Electric Power Generation, Transmission And Distribution, except when that standard requires compliance with this standard.
- (e) Manholes and vaults regulated by 1910.268(o) in Division 2/R Telecommunications, unless the space cannot be made safe to enter even after following the requirements of 1910.268(o).

*Note: Division 3/J, the Construction Welding Standard, also contains language pertaining to confined space work.*

## What is Not Covered?



Welding During  
Tank Construction



Grain Elevator  
Headworks

**(f)** Welding in confined spaces regulated by Division 2/Q Welding, Cutting & Brazing, when the only hazards are related to the welding process.

**(g)** Grain bins, silos, tanks, and other grain storage structures regulated by 1910.272, Grain Handling Facilities.

**(h)** Diving operations regulated by Division 2/T, Commercial Diving Operations.

**(i)** Except for (a) through (h) above, when any other applicable standard addresses work in confined spaces or additional hazards that may be present, you must comply with the provisions of that standard and this standard. Where the requirements of one standard are more restrictive than the other, follow the more stringent requirements.

*Note: The intent of subpart (i) is to address conflict between rules, especially in future rulemaking.*

### 437-002-0146 Confined Spaces

(1) **Purpose and application.** This rule applies to all activities in confined spaces and provides requirements to protect employees from the hazards of entering and working in confined spaces.

(2) **Exceptions.** This standard does not apply to the following:

(a) Construction work regulated by Division 3/P Excavations, except for existing sanitary sewers and new sanitary sewers when connected to an existing sanitary sewer.

(b) Construction work regulated by Division 3/S Underground Construction, Caissons,

**Are there words in the rule with specific definitions? Yes! They can be found in Section 3 of the rule, which is located in Appendix A of this workbook.**

(g) Diving operations regulated by Division 2/T, Commercial Diving Operations.

(h) Except for (a) through (g) above, when any other applicable standard addresses work in confined spaces or additional hazards that may be present, you must comply with the provisions of that standard and this standard. Where the requirements of one standard are more restrictive than the other, follow the more stringent requirements.

(3) **Definitions.**

**Acceptable entry conditions:** The conditions that must exist in a permit-required confined space to allow safe entry and work.

**Alternate entry** – An alternative process for entering a permit space under very specific conditions. The space remains a permit space even when entered using alternate entry.

**Atmospheric hazard** (see the definition of hazardous atmosphere).

**Authorized** – Approved by the employer or controlling contractor.

**Attendant** - An individual stationed outside one or more permit spaces to monitor the authorized entrants and who performs all attendants duties assigned in the employer's permit space program.

**Atmospheric testing** – see "Testing."

**Authorized entrant** - An employee who is authorized by the employer to enter a permit space.

**Barrier** - A physical obstruction that blocks or limits access.

# What is a Confined Space?

It is a space that meets all of the following requirements:

Large enough and shaped so someone can fully enter and do work

AND

Entry and/or exit is limited or restricted

AND

Is not designed for continuous human occupancy

## Activity:

Identify the confined spaces in the following photos.



Sport Utility Vehicle

**What is a Confined Space?**



Plastic  
Tanks

Welding During  
Tank Construction



Cement  
Mixer

Cement Mixer  
Drum



**What is a Confined Space?**



Fermentation  
Tank



Produce  
Washer



Manhole  
in Excavation

Underground  
Utility Tunnel



# What is a Permit-required Confined Space?

It is a confined space with a hazard as explained below:



Have or could have a **hazardous atmosphere**



Contains a material that could **trap or bury**



Is **shaped** so a person could be trapped or asphyxiated



Has **any other recognized serious safety or health hazard**

# Hazard Evaluation

In the Confined Space Rule there are two main types of hazards: physical and atmospheric. They may be present or have the potential to be present. Prior to entry, hazards should be anticipated, identified, evaluated, and eliminated if a physical hazard, and controlled or eliminated if an atmospheric hazard.

A **physical hazard** is defined as an existing or potential hazard that can cause:

- Death
- Serious physical harm

It includes but is not limited to:

- Explosives
- Mechanical, electrical, hydraulic and pneumatic energy
- Radiation
- Temperature extremes
- Engulfment
- Noise , if it prevents the ability to communicate or hear warnings
- Inwardly converging surfaces
- Chemicals that can cause death or serious physical harm through skin or eye contact, rather than by inhalation

*Note: Consider the work when defining the hazard.*

*Note: Does the hazard limit the ability to escape without help?.*

## Hazard Evaluation

An **atmospheric hazard** is an existing or potential atmosphere that may expose employees to the risk of:

- Death
- Incapacitation
- Impairment of ability to escape without help
- Injury
- Acute illness

As a result of one or more of the following conditions:

- A flammable gas, vapor, or mist in excess of 10 percent of its lower flammable limit
- An airborne combustibile dust
- An atmospheric oxygen concentration below 19.5 percent or above 23.5 percent (oxygen deficiency and oxygen enrichment)
- An airborne concentration of a substance that exceeds the dose or exposure limit specified by an Oregon OSHA requirement (dust that obscures vision at a distance of 5 feet is included)
- An atmosphere that presents an immediate danger to life or health (IDLH)

In other words, any atmosphere that could result in death or serious injury to a worker as caused by oxygen deficiency or enrichment, toxic materials, and flammable or explosive materials. The emphasis is on acute hazards, not chronic.

*Note: While welding, noise, falls, asbestos, lead, and silica may be hazards in a confined space, they are all covered under specific rules. For example, if lead is the only hazard, then the Lead Rule applies, not the Confined Space Rule.*

## Hazard Evaluation

**To anticipate and identify**, check historical information such as accident investigations, OSHA 300 Logs, Workers' Compensation claims, worksite inspections and Safety Data Sheets (SDS). Consider injury and illness data from sources such as the Oregon Occupational Safety and Health Administration (Oregon OSHA), The National Institute of Occupational Safety and Health (NIOSH), the Oregon Institute of Occupational Health Sciences (OIOHS) and trade or professional associations, if available.

**To evaluate**, measure the hazard with a device, such as a gas meter or other direct-reading instrument. Conform or compare to set standards where acceptable and unacceptable conditions have been determined, such as Oregon OSHA's Division 2/Sub Z Toxic and Hazardous Substances Rule Permissible Exposure Limits (OSHA PELs), National Institute of Occupational Safety and Health Recommended Exposure Limits (NIOSH RELs), the American National Standards Institute (ANSI), or the American Congress of Governmental Industrial Hygienists Threshold Limit Values (ACGIH TLVs).

**To eliminate or control**, remember that elimination removes the source of the hazard, while a control is a means to prevent or reduce exposure to the hazard. For the purpose of this rule, removal of the source of the hazard and isolation are considered elimination, with lockout being an example. Engineering controls such as mechanical ventilation are considered control measures. Personal protective equipment, such as respirators, are not considered engineering control measures.

*Note: For the purpose of this rule, tagout is allowed for a permit entry, but lockout is required for an alternate entry.*

*Note: In some cases, such as with painting and welding, exhaust ventilation should be used as well as forced-air ventilation to control the hazard.*

**Activity:**  
**Can this four-gas monitor be used to measure all atmospheric hazards?**  
**Why or why not?**  
**What can it measure?**



**Activity:**  
**Under what conditions would the confined spaces shown below be permit-required confined spaces?**



Manhole in Excavation



Tank



Cement Mixer



Cement Mixer Drum

# Identifying Permit-Required Confined Spaces with Signs

You must have a way for employees to recognize your permit-required confined spaces. In addition to training, you can use signs, labels or tags.

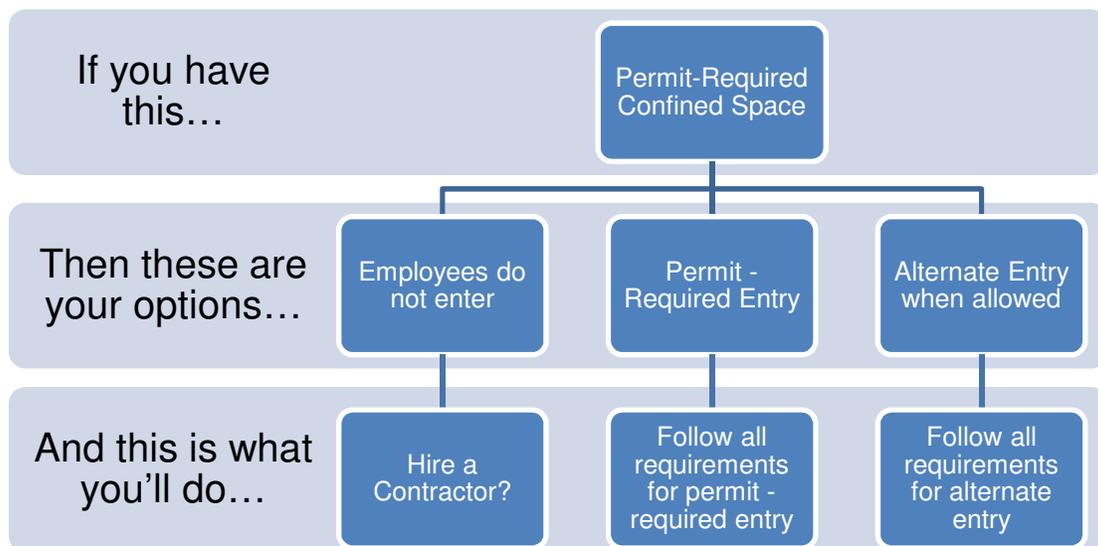
The rule does not require each space to have its own sign—it's acceptable to identify a group of similar spaces, such as manholes, in a general way.



# Entering a Permit-Required Confined Space

After you have identified and evaluated your permit-required confined spaces, you'll need to make some decisions about how those spaces will be entered. What are your options for entering a permit-required confined space?

In Oregon, under Oregon OSHA standard OAR 437-002-0146, you have the following options:



We will look at the requirements for each option in the order they appear.

# Employees Do Not Enter

What are your responsibilities if you decide your employees will not enter your permit-required confined spaces?

Your employees must know how to identify your permit-required confined spaces, and that they are not allowed to enter.

If you have someone else enter your permit-required confined spaces, such as a contractor, then you are required to provide them any information you have about the hazards of the space (e.g. why you consider the space to be a permit-required confined space). More information on this topic will be provided in a later section of this workbook, Multi-employer Worksites.

# Entry with a Permit

To enter a permit-required confined space with a full permit, do or have the following. The corresponding paragraphs in the Confined Space Rule are found in parentheses:

- Evaluations (4)
- Permit-required confined space written entry program and permits (5)
- Permit entry procedures (6)
- Equipment (7)
- Personnel (8)
- Rescue (9)
- Training (11)
- Multi-employer worksite procedures (12)
- Records(13)



## Entering a Permit-required Confined Space

### Entry with a Permit - Written Program and Permits

What must be included in the written program? The full list of requirements is found on page J-9 of the rule, which is included as Appendix A of this workbook, but here is a partial summary:

- Develop and implement a written program that describes the means, practices, and procedures to safely identify and enter those spaces.
- On fixed sites, also include a catalog of the locations of all permit spaces, and the reasons why they are permit spaces. A group of similar spaces, such as manholes, can be identified in a general way.
- Ensure employees and their representatives have access to the written program.

As a best practice for construction, you may wish to develop a written program that can be tailored to the different potential sites you might encounter in your line of business, well in advance of any actual entry. Also, many general contractors require subcontractors to have a written program.

There are requirements in the program for managing permits, also. Within one year of their cancellation date, all permits must be reviewed to evaluate the program. Also, the program must be reviewed and revised if there is reason to believe employees are not adequately protected. Situations that require this review include unauthorized entry of a permit-required space, and any injury or near-miss during entry.

*Note: A permit is documentation of your process for performing a permit-required confined space entry. It serves as the written authorization from your company to perform the entry.*

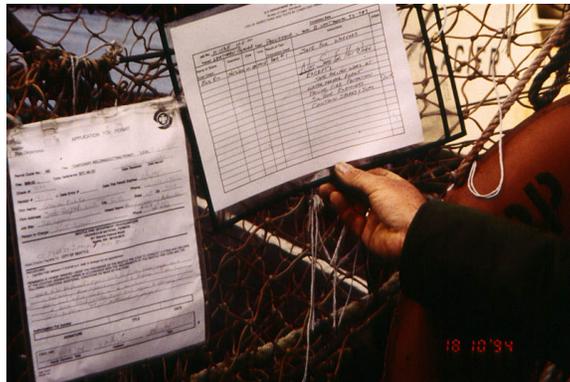
## Entering a Permit-required Confined Space

### Entry with a Permit - Procedures

You must have the following in place to enter a permit space:

1. Entry permits that include the following information:

- ✓ The space to be entered
- ✓ The purpose of the entry
- ✓ The date, start, and stop times of the permit
- ✓ The hazards of the space
- ✓ Acceptable entry conditions
- ✓ Results of initial tests and periodic monitoring, or the period for continuous monitoring, and the names or initials of the testers and when the tests were performed
- ✓ Measures to isolate the space and eliminate or controls hazards before entry
- ✓ Names of entrants and current attendants
- ✓ Signature of the original supervisor authorizing entry
- ✓ Current entry supervisor
- ✓ Communication procedures for entrants and attendants
- ✓ Equipment provided for entry
- ✓ Rescue services available and how to contact them
- ✓ Other information needed for safety
- ✓ Additional permits for work in the space, such as for hot work
- ✓ Any problems encountered during entry



## Entering a Permit-required Confined Space

2. Procedures for issuing permits
3. Testing for atmospheric hazards before entry
4. Provide results of atmospheric testing to entrants
5. Maintain safe entry conditions for the duration of the entry
6. Follow all actions and precautions on the permit
7. If you have to evacuate, re-assess the conditions of the space to ensure it is safe for re-entry and ensure the permit reflects the evacuation and subsequent re-assessment. Another option is to issue a new permit.
8. Allow entrants to observe monitoring, testing, and any other actions taken to eliminate or control hazards

There is an example of a blank entry permit in the Confined Space Rule, found in Appendix A of this workbook. There is also an example of a completed entry permit, in Appendix C of this workbook.

## Entering a Permit-required Confined Space

### Entry with a Permit - Equipment

All equipment must be maintained and used in accordance with the instructions from the manufacturer. For example, if the manufacturer's directions say to perform a factory calibration, then that's what you need to do.

Bump testing of air monitoring equipment is recommended prior to every use. Keep in mind that a bump test confirms that the monitor reads a given substance, as opposed to zeroing, which means nothing is detected.

Provide all necessary equipment at no cost to your employees. Ensure all employees who use equipment are trained to do so.



*Note: If you keep calibration gases on hand to perform bump checks (or to do calibration), make sure they are within their expiration dates.*

## Entering a Permit-required Confined Space

**Activity:**  
Name the types of equipment in the pictures



\_\_\_\_\_



\_\_\_\_\_



\_\_\_\_\_



\_\_\_\_\_



\_\_\_\_\_



\_\_\_\_\_



\_\_\_\_\_

## Entering a Permit-required Confined Space

### Entry with a Permit - Personnel

What are the roles and training requirements for personnel involved with a permit-required entry?

Entrants must:

- Know about hazards that they may face during entry and the signs, symptoms and consequences of exposure
- Communicate with the attendant so the attendant can monitor their status and warn them when they need to evacuate
- Alert the attendants about hazardous conditions in the space or symptoms of exposure
- Exit the space immediately when:
  - An order to evacuate is given by the attendant or the entry supervisor
  - An entrant recognizes any warning sign or symptom of exposure to a dangerous situation
  - An entrant detects a dangerous or hazardous condition
  - An evacuation alarm is activated



## Entering a Permit-required Confined Space

Attendants must:

- Know the hazards entrants may face during entry and the signs, symptoms, and consequences of exposure
- Be aware of the behavioral effects of hazards on entrants
- Keep an on-going count of entrants and ensure that the count identifies who is in the space
- Remain outside the space during entry operations until relieved by another attendant
- Communicate with entrants to monitor their status and to alert them if they need to evacuate
- Monitor activities inside and outside the space to determine if it is safe for entrants to remain in the space. Order entrants to evacuate immediately under the following conditions:
  - A dangerous or hazardous condition is detected
  - If the behavioral effects of hazard exposure are detected
  - If there is a dangerous situation outside the space
  - If the attendant cannot perform all required duties
- Summon emergency services as soon as entrants need to escape from the space
- Warn unauthorized persons to stay away if they approach the space; tell them to leave immediately if they enter the space; and inform the entrants and entry supervisor if unauthorized persons have entered the space.
- Perform non-entry rescues following your established rescue procedure
- Do nothing that would interfere with monitoring and protecting an entrant (note: even while monitoring another space.)



## Entering a Permit-required Confined Space

Entry Supervisors must:

- Know the hazards that entrants may face during entry, including the signs, symptoms, and consequences of exposure
- Understand how to control or eliminate hazards associated with the space
- Verify, by checking that the appropriate entries have been made on the permit, that all tests specified by the entry permit have been conducted and that all procedures and equipment specified by the permit are in place before signing the permit and allowing entry to begin
- Inform entrants and attendants about the hazards and conditions associated with the space and the methods used to eliminate or control the hazards
- Terminate the entry and cancel the entry permit as required by the entry procedures
- Verify that rescue service providers are available and that they can be contacted in an emergency
- Remove unauthorized individuals who enter or attempt to enter
- Reevaluate the conditions within the space whenever responsibility for a permit space entry operation is transferred and at intervals dictated by the hazards and operations performed within the space.



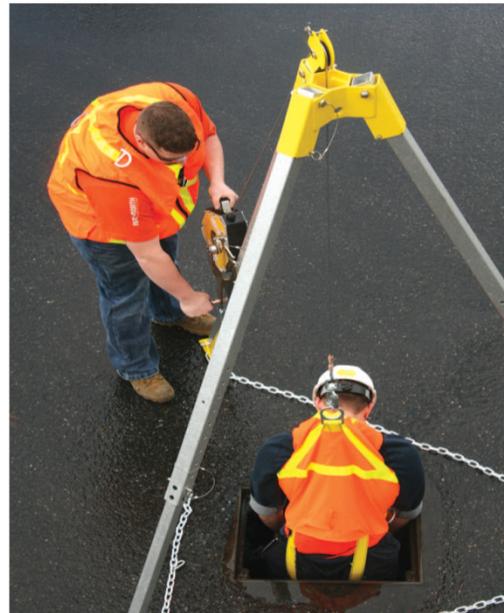
### Entry with a Permit - Rescue

What are your options for performing rescue? If workers cannot evacuate without outside help, then these are your options:

#### Non-entry rescue

This means nobody beyond the entrant goes in. It also typically means the entrant is wearing a harness that is attached to a retrieval device that is designed to allow them to be pulled them out of the space by somebody else, such as the attendant.

*Note: The chains on this tripod are necessary for stability They shouldn't be removed!*



#### Entry rescue

This means somebody goes in. They must have equipment and training, and follow all requirements in the rule.

## Entering a Permit-required Confined Space

### Third-party rescue

This means somebody else goes in, with whom you have made arrangements to do so. The third-party must follow entry requirements. Simply planning to rely on 911 services does not meet requirements of the rule.



Whatever option you choose, **rescue procedures must include** :

- A process for summoning rescue services
- A process for summoning emergency medical services or transporting injured entrants to a medical facility.
- A way for the Safety Data Sheet (SDS) or other similar written information be kept at the worksite, and be made available to the medical facility treating an exposed entrant.
- They must also have practiced performing a rescue before the entry, but no more than 12 months before.

*Note: Have rescue onsite for IDLH conditions.*

## Entering a Permit-required Confined Space



The rescue team must have access to the spaces before the entry because they need to develop a rescue plan and practice before the actual entry. If the team has access to a space similar in size, configuration and accessibility to the one that needs to be entered, they can use that space for the practice rescue instead.

When your workers are mobile, they do not need to do the annual practice (either entry or non-entry) if the rescue team does a practice rescue in the space that needs to be entered, before the actual entry.

*Note: For your information, a couple of case studies from accident investigations are included in Appendix D of this workbook.*

## Entering a Permit-required Confined Space

What about the fire department? In most cases, fire departments do not provide rescue services. If they do, they must follow the same requirements as any third-party rescue provider. For more information, see the Confined Space Rule, Non-Mandatory Appendix D - Rescue Considerations



**Activity:**  
**Can a space be modified to make rescue safer or easier?**

## Entering a Permit-required Confined Space

### Entry with a Permit - Training

Train employees involved in permit space activities so they have the understanding, knowledge, and skills necessary to safely perform their duties.

Training is required:

- For all new employees
- Before an employee is assigned permit-space duties
- Before there is a change in an employee's assigned duties
- When there is a hazard for which an employee has not been trained
- When there are changes to the permit program
- When the permit audit shows deficiencies
- When there is a deviation from established procedures or an employee's knowledge of the procedures is inadequate

Awareness training is required for employees who work or may work in areas where permit spaces are present. It must explain the permit-space program, the entry permit system, the alternate entry procedures, if used, and how to recognize permit spaces in their work area. It provides a basic overview of the permit space program.

Repeat training when there is a change in the written program and when there are new or previously unidentified permit spaces.

Record each employee's training, including the employee's name, the trainer's signature, the training date, and the employee's responsibilities. Employees must be able to inspect their training records.



# Alternate Entry

Alternate entry is a specific procedure for entering a permit space without a full permit. Alternate entry procedures vary from permit entry procedures in several significant ways. For example: an attendant is not required; rescue procedures are not required; and there are fewer documentation requirements.

The following sections of the rule apply. The corresponding paragraphs in the Confined Space Rule are found in parentheses:

- Evaluations (4)
- Equipment (7)
- Alternate entry procedures (10)
- Training (11)

You need to do the following:

- Eliminate all hazards  
OR
- Eliminate all physical hazards in the space and control all hazardous atmospheres with continuous ventilation



## Alternate Entry

You need to develop and implement alternate entry procedures that address the following:

- Who can authorize alternate entry procedures and is responsible for ensuring safe entry conditions
- The hazards associated with the space
- The methods used to eliminate the hazards
- The methods used to ensure the hazards have been eliminated
- The methods used to test the space for all hazardous atmospheres
- The methods used to determine if unsafe conditions occur before or during entry
- The criteria and conditions used for evacuating the space
- The methods for training employees in these procedures
- The methods for ensuring employees follow these procedures

Alternate entry procedures do not have to be in writing, but you may find it beneficial to do so.



## Alternate Entry

When using ventilation to control atmospheric hazards:

- Use only properly calibrated direct-reading meters to test the atmosphere.
- Test the atmosphere for all identified atmospheric hazards before entering the space.
- Do not allow employees to enter until testing verifies that all identified atmospheric hazards are adequately controlled by the ventilation.
- Perform continuous monitoring for all atmospheric hazards during the entry.
- Immediately evacuate the space:
  - When monitoring indicates the return of atmospheric hazards.
  - Upon any failure with the direct-reading instrument.
  - Upon any failure with the ventilation.
  - When a new hazard is introduced or conditions within the space change.

If a space is evacuated, it cannot be re-entered as an alternate entry unless:

- The conditions that necessitated the evacuation are corrected; and
- The re-entry is treated and documented as a new entry.

There is an example of a blank alternate entry form in the Confined Space Rule, found in Appendix A of this workbook. There is also an example of a completed alternate entry form, in Appendix C of this workbook.

*Note: The requirements for alternate entry are different between the Oregon OSHA Rule and the Federal OSHA Rule. Also, reclassification is not allowed under the Oregon OSHA Rule.*

## Alternate Entry

Ensure that all employees who enter:

- Have the opportunity to observe the activities required to comply with the alternate entry procedures
- Have an effective means of communication to request help in an emergency

Finally, remember to document the entry! There are ten items that must be documented, if they apply:

- ✓ The location of the space
- ✓ The hazards of the space
- ✓ Measures taken to eliminate the hazards
- ✓ Measures taken to control the atmospheric hazards
- ✓ The identity of the direct-reading instruments used to test the atmosphere
- ✓ The results of the atmospheric testing
- ✓ The date of entry
- ✓ The duration of the entry
- ✓ Any and all conditions that required the evacuation of the space
- ✓ The name, title, and signature of the person responsible for ensuring the safe entry conditions

Maintain this documentation for the duration of the entry at the location of the entry. The rule does not require the documentation to be kept after the entry is complete, but it would be a best practice to do so. It would allow you to evaluate your alternate entry procedures for effectiveness and to make improvements.

## Alternate Entry

Alternate entry cannot be used to enter a continuous system unless you can isolate the area to be entered from the rest of the space, or can demonstrate the conditions that caused the hazard or potential hazard no longer exist within the system during the entry, or can demonstrate that engulfment cannot occur and continuous ventilation in the area to be entered is sufficient to control atmospheric hazards.



Note: An example of isolating the area could be using double-block-and-bleed to separate a tank from the rest of the system.

# Multi-employer Worksites

## Does someone else's employees enter permit-required confined spaces you control?

If so, you need to do the following:

- Let them know about the hazards of the spaces and about any precautions you require to protect your own employees.
- When your employees are working in a space and someone else's employees are working in or around that space, coordinate entry with the other employers so your employees are not exposed to hazards created or discovered by the other employees, and vice-versa.
- Discuss any hazards created or encountered, after the operation is finished.

## Do your employees enter permit spaces someone else controls?

If so, you need to evaluate the permit space. Use information from the host employer or controlling contractor, if there is any. After entry, you need to let whoever is in control of that space (such as the property owner or a general contractor) know about the precautions and procedures you followed and about any hazards that you found during entry or that developed during entry operations.



Note: "Control" in this case means the authority to regulate, direct or influence. A "Controlling Contractor" is an employer that has overall responsibility for construction at a worksite. A "Controlling Contractor" who owns or manages a property is both a controlling contractor and a host employer.

# Records

After a permit entry, keep cancelled permits for at least one year from the date the permit expires. To evaluate the permit program, review permits to ensure that the procedures for issuing them are still effective and the information still protects employees who enter the space.

After an alternate entry, keep the entry document where the space is located for the duration of the entry. There is no requirement to keep it after the entry. It would be a best practice to keep it for review of the effectiveness of the procedure.

Keeping records of the evaluation of permit-required confined spaces is required if an employer enters using permit entry procedures and has to have a written program, but is not if an employer only uses alternate entry or if their own employees do not enter. It would be a best practice to keep these records, because there is a chance that a contractor may enter the space at a later date.

There is a special relationship between permits, alternate entry forms and 1910.1020 "Access to Employee Medical and Exposure Records." If the permit or alternate entry form documents exposure to an atmospheric hazard, it becomes an exposure record and must be maintained for 30 years.

If an air monitor is used that datalogs, and the monitoring is associated with a specific person, then the logged data can be used as an exposure record. If so, then it must be kept in an accessible form for 30 years.





# Appendices



# **Appendix A**

**OAR 437-002-0146**



OAR 437, Oregon Occupational Safety and Health Division  
Oregon OSHA Administrative Order 5-2014  
Filed October 20, 2014, effective January 1, 2015

DIVISION 2, GENERAL INDUSTRY

Subdivision J – General Environmental Controls

**437-002-0146 Confined Spaces**

(1) Purpose and application. This rule applies to all activities in confined spaces and provides requirements to protect employees from the hazards of entering and working in confined spaces.

(2) Exceptions. This standard does not apply to the following:

(a) Construction work regulated by Division 3/P Excavations, except for entry into sanitary sewer spaces that are large enough to bodily enter.

(b) Construction work regulated by Division 3/S Underground Construction, Caissons, Cofferdams and Compressed Air, except for sewers.

(c) Enclosed spaces regulated by 1910.269 in Division 2/R Electric Power Generation, Transmission and Distribution, except when that standard requires compliance with this standard.

(d) Enclosed spaces regulated by 1926.953 in Division 3/V Electric Power Generation, Transmission and Distribution, except when that standard requires compliance with this standard.

(e) Manholes and vaults regulated by 1910.268(o) in Division 2/R Telecommunications, unless the space cannot be made safe to enter even after following the requirements of 1910.268(o).

(f) Welding in confined spaces regulated by Division 2/Q Welding, Cutting & Brazing, when the only hazards are related to the welding process.

(g) Grain bins, silos, tanks, and other grain storage structures regulated by 1910.272, Grain Handling Facilities.

(h) Diving operations regulated by Division 2/T, Commercial Diving Operations.

(i) Except for (a) through (h) above, when any other applicable standard addresses work in confined spaces or additional hazards that may be present, you must comply with the provisions of that standard and this standard. Where the requirements of one standard are more restrictive than the other, follow the more stringent requirements.

### (3) Definitions.

Acceptable entry conditions: The conditions that must exist in a permit-required confined space to allow safe entry and work.

Alternate entry – An alternative process for entering a permit space under very specific conditions. The space remains a permit space even when entered using alternate entry and even though no entry permit is required in those circumstances.

Atmospheric hazard (see the definition of hazardous atmosphere).

Atmospheric testing – see “Testing.”

Attendant – An individual stationed outside one or more permit spaces to monitor the authorized entrants and who performs all attendants duties assigned in the employer's permit space program.

Authorized – Approved by the employer or controlling contractor.

Authorized entrant – An employee who is authorized by the employer to enter a permit space.

Barrier – A physical obstruction that blocks or limits access.

Blanking or blinding – 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.

Calibration – The checking of a direct-reading instrument against an accurate standard (such as a calibration gas) to determine any deviation and correct for errors.

Note: A similar process may also be referred to as a “bump test” in which an instrument is tested with an accurate standard to ensure it is still reading correctly. For the purposes of this rule, a “bump test” performed in accordance with the manufacturer’s instructions can be used to verify calibration.

Confined space – A space that meets all of the following:

- Large enough and so configured that an employee can fully enter the space and perform work.

- Has limited or restricted means for entry and/or exit.

- Is not designed for continuous human occupancy.

Continuous system – a confined space that meets all of the following:

- Part of, and contiguous with, a larger confined space (for example, storm sewers, sanitary sewers, or steam tunnels).

Subject to a potential release from the larger confined space that can overwhelm control measures and/or personal protective equipment, resulting in a hazard that is immediately dangerous to life and health.

Control or controlling – Authority to regulate, direct or influence.

Controlling contractor – The employer that has overall responsibility for construction at a worksite.

Note: A controlling contractor who owns or manages a property is both a controlling contractor and a host employer.

Double block and bleed – 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.

Emergency – 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 hazard – A physical hazard consisting of a liquid or flowable solid substance that can surround and capture an individual. Engulfment hazards may cause death or serious physical harm if: the individual inhales the engulfing substance into the respiratory system (drowning, for example); the substance exerts excessive force on the individual's body resulting in strangulation, constriction, or crushing; or the substance suffocates the individual.

Entrant (see the definition of authorized entrant).

Entry – The action by which any part of an employee's body breaks the plane of an opening into a confined space. Entry (or entry operations) also refers to the period during which an employee occupies a confined space.

Entry Permit – Written authorization from the employer, controlling contractor, or host employer to enter a permit-required confined space and perform work.

Entry supervisor – The person (such as the employer, foreman, or crew chief, or any other designated employee) responsible for:

- Determining if acceptable entry conditions are present at a permit space where entry is planned; and

- Authorizing entry and overseeing entry operations; and

- Terminating entry as required.

Hazard – For the purpose of this rule, hazard means a physical hazard or hazardous atmosphere.

Hazard control – The action taken to reduce the level of any hazard inside a confined space using engineering methods (for example, by isolation or ventilation), and then using these methods to maintain the reduced hazard level. Hazard control also refers to the engineering methods used for this purpose. Personal protective equipment is not a hazard control.

Hazard elimination – The action taken to remove a hazard from the work environment. For confined spaces, this includes isolation. For a hazard to be eliminated, the conditions that create or cause the hazard no longer exist within the confined space.

Hazardous atmosphere – An existing or potential atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to escape unaided from a permit space, injury, or acute illness from one or more of the following:

A flammable gas, vapor, or mist in excess of 10 percent of its lower flammable limit.

An airborne combustible dust at a concentration that meets or exceeds its lower explosive limit.

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

An atmospheric oxygen concentration below 19.5 percent (oxygen deficient) or above 23.5 percent (oxygen enriched).

An airborne concentration of a substance that exceeds the dose or exposure limit specified by an Oregon OSHA requirement.

Note: An atmospheric concentration of any substance that is not capable of causing death, incapacitation, impairment of ability to escape unaided, injury, or acute illness due to its health effects is not covered by this provision. You must still follow all other applicable Oregon OSHA requirements to protect employee health.

An atmosphere that presents an immediate danger to life or health (IDLH).

Host employer – An employer who owns or manages the property on which confined space work is taking place.

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.

Inerting – 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.

Isolate or isolation – The elimination or removal of a physical or atmospheric hazard by preventing its release into a confined space. Isolation includes, but is not limited to, the following methods:

blanking and blinding;  
misaligning or removing sections of lines, pipes, or ducts;  
a double-block-and-bleed system;  
machine guarding;  
blocking or disconnecting all mechanical linkages;  
locking out or tagging out energy sources.

Note: When using lockout/tagout, you must follow all of the requirements of 1910.147, "The Control of Hazardous Energy".

Mobile worker – An employee who performs work in multiple locations such as customer sites, company offices, private homes, vendor offices, or construction sites.

Monitor or monitoring – The process used to identify and evaluate the atmosphere in a permit space after an authorized entrant enters the space. This is a process of checking for changes in the atmospheric conditions within a permit space and is performed in a periodic or continuous manner after the completion of the initial testing of that space. (See also "testing.")

Non-entry rescue – Retrieval of entrants from a permit space without entering the permit space.

Permit-required confined space (permit space) – A confined space that has one or more of the following characteristics:

Contains, or has a potential to contain, a hazardous atmosphere.

Contains a material that has the potential to engulf an entrant.

Has an internal configuration such that an entrant could become trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section.

Contains any other recognized serious safety or health hazard that can inhibit an entrants ability to escape unaided.

Physical hazard – An existing or potential hazard that can cause death or serious physical harm in or near a confined space, or a hazard that has a reasonable probability of occurring in or near a confined space, and includes, but is not limited to:

Explosives; mechanical, electrical, hydraulic, and pneumatic energy; radiation; temperature extremes; engulfment; noise; and inwardly converging surfaces; and

Chemicals that can cause death or serious physical harm through skin or eye contact (rather than through inhalation).

Potential hazards – All reasonably anticipated conditions within the space and outside the space that can adversely affect conditions within the space.

Rescue – Retrieving employees who are unable to remove themselves from a permit space. Rescue can be entry or non-entry, and can be conducted by the employer's employees or a third-party.

Rescue service – The onsite or offsite personnel who the employer designates to engage in non-entry and/or entry rescue of employees from a permit space.

Retrieval system – The equipment, including mechanical retrieval devices, used for non-entry rescue of authorized entrants from a permit space.

Serious physical harm – An impairment in which a body part is made functionally useless or is substantially reduced in efficiency. Such impairment may include loss of consciousness or disorientation, and may be permanent or temporary, or chronic or acute. Injuries involving such impairment would usually require treatment by a physician or other licensed health-care professional while an illness resulting in serious physical harm could shorten life or substantially reduce physical or mental efficiency by impairing a normal bodily function or body part.

Simulated Permit-Required Confined Space – Is a confined space or a mock-up of a confined space that has similar entrance openings, and is similar in size, configuration, and accessibility to the permit space the authorized entrants enter. A simulated space does not need to contain any physical or atmospheric hazards.

Testing – The process of identifying and evaluating the atmospheric hazards that entrants may be exposed to in a permit-required confined space. Testing includes specifying the initial tests that are to be performed in the permit space. (See also "monitor or monitoring")

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.

Ventilate or ventilation – Controlling an actual or potentially hazardous atmosphere using either powered equipment, such as fans and blowers, or reliable natural air flow, or a combination of the two, to reduce an otherwise hazardous atmosphere below the level that makes it a hazardous atmosphere. Ventilation is a method of hazard control, not hazard elimination.

You – The employer.

You can use this table to determine which requirements to follow.

Requirements for Confined Spaces										
For spaces that are	The requirements in the following paragraphs apply									
	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	Evaluation	Permit-required confined space entry programs and permits	Permit Entry	Equipment	Personnel	Rescue	Alternate entry	Training	Multi-employer work sites	Records
Confined spaces	X									
Permit-required confined spaces	X	X	X	X	X	X		X	X	X
Never entered	X									
If you only:										
Use alternate entry procedures	X			X			X	X		
Have other employers enter your space	X								X	X
Are a rescue service provider		X	X	X	X	X		X		X

(4) Evaluation.

(a) You must determine if any of your confined spaces are permit-required confined spaces. This evaluation must include:

(A) Any known or anticipated hazard.

Note: If the only hazard associated with a confined space is a fall hazard, it is not covered by the Confined Space rule. If the space contains other hazards that make it a permit space, the fall hazard must be addressed on the permit.

(B) The determination from any previous evaluation of that space.

(C) Any precautions and procedures previously implemented for entering the space.

(b) Exceptions:

(A) Employers of mobile workers (for example, contractors, electricians, plumbers) where they are not the property owner or controlling contractor are not required to perform this evaluation for the entire site. Mobile worker employers must evaluate the areas they are responsible for or where their employees will be working and must follow the requirements of (4)(e).

(B) Controlling contractors on sites with existing confined spaces are responsible for performing this determination only for the area under their control.

(C) On sites where confined spaces are being built, the host employer or controlling contractor is responsible for ensuring this determination is accomplished only when:

(i) Any of their employees enter that space.

(ii) An agent of the employer enters that space.

(iii) Employees of an employer accountable to that controlling contractor or host employer enter that space.

(iv) They assume control over that space.

(D) Before employees of another employer enter a confined space at your workplace that is under your control, and you have information related to paragraph (4)(a), you must provide it to that employer.

(c) When a space has hazards that make it a permit space:

(A) Develop and implement a means so employees can identify that space. Signs, labels, or tags are methods that can be used to accomplish this.

(B) Allow employees or their representatives to observe the evaluation or re-evaluation of the space.

(C) When conditions within a confined space or a permit space change, re-evaluate it.

(D) Take all necessary measures to prevent unauthorized employees from entering permit spaces.

(d) Prevent employees from entering any unevaluated confined space until it is fully evaluated.

(e) When your employees are mobile, you must determine if they will be exposed to permit-required confined spaces at their assigned work locations. This determination must include information, if any, from the host employer or controlling contractor.

(A) Identify any physical and atmospheric hazards that make the space a permit-required confined space.

(B) Allow employees or their representatives to observe the evaluation or re-evaluation of the space.

(C) When conditions within a confined space or a permit space change, re-evaluate it.

(D) Take all necessary measures to prevent unauthorized employees from entering permit spaces.

(E) Prevent employees from entering any unevaluated confined space until it is fully evaluated.

(5) Permit-Required Confined Space Entry Program and Permits.

(a) When employees must enter a permit space, develop and implement a written program that describes the means, practices, and procedures to safely identify and enter permit spaces.

(b) Include the following in the program:

(A) Documentation of entry permit procedures.

(B) Measures taken to prohibit unauthorized persons from entering permit spaces.

(C) Designation of employee roles, such as entrants, attendants, entry supervisors, rescuers, or those who test or monitor the atmosphere in a permit space.

(D) Identification of designated employee duties.

(E) Training on the written program and entry permits.

(F) Training employees on their designated roles.

(G) Instructions to identify and evaluate hazards.

(H) Methods to eliminate and/or control hazards.

(I) Instructions on equipment use and maintenance.

(J) Instructions to coordinate entry with another employer.

(K) Procedures necessary for concluding the entry and canceling the permit after entry operations have been completed.

(c) On fixed sites, include the following additional elements:

(A) The location of all permit spaces.

(B) The reason for the classification of each permit space or each type of permit space.

Note: Where there are multiple permit spaces of the same type that have the same hazards, such as sewers, water vaults, or valve pits, the exact location of each space does not need to be identified so long as there is enough information so that employees can readily identify each type of space and its hazards at each location.

(C) Exception: The locations of permit spaces at remote unmanned locations do not need to be added to the program until the first time employees go to that location after the effective date of this rule.

(d) Provide employees and their representatives access to the written program.

(e) Provide entrants or their authorized representatives access to the completed permit before entry so they can confirm that pre-entry preparations have been completed.

(f) Review the permit program when there is any reason to believe that employees are not adequately protected, and revise it as necessary.

(A) Situations that require this review include:

(i) Unauthorized entry of a permit space.

(ii) Discovery of a previously unrecognized hazard.

(iii) Existence of a condition prohibited by the permit or permit program.

(iv) An injury or near-miss during entry.

(v) An employee reports of concerns about the effectiveness of the program.

(vi) Any other condition that affects employee safety or health.

(B) When revising the permit program to correct hazard-related deficiencies, do not allow entries into affected permit spaces to be made until the revisions are complete.

(C) Provide employees and their representatives access to the revised permit program.

(g) Review permits within one year of their cancellation to evaluate:

(A) The permit program.

(B) The protection provided to employees entering permit spaces.

(6) Permit Entry.

(a) Develop and implement procedures for issuing permits. Procedures must include how to:

- (A) Evaluate the hazards of the space.
- (B) Evaluate hazards of the work to be performed.
- (C) Identify safe entry conditions.

(b) Entry permits must include the following information:

- (A) The space to be entered.
- (B) The purpose of the entry.
- (C) The date, start, and stop times of the permit.
- (D) The hazards of the space.
- (E) Acceptable entry conditions.
- (F) Results of initial tests and periodic monitoring performed to evaluate and identify the hazards and conditions of the space, or the period for continuous monitoring, accompanied by the names or initials of the testers and by an indication of when the tests were performed.
- (G) Appropriate measures used before entry to isolate the space and eliminate or control hazards.  
Examples of appropriate measures include the de-energizing and lockout or tagging of equipment, and procedures for purging, inerting, ventilating, and flushing permit spaces.
- (H) Names of entrants and current attendants.
- (I) The signature of the original supervisor authorizing entry.
- (J) The current entry supervisor.
- (K) Communication procedures for entrants and attendants to maintain contact during the entry.
- (L) Equipment provided for safe entry, such as:
  - (i) Personal protective equipment (PPE).
  - (ii) Testing and monitoring equipment.
  - (iii) Communications equipment.

(iv) Alarm systems.

(v) Rescue equipment.

(M) Rescue services available, and how to contact them.

(N) Other information needed for safety in the particular permit space.

(O) Additional permits issued for work in the space, such as for hot work.

(P) Any problems, if any, encountered during the entry.

(c) Perform initial testing for atmospheric hazards, where necessary, before entry is made.

(d) Provide each entrant or their authorized representative with the results of any initial testing before they enter the space.

(e) Maintain safe entry conditions for the duration of the entry.

(A) When the space is too large to isolate, or is part of a continuous system, such as a sewer, ensure continuous monitoring where entrants are working for the duration of the entry.

(B) When an entrant or their authorized representative has reason to believe that the testing or monitoring was inadequate, re-test the space.

(f) Follow all actions and precautions identified on the permit.

(g) When conditions require the space to be evacuated, do not allow re-entry unless you:

(A) Re-assess the conditions of the space to ensure it is safe for re-entry and ensure the permit reflects the evacuation and subsequent re-assessment; or

(B) Issue a new permit.

(h) Allow entrants or their authorized representatives the opportunity to observe monitoring, testing, and all other actions taken to eliminate or control the hazards of the space.

(7) Equipment.

(a) When employees enter permit spaces, provide the following equipment as necessary:

(A) Testing and monitoring equipment.

(B) Ventilating equipment, when needed, used to obtain and maintain acceptable entry conditions.

(C) Communication equipment, such as a two-way radio, for effective communication between the attendant and all entrants and to initiate rescue when necessary.

(D) Lighting equipment needed to ensure employees can see well enough to work safely and exit the space quickly in the event of an emergency.

(E) Barriers or shields to protect entrants from external hazards, such as pedestrians and vehicles.

(F) Ladders or other equipment to safely enter and exit the space.

(G) Rescue and emergency equipment necessary to safely and effectively rescue entrants.

(H) Any other equipment necessary to safely enter and exit the space.

(I) Personal protective equipment as mandated by any applicable Oregon OSHA standard or as otherwise required by the employer's assessment of the hazards.

(b) Provide all necessary equipment at no cost to employees.

(c) Ensure all equipment is maintained and used in accordance with the instructions from the manufacturer.

(d) Train all employees who use equipment in the use of that equipment.

(8) Personnel.

(a) Before employees enter permit spaces, designate entrants, attendants, and entry supervisors.

Note: The entry supervisor can also be either the attendant or entrant.

(b) Entrants must:

(A) Know the hazards that may be faced during entry, including information on the type of hazard, as well as signs, symptoms, and consequences of exposure to those hazards.

(B) Communicate with the attendant as necessary so the attendant can monitor the entrant's status and to enable the attendant to alert entrants of the need to evacuate the space.

(C) Alert the attendant whenever the entrant detects a dangerous or hazardous condition or warning sign or symptom of exposure to a dangerous situation.

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

(i) An order to evacuate is given by the attendant or the entry supervisor,  
or

- (ii) The entrant recognizes any warning sign or symptom of exposure to a dangerous situation, or
- (iii) The entrant detects a dangerous or hazardous condition, or
- (iv) An evacuation alarm is activated.

(c) Attendants must:

- (A) Know the hazards that may be faced during entry, including information on the type of hazard, as well as signs, symptoms, and consequences of exposure to those hazards.
- (B) Be aware of possible behavioral effects of hazard exposure in authorized entrants.
- (C) Continuously maintain an accurate count of authorized entrants in the permit space and ensure that the means used to identify authorized entrants accurately identifies who is in the permit space.
- (D) Remain outside the permit space during entry operations until relieved by another attendant.
- (E) Communicate with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the space.
- (F) Monitor activities inside and outside the space to determine if it is safe for entrants to remain in the space and order the authorized entrants to evacuate the permit space immediately under any of the following conditions:
  - (i) If the attendant detects a dangerous or hazardous 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; or
  - (iv) If the attendant cannot effectively and safely perform all the duties required of the attendant.
- (G) Summon rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from permit space hazards.
- (H) Take the following actions when unauthorized persons approach or enter a permit space while entry is underway:
  - (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; and

(iii) Inform the authorized entrants and the entry supervisor if unauthorized persons have entered the permit space.

Note: The employer can give the attendant the authority to remove unauthorized individuals who enter or who attempt to enter the permit space during entry operations, so long as the attendant does not enter the space.

(I) Perform non-entry rescues as specified by the employer's rescue procedure; and

(J) Perform no duties that might interfere with the attendant's primary duty to monitor and protect any authorized entrant.

NOTE: An attendant may monitor more than one space at a time, but the duties in relation to one space may not interfere with the duties for any other spaces. If an attendants' attention is focused on one space, such as to initiate the rescue procedures, all other spaces that the attendant is monitoring must be evacuated or another attendant must take over those duties first.

(d) Entry supervisors must:

(A) Know the hazards that may be faced during entry, including information on the type of hazard, as well as signs, symptoms, and consequences of exposure to those hazards.

(B) Understand the means and methods to control and/or eliminate the hazards of the permit space.

(C) Verify, 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.

(D) Inform entrants and attendants of the hazards and conditions associated with the space and the methods used to eliminate and/or control those hazards.

(E) Terminate the entry and cancel the permit as required by the permit entry program.

(F) Verify that rescue services are available and that the means for summoning them are operable.

(G) Remove unauthorized individuals who enter or who attempt to enter the permit space during entry operations.

(H) Reevaluate the conditions within the space whenever responsibility for a permit space entry operation is transferred and at intervals dictated by the hazards and operations performed within the space.

(9) Rescue.

(a) Before employees enter a permit space, develop and implement procedures to remove entrants in the event of an emergency or when they are unable to evacuate without outside assistance. These procedures must include:

(A) The process for summoning rescue services.

Note: 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 the rescue requirements of the standard.

(B) The process for summoning emergency medical services or transporting injured entrants to a medical facility.

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

(b) Ensure rescue personnel can respond to a rescue call in a timely manner. Timeliness is based on the identified hazards of the space. Rescuers must be able to reach potential victims within an appropriate time frame based on the identified hazards of the permit space.

Note: When there are multiple entrants in a permit space, the rescue plan needs to address how all entrants will be removed in a timely manner.

(c) Ensure all rescuers, including non-entry, entry, and third-party, are knowledgeable in basic first aid and cardiopulmonary resuscitation (CPR). At least one member must be certified in first aid and CPR.

Note: Additional medical training, such as oxygen administration, the use of automated external defibrillators (AEDs), and personnel decontamination should be considered.

(d) Rescuers must practice performing permit space rescues prior to entry and no more than 12 months before an entry.

(A) The practice rescue must include every type of space in which the rescue team may perform rescues.

(B) The practice rescue must include removing persons, dummies, or manikins from the actual permit spaces, or representative spaces (simulated permit-required confined spaces) that have similar opening size, configuration, and

accessibility issues as the actual permit spaces where rescue may be performed.

Note: Reliance upon “self rescue” does not constitute an acceptable rescue program.

(e) Where feasible, use non-entry retrieval systems or methods whenever an authorized entrant enters a permit space, unless it would increase the overall risk to the entrant or would not contribute to the rescue of the entrant.

(A) Non-entry Rescue. Use a retrieval system that meets the following requirements.

(i) Each authorized entrant must 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 you can establish presents a profile small enough for the successful removal of the entrant. Wristlets or ankle straps or other equally effective means may be used in lieu of the chest or full body harness if you can demonstrate that the use of a chest or full body harness is infeasible or creates a greater hazard and that the use of other methods are the safest and most effective alternative.

(ii) Attach the other end of the retrieval line to a mechanical device or fixed point outside the permit space so that rescue can begin as soon as the attendant becomes aware that rescue is necessary. Ensure a mechanical device is available to retrieve personnel from vertical type permit spaces more than 5 feet (1.52 m) deep.

(B) Entry Rescue.

(i) Where non-entry rescue is not feasible or would increase the overall risk to the entrant, designate a rescue team before employees enter any permit space.

(ii) Ensure the rescue team:

(I) Can efficiently rescue employees from permit spaces.

(II) Has the appropriate equipment to rescue employees from all permit spaces employees enter.

(iii) Inform each rescue team or service about the hazards they may confront when called to perform rescue.

(iv) Provide the rescue team or service with access to all permit spaces from which rescue may be necessary.

(v) Provide rescue team members with personal protective equipment (PPE) needed for safe entry and any other equipment required to safely conduct rescues.

(vi) Rescue team personnel must have the same training and proficiencies as a permit space entrant, attendant, and/or entry supervisor.

(vii) When a third-party rescue service is used, ensure that the service is:

(I) Aware that they are so designated and agree to it prior to entry.

(II) Capable of performing all required rescue operations.

(III) Knowledgeable in first aid and CPR, and at least one member is certified in first aid and CPR.

(10) Alternate Entry.

(a) Permit spaces may be entered without a permit when:

(A) All hazards have been eliminated; or

(B) All physical hazards, if any, have been eliminated and all atmospheric hazards are controlled with continuous ventilation.

Note: For purposes of this rule, tagout alone does not eliminate a hazard.

Note: Continuous ventilation does not eliminate atmospheric hazards. It only controls the hazards.

(b) Exception: Alternate entry cannot be used to enter a continuous system unless you can isolate the area to be entered from the rest of the space, can demonstrate that the conditions that caused the hazard or potential hazard no longer exist within the system during the entry, or can demonstrate that engulfment cannot occur and continuous ventilation in the area to be entered is sufficient to control atmospheric hazards.

(c) When employees enter permit spaces under alternate entry, you do not need to comply with the requirements of paragraphs (5), (6), (8), (9), (12), and (13) of this rule for those entries.

(d) Develop and implement procedures for each space that can be entered with alternate entry procedures. These procedures must address:

(A) Who can authorize alternate entry procedure and is responsible for ensuring safe entry conditions.

(B) The hazards of the space.

Note: When fall hazards (if any) have been addressed and all other physical hazards, if any, have been eliminated and all atmospheric hazards have been eliminated, or are controlled with continuous ventilation, alternate entry is allowed.

(C) The methods used to eliminate hazards.

- (D) The methods used to ensure that the hazards have been eliminated.
  - (E) The methods used to test the atmosphere within the space, where applicable, for all atmospheric hazards.
  - (F) The methods used to determine if unsafe conditions arise before or during entry.
  - (G) The criteria and conditions for evacuating the space during entry.
  - (H) The methods for training employees in these procedures.
  - (I) The methods for ensuring employees follow these procedures.
- (e) When using ventilation to control atmospheric hazards:
- (A) Use only properly calibrated direct-reading meters to test the atmosphere.
  - (B) Test the atmosphere for all identified atmospheric hazards before entering the space.
  - (C) Do not allow employees to enter until testing verifies that all identified atmospheric hazards are adequately controlled by the ventilation.
  - (D) Perform continuous monitoring for all atmospheric hazards during the entry.
  - (E) Immediately evacuate the space:
    - (i) When monitoring indicates the return of atmospheric hazards.
    - (ii) Upon any failure with the direct-reading instrument.
    - (iii) Upon any failure with the ventilation.
    - (iv) When a new hazard is introduced or conditions within the space change.
- (f) Provide all employees who will conduct the entry or their representatives the opportunity to observe all activities used to comply with this section.
- (g) Provide all employees who conduct entry an effective means of communication, such as a two-way radio, cell phone, or voice if other employees are present, to summon help while within the space.
- (h) When a space is evacuated, it cannot be re-entered as an alternate entry unless:
- (A) The conditions that necessitated the evacuation are corrected; and
  - (B) The re-entry is treated and documented as a new entry.

(i) Document each entry. This documentation must include:

(A) The location of the space.

(B) The hazards of the space.

(C) The measures taken to eliminate the hazards.

(D) When applicable, the measures used to control the atmospheric hazards.

(E) When applicable, the identity of the direct-reading instruments used to test the atmosphere.

(F) When applicable, the results of the atmospheric testing.

(G) The date of the entry.

(H) The duration of the entry.

(I) When applicable, any and all conditions that required the evacuation of the space.

(J) The name, title, and signature of the person responsible for ensuring the safe entry conditions.

(j) Maintain this documentation for the duration of the entry at the location of the entry.

Note: Additional record retention requirements may apply under 1910.1020. "Access to Employee Medical and Exposure Records."

(11) Training.

(a) Train each employee involved in permit space activities so they acquire the understanding, knowledge, and skills necessary to safely perform their duties, according to their assigned responsibilities.

(A) Provide training:

(i) For all new employees.

(ii) Before an employee is assigned permit space duties.

(iii) Before there is a change in an employee's assigned duties.

(iv) When there is a hazard for which the employee hasn't already been trained, or when there is a change in the hazards of an existing confined space.

(v) When there are changes to the permit program.

(vi) When the permit audit shows deficiencies.

(vii) Whenever there is a deviation from the established procedures or employee knowledge of the procedures is inadequate.

(B) Document employee training. Ensure the documentation:

(i) Contains the employee's name, the name and signature of the trainer, and the date of training.

(ii) Contains the responsibilities for which they were trained.

(iii) Is available for inspection by employees and their authorized representative.

(b) Ensure each employee is proficient in their assigned duties.

(c) Awareness training:

(A) Provide all employees whose work operations are or may be in an area where permit spaces are present with a basic overview of:

(i) The permit space program.

(ii) The entry permit system.

(iii) The alternate entry procedures, if used.

Note: Awareness training is not required for employees whose exposure is negligible, such as office workers who walk in a parking lot that has a sewer manhole or workers entering a building with a baghouse near it, as long as those employees have no other exposures to permit spaces. Similarly, when all permit spaces cannot be accessed or opened by employees, awareness training is not required.

An example of this are spaces that are locked or require a specialized tool, access to the key or tool is controlled, and access without the key or tool would require extraordinary means (such as a chop saw or cutting torch).

(B) Provide this training:

(i) For all new affected employees.

(ii) For all employees whose duties change to include work in areas with permit spaces.

(iii) When inadequacies in an employee's knowledge indicate that the employee has not retained the requisite understanding.

(iv) When there is a change in the permit program.

(v) When there are new or previously unidentified permit spaces.

(C) Ensure all employees understand how to recognize permit spaces in their work area.

(12) Multi-employer worksites.

(a) Unless you fall within an exemption under paragraph (4)(b), before employees of another employer enter permit spaces under your control, you must:

(A) Inform the employer and their employees:

(i) That the workplace contains permit spaces and can be entered only when the applicable requirements of this rule are met.

(ii) Of the identified hazards and your experience with each permit space they will enter.

(iii) Of any precautions or procedures you require to protect employees in or near spaces where the work will be performed.

(B) Coordinate entry operations with the employer, when employees of different employers will be working in or near the same permit spaces.

(C) Discuss entry operations with the employer after they are complete. This discussion must include:

(i) The program followed during permit space entry,  
and

(ii) Any hazards confronted or created.

(b) When your employees enter a permit space under the control of another entity, at the conclusion of entry operations, inform the controlling contractor and host employer about the precautions and procedures you followed and any hazards that were present or that developed during entry operations.

(13) Records. Keep cancelled permits for at least one year from the date the permit expires for review (see paragraph (5)(g)).

Note: Additional record retention requirements may apply under 1910.1020 "Access to Employee Medical and Exposure Records."

(14) Effective dates. For work covered under Division 3, Construction, these rules are effective as of March 1, 2015.

Stat. Auth.: ORS 654.025(2) and 656.726(4).

Stats. Implemented: ORS 654.001 through 654.295.

Hist: OR-OSHA Admin. Order 6-2012, f. 9/28/12, ef. 4/1/13.

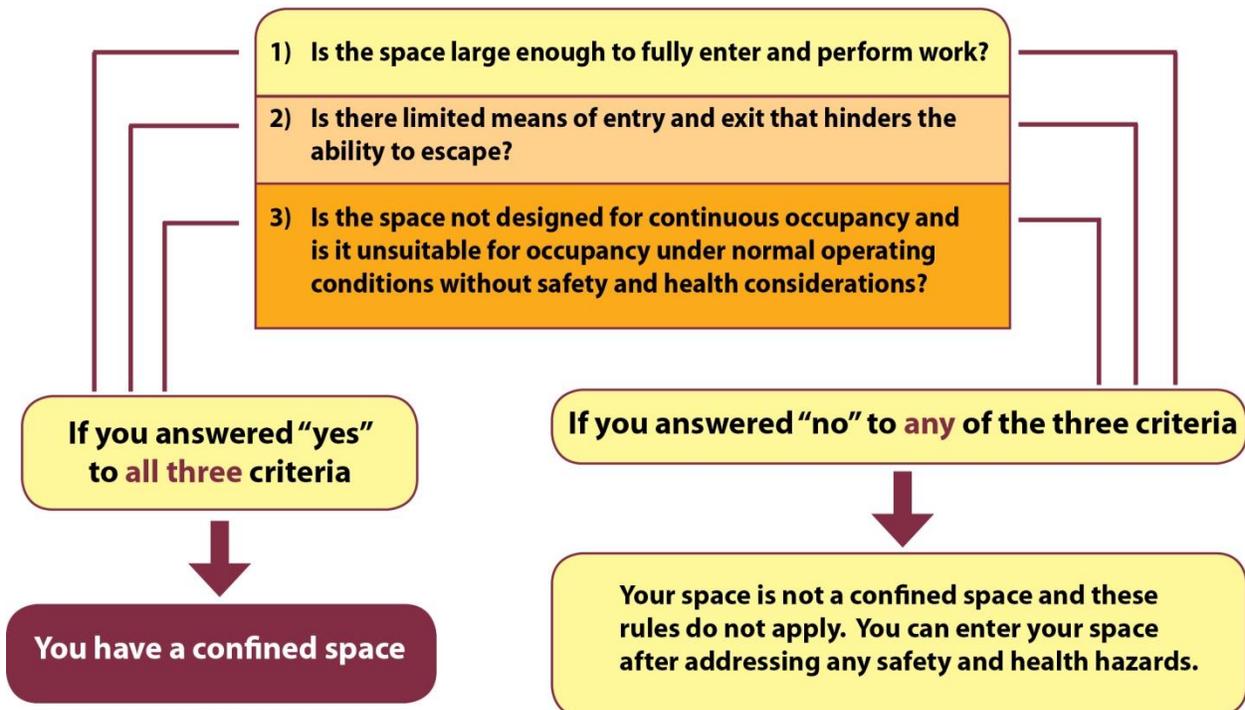
OR-OSHA Admin. Order 5-2014, f.10/20/14, ef. 1/1/15.

# OAR 437-002-0146 Confined Spaces

## Non-Mandatory Appendices A, B, C, and D for OAR 437-002-146 Confined Spaces

### Non-Mandatory Appendix A Part I: Evaluate the space to determine if you have a confined space.

#### Evaluate the Space



#### Evaluation of confined spaces

A confined space is defined as having **three** distinct characteristics. It must meet all three in order to be a confined space.

##### **1 – It must be large enough to enter.**

First, it must be large enough and so configured that an employee can fully enter and perform work. A space that is just large enough that an employee could just barely squeeze into, but cannot perform any work does not meet this definition. Similarly, a space that is large enough that an employee can only get part of their body into, but can't fully enter, does not meet this definition. While there may be hazards associated with these types of spaces, they are not addressed with this particular rule.

## **2 – It must have limited means of entry and exit.**

Second, it must have a limited means for entry and exit. Typically, if you must contort your body to enter a space it may be limited means of entry and exit. Examples of this include having to climb through a porthole, climb up a ladder, or crawling through a tunnel in order to exit.

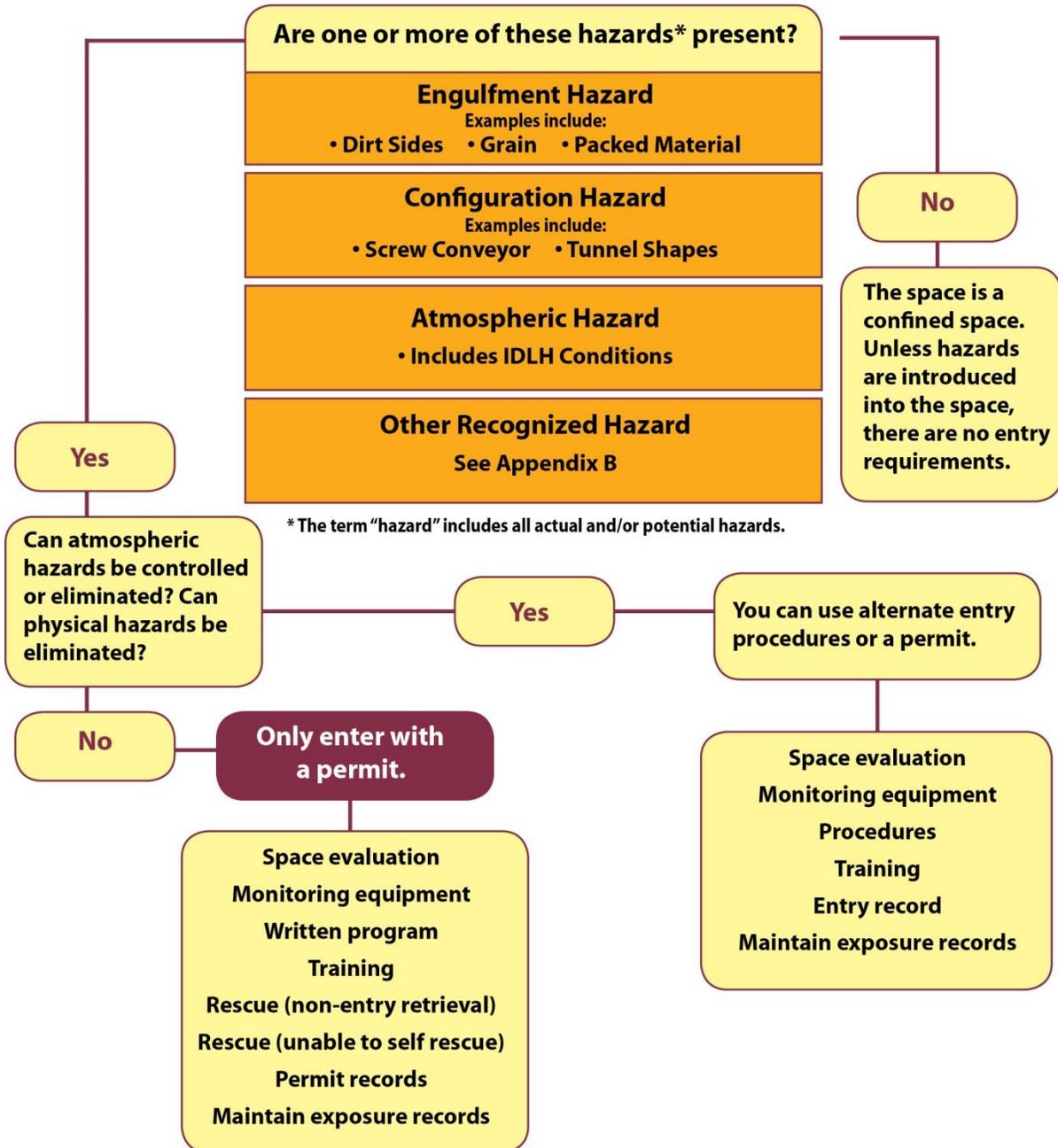
Another way of measuring limited means of entry and exit is to determine how difficult it would be to extract an injured person from the space. If there is a need for any type of technical rescue operation to remove an immobilized person from the space then you likely have limited entry and exit. It is important to recognize that each space should be evaluated on a case by case basis and a limitation in one set of circumstances may not be a limitation elsewhere.

## **3 – It is not designed for continuous occupancy.**

Third, it is not designed for continuous human occupancy. This particular characteristic can cause a certain amount of confusion and discussion. A space that is designed for periodic occupancy is not the same thing as a space that is designed for continuous occupancy. The presence of a fixed ladder, lighting, or ventilation does not automatically mean that the space was designed for continuous occupancy. One must look at the primary function and purpose of the space. A space may have lighting to facilitate periodic occupancy. This lighting may be needed to safely enter and exit, read gauges or perform maintenance or repairs to equipment in the space. Similarly, ventilation may be necessary to keep equipment from overheating or provide fresh air for temporary job assignments or tasks. In both cases the work required to be performed in these spaces is intermittent or temporary in nature. Was the space designed for an employee to be permanently assigned to perform work there or was the space designed to house and protect operating equipment that needs to be monitored or occasionally maintained?

**PART II: Determine if you have a permit-required confined space.**

**You determined that you have a confined space.**



## **Evaluation of Permit-Required Confined Spaces**

**A permit space is a confined space with an actual or potential hazard that can inhibit an entrant's ability to safely exit the space.**

Once a confined space is identified, the next step is to determine if it is a permit-required confined space (permit space). There are 2 types of actual or potential hazards.

Atmospheric hazards can include an oxygen-deficient or oxygen-rich atmosphere, a toxic atmosphere, or an explosive atmosphere. Physical hazards can include entrapment, engulfment, electrocution, heat stroke, moving machinery, or any other serious hazard.

### **Atmospheric Hazards:**

In evaluating the atmospheric hazards, it is important to include conditions within the space, systems connected to the space, conditions outside of the space, and anything that is brought into the space in order to perform assigned tasks. For example, workers may need to enter one part of a tunnel where there are no obvious sources of atmospheric hazards, but workers in another part of the tunnel may be creating an atmospheric hazard that has the potential to migrate to other parts of the system. These need to be identified by all affected parties. Another example of overlooked hazards can be with a space with a particularly small volume with several workers inside. In these situations the simple act of breathing can create an oxygen-deficient atmosphere.

Another consideration for evaluating atmospheric hazards is using air monitoring equipment to evaluate conditions within a permit space. Any air monitoring equipment must be used according to the manufacturer's instructions, and employees using those meters must know how to use them. There have been several fatalities in permit required confined spaces where the air monitoring equipment alarms identified an unsafe condition but were ignored by the operator. If there is any indication of equipment failure all permit required confined space operations must stop until the equipment is repaired.

Also, there can be a tendency to oversimplify the results of oxygen testing when evaluating an oxygen-deficient atmosphere. While the rule clearly identifies 19.5% as an oxygen-deficient atmosphere; that does not mean that nothing more needs to happen if the meter reads 19.6% oxygen. Typically, the normal atmospheric concentration of oxygen is around 20.8% to 21.5%. If your meter reads 20.9% outside of the space, and 19.9% inside the space that is telling you that something has displaced 1% of the oxygen inside the space, which can equate to at least 10,000 parts-per-million of another gas. To put this into perspective, an atmosphere containing 1200 parts-per-million of carbon monoxide is considered to be immediately dangerous to life and health. It is vitally important to identify that other gas to adequately identify all of the hazards of that space.

### **Physical Hazards:**

Physical hazards can come in many different forms. The hazard could be related to the configuration of a space, equipment inside the space or materials which can flow into a space and entrap an entrant. There are several ways of eliminating physical hazards through lockout/tagout, blanking and blinding or a physical separation on piping systems from the confined space.

In evaluating physical hazards, it is important to understand that the confined space must be evaluated as it normally operates. There can be a tendency to evaluate a space after protective actions, such as lockout/tagout, are taken, and then not designate it as a permit space. If any actions, such as lockout/tagout, are necessary to make the space safe for entry, then it is a permit space. While lockout/tagout is recognized as an elimination of hazards, it is only a temporary elimination that exists only as long as the lock is in place. Once the lock is removed, the hazard is no longer eliminated. Another consideration for using lockout/tagout is that all of the requirements for the control of hazardous energy in 1910.147, where applicable, still apply. Any hazards that still remain after applying lockout/tagout must still be addressed.

## **Non-Mandatory Appendix B**

### **Potential Confined Space Hazards**

What follows is a compilation of hazards and conditions which may compromise safe confined space entry and/or rescue procedures. The list is not exhaustive. Specific confined spaces may have hazards unique to that space. All hazards need to be evaluated and eliminated or controlled prior to entry. Consider hazards that may be present initially as well as those that may develop during the course of work.

Atmospheric hazards:

- Oxygen deficiency
- Oxygen enrichment
- Inert gases used to exclude oxygen (for example, nitrogen, helium, steam, freons, argon, or carbon dioxide)
- Flammable or explosive gases, liquids, vapors, mists, fibers, or dusts
- Toxic dusts, mists, fumes, smoke, vapors, fibers, or gases
- Airborne biological contaminants, including molds, bacteria, viruses and other potential disease-inducing agents

Engulfment hazards – presence of materials that can capture or surround an entrant:

- Avalanche of materials
- Surrounding and suffocating
- Trenching cave-ins
- Drowning
- Bridged materials which collapse when stepped on

Falls from heights

Falling objects (tools, structural materials, debris)

Harness or lifeline snag points (e.g., agitator blades, piping, screws, etc.)

Configuration of space:

- Complexity of internal structure
- Inwardly sloping walls or floors
- Tight and/or narrow diameter spaces – entrapment
- Access restricting rescue

Ignition sources – examples include:

- Grinding
- Welding, cutting, burning, brazing
- Space heaters
- Hand tools
- Power tools
- Exposed light bulbs
- Sources of static electric discharge (e.g., synthetic clothing, transfer of liquids or gases not bonded and grounded)
- Non-intrinsically safe equipment

Illumination – insufficient in quality or quantity

Moving mechanical equipment:

- Agitators
- Tumblers
- Crushers
- Mixing blades
- Screw conveyors
- Shakers

#### Electrical power sources

- Transmission lines
- Junction boxes
- Transformers
- Electrically powered equipment taken into the space or installed in the space

#### Hydraulically or pneumatically powered equipment

##### Pressurized lines

- Steam
- Hydraulic
- Pneumatic
- Fuel and other gas
- Water

##### Radiation

- Ionizing
- Non-ionizing (including lasers)

#### Process material lines, open or leaking lines which introduce:

- Toxic materials
- Flammable or combustible
- Oxidizing materials
- Corrosive materials
- Heated liquid or gaseous substances (such as steam) containing hydraulic oils, other fluids, or gases
- Other substances hazardous to health or that may displace oxygen

#### Isolation is difficult or impossible – Examples of environments in which significant isolation issues may arise:

- Wastewater sewer systems
- Stormwater drain systems
- Dams
- Hydro-electric plants
- Nuclear plants

#### Hazards originating in adjacent areas:

- Exhaust or flue gases
- Chemical releases

#### Mobile confined spaces that are not adequately secured prior to entry:

- Moving (such as ships and barges; or rail cars or tank trucks that do not have chocks or wheel blocks)
- Rotating (cement or other trucks which may not be properly locked out)

- Shifting (tank trucks lacking a cab or jack stand)
- Crushing (garbage trucks which may not be properly locked out)

Noise (preventing the ability to communicate or hear warnings)

Slippery surfaces

Surface contaminants – liquids and solids on floors, walls, ceilings, or other interior surfaces that may cause eye or skin irritation, burns, or other adverse health effects upon contact

Thermal (heat and cold) extremes:

- Surfaces (radiant or conduction)
- Air temperature (convection)

Tripping hazards

Uncontrolled lateral movement or swing potential with suspended loads

Vibration – Vibrating equipment or vibration of the confined space

Work or equipment introducing additional hazards:

- Hot work (welding, cutting, burning, grinding)
- Inerting
- Abrasive blasting
- Surface coating and painting
- Use of solvents, degreasers, and other cleaning agents
- Demolition activities
- Use of internal combustion engines
- Use of space heaters
- Use of equipment which is not approved or fit for use in the type of confined space, such as non-intrinsically safe or no GFCI when needed.

## **Non-mandatory Appendix C Sample Confined Space Entry Permit and Alternate Entry Form**

The following confined space entry permit and alternate entry form can be modified to fit your particular entry. Make sure you use only the appropriate portions of the forms to create your own entry permit or alternate entry form.

You can also design your own entry permit or alternate entry form. You're **not** required to use the examples provided here.

# SAMPLE CONFINED SPACE ENTRY PERMIT

**Permit**

**date:**                    /   /                    **Work shift:** 1<sup>st</sup>  2<sup>nd</sup>  3<sup>rd</sup>                     **Expires:**                    /   /

**Time started:**

**Permit space to be entered** (name and location of space):

**Purpose of entry:**

**Pre-entry checklist**

Do not enter this permit space until the following “needs action” conditions are corrected.

OK	Needs action	
<input type="checkbox"/>	<input type="checkbox"/>	Before entering the permit space, the supervisor or designee must notify the rescue team. IDLH conditions require at least one rescue team member located outside the space.
<input type="checkbox"/>	<input type="checkbox"/>	A minimum of two employees must be assigned to work involving permit space entry. One employee must remain outside the permit space at all times.
<input type="checkbox"/>	<input type="checkbox"/>	The surrounding area must be surveyed to show that it is free of hazards such as drifting vapors from tanks, piping, sewers, or vehicle exhaust.
<input type="checkbox"/>	<input type="checkbox"/>	Those responsible for operation of the gas monitor have been trained.
<input type="checkbox"/>	<input type="checkbox"/>	Gas monitor calibration tests and functional test (fresh air calibration) have been performed this shift on the gas monitor.
<input type="checkbox"/>	<input type="checkbox"/>	The atmosphere will be continuously monitored while the space is occupied, if required by entry procedure.

**Identify potential hazards**

Possible atmospheric hazards	Yes	No	N/A
Lack of oxygen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Combustible gases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Combustible vapors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Combustible dusts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Toxic gases/vapors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Possible non-atmospheric hazards			
Noise	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chemical contact	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Electrical hazard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mechanical exposure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Temperature extreme	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Engulfment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entrapment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other non-atmospheric hazard (list on separate page)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Pre-entry requirements**

Requirements	Yes	No	N/A	Requirements	Yes	No	N/A
Lockout - tagout/de-energize	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Hot work permit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pipes(s) broken or capped or blanked	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Fall arrest harness/lifeline/tripod	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Purge or flush or drain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Personal protective equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ventilation (natural or mechanical)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Hardhat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secure area	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Gloves	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Safe lighting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Safety glasses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Non-sparking tools	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Respirator, type	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Communication method	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Other PPE:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Contractor employees involved	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Other PPE:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Continuous air monitoring used	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Periodic air monitoring used	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Space-monitoring results		Test 1	Test 2	Test 3	Test 4
Substance monitored	Permissible entry levels	Time: Initial:	Time: Initial:	Time: Initial:	Time: Initial:
Percent oxygen	19.5% to 23.5%				
Combustible gas	Less than 10% LEL				
Other toxic gas					
Other toxic gas					
Other toxic gas					

**Names of trained, authorized individuals**

- Entry supervisor: \_\_\_\_\_
- Entry attendant: \_\_\_\_\_
- Authorized entrants: \_\_\_\_\_
- Authorized entrants: \_\_\_\_\_

**Emergency contact information**

Emergency responder: \_\_\_\_\_ Phone number: \_\_\_\_\_  
 Contact person: \_\_\_\_\_ Time: \_\_\_\_\_

**This permit has been terminated for the following reason:**

Work completed       Canceled      Time: \_\_\_\_\_      Note: \_\_\_\_\_

Supervisor's signature \_\_\_\_\_ Time: \_\_\_\_\_ Date: / /

**Return this completed permit to \_\_\_\_\_ . Review, then file for one year.**

## SAMPLE ALTERNATE ENTRY FORM

Location of space:	
Entry date:	Duration of entry:

List entrants' names

List physical hazards in the space	List atmospheric hazards in the space

List each action taken to eliminate physical and atmospheric hazards in the space	
Action	Description

Ventilation	
Is ventilation required? <b>YES</b> <input type="checkbox"/>	<b>NO</b> <input type="checkbox"/>
If "Yes," type of ventilation:	Amount of ventilation (cfm or AC/hr)

Air monitoring					
Substance monitored	Unit	Permissible levels		Monitoring results	
				Initial Test	Peak reading during entry

Instruments used for air monitoring	
Model # or type:	Calibration (or bump test) date:

Additional notes about the space and entry (including whether evacuation was necessary)

Person responsible for ensuring the space is safe to enter	
Name:	Job title:
Signature:	

## **Non-Mandatory Appendix D**

### **Rescue Service Considerations**

- (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. Oregon OSHA believes that compliance with all the provisions of 437-002-0146 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 437-002-0146(9). 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 the rescue requirements of the standard.
  1. 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. 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)? 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 rescue requirements 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.
8. 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?
9. 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?
10. Does the rescue service have the necessary skills in medical evaluation, patient packaging and emergency response? Where necessary, can the rescue service perform patient decontamination before being transported to a medical facility?
11. 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 (9)(d) of the standard to practice rescues prior to an entry or within 12 months of an entry, 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.

- i. 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?

- ii. 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?
- iii. 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?
- iv. 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?
- v. If necessary, can the rescue service properly test the atmosphere to determine if it is IDLH?
- vi. Can the rescue personnel identify information pertinent to the rescue from entry permits, hot work permits, and SDSs?
- vii. 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?
- viii. 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?
- ix. If necessary, can the rescue service safely perform an elevated (high angle) rescue?
- x. 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.** Nonelevated – 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.

## **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.



**Appendix B**  
**Highlights of the Amendments**  
**to the**  
**Oregon OSHA Rule**



## Under the Oregon OSHA Confined Space Rule...

- Both General Industry and Construction employers are covered, unless they are exempt from the rule
- Include a catalog of permit spaces in your written program that describes why they are permit spaces
- Use equipment in accordance with manufacturer's instructions
- Train employees in how to use necessary equipment
- Awareness training is required for employees who work or may work in areas where permit spaces are present. It must explain the permit-space program, the entry permit system, the alternate entry procedures (if used), and how to recognize permit spaces in their work area.
- If you use a third-party rescue service, have an agreement with them
- Reclassification as defined in the Federal OSHA Rule 1910.146(c)(7) is not allowed under the Oregon OSHA regulation.
- Alternate entry may be used to enter a permit space if all physical hazards have been eliminated and all atmospheric hazards have been eliminated or controlled with continuous ventilation. This is not the same as requirements found in the Federal OSHA Rule 1910.146(c)(5)



# **Appendix C**

**Example completed  
entry permit**

**Example completed  
alternate entry form**



# Entry permit

Permit date: 1/21/14 Work shift: 1<sup>st</sup>  2<sup>nd</sup>  3<sup>rd</sup>  Expires: 1/21/14

Time started: 7:00 am

Permit space to be entered (name and location of space): Water Tank #1

Purpose of entry: Remove rust inside tank, paint inside with epoxy paint

### Names of trained, authorized individuals

- Entry supervisor: Nick Fellows
- Entry attendant: Margaret Carter
- Authorized entrants: Jim Buchanan
- Authorized entrants: Jay Kirby

### Emergency contact information

Emergency responder: In-house Phone number: \_\_\_\_\_

Contact person: Steve Rogers Time: \_\_\_\_\_

### Pre-entry requirements

Requirements	Yes	No	N/A	Requirements	Yes	No	N/A
Lockout - tagout/de-energize	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Hot work permit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pipes(s) broken or capped or blanked	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Fall arrest harness/lifeline/tripod	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Purge or flush or drain	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Personal protective equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ventilation (natural or mechanical)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Hardhat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secure area	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Gloves	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Safe lighting	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Safety glasses	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Non-sparking tools	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Respirator, type	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Communication method	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Other PPE:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Contractor employees involved	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Other PPE:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### Space-monitoring results

Space-monitoring results		Test 1	Test 2	Test 3	Test 4
Monitor at least every four hours	Permissible entry levels	Time: 7:30 AM Initial:MC	Time: 11:30 AM Initial:MC	Time: Initial:	Time: Initial:
Percent oxygen	19.5% to 23.5%	20.9%	20.9%		
Combustible gas	Less than 10% LEL	0%	0%		
Other toxic gas					
Other toxic gas					
Other toxic gas					

# Entry permit (continued)

Possible atmospheric hazards	Yes	No	N/A
Lack of oxygen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Combustible gases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Combustible vapors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Combustible dusts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Toxic gases/vapors	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Possible non-atmospheric hazards			
Noise	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chemical contact	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Electrical hazard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mechanical exposure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Temperature extreme	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Engulfment	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entrapment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other non-atmospheric hazard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Pre-entry checklist

Do not enter this permit space until the following "needs action" conditions are corrected.

OK	Needs action	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Before entering the permit space, the supervisor or designee must notify the rescue team. IDLH conditions require at least one rescue team member located outside the space.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	A minimum of two employees must be assigned to work involving permit space entry. One employee must remain outside the permit space at all times.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	The surrounding area must be surveyed to show that it is free of hazards such as drifting vapors from tanks, piping, sewers, or vehicle exhaust.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Those responsible for operation of the gas monitor have been trained.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Gas monitor calibration tests and functional test (fresh air calibration) have been performed this shift on the gas monitor. If so, by whom? <u>MC</u>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	The atmosphere will be continuously monitored while the space is occupied, if required by entry procedure.

## This permit has been terminated for the following reason:

Work completed     Canceled    Time: \_\_\_\_\_    Note: \_\_\_\_\_

Supervisor's signature Nick Fellows    Time: 11:30 AM    Date: 1/21/14

Return this completed permit to \_\_\_\_\_ . Review, then file for one year.

# Alternate entry form

Location of space: <b>Mixing Vat #3</b>	
Entry date: <b>8-26-14</b>	Duration of entry: <b>4 hrs</b>

List entrants' names
<b>Rory Williams</b>
<b>Amelia Pond</b>

List physical hazards in the space	List atmospheric hazards in the space
<b>rotating agitator</b>	<b>potential for oxygen deficiency from cleaning operation prior to entry</b>
<b>high temperature/heating element</b>	

List each action taken to eliminate physical and atmospheric hazards in the space	
Action	Description
<b>Lockout rotating agitator</b>	<b>Test oxygen level before entry and use forced-air ventilation if oxygen level below 20.9%, then retest.</b>
<b>Lockout heating element and allow vat to cool for 24 hours before entry</b>	

Ventilation	
Is ventilation required? <b>YES</b> <input type="checkbox"/>	<b>NO</b> <input checked="" type="checkbox"/>
If "Yes," type of ventilation:	Amount of ventilation (cfm or AC/hr)

Air monitoring					
Substance monitored	Unit	Permissible levels		Monitoring results	
				Initial Test	Peak reading during entry
<b>Oxygen</b>	<b>%</b>	<b>20.9%</b>		<b>20.9%</b>	

Instruments used for air monitoring	
Model # or type:	Calibration (or bump test) date:
<b>Draeger X-am 2000 SN: 8318705</b>	<b>Bump test 8-26-14</b>

Additional notes about the space and entry (including whether evacuation was necessary)

Person responsible for ensuring the space is safe to enter	
Name: <b>Matt Smith</b>	Job title: <b>Mixing Room General Foreman</b>
Signature: <i>Matt Smith</i>	



**Appendix D**

**Case Studies**  
**from**  
**Accident Investigations**

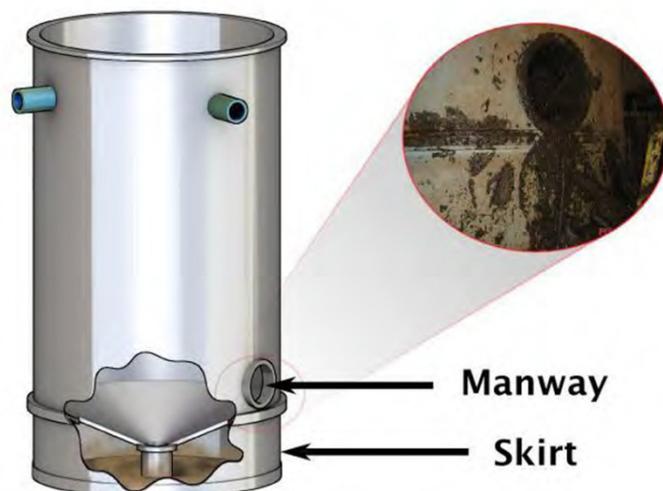


ConAgra Foods  
Boardman, Oregon  
February 16, 2009  
1 Worker Killed

A welding contractor was killed while repairing a 1 ¼ by ½ inch crack on the bottom of a water clarifier tank at a ConAgra Foods facility. The 23-foot-tall tank was used to separate dirt and debris from wastewater in a potato-washing process area. The tank was open at the top and had a metal skirt around its cone-shaped base. While the welder was working inside the tank, an explosion occurred; the internal tank structures collapsed, resulting in his death.

The CBS determined that approximately 14 inches of debris-laden water had leaked through the crack in the tank and accumulated in the hidden space under the tank skirting. Examination of a sample of the liquid indicated that bacterial decomposition of the organic matter likely produced flammable gas, which was then ignited by the welding activity.

In this case, ConAgra personnel had tested for combustible gas inside the tank prior to the hot work, but only from the entrance of the tank and no flammable gas was detected. Monitoring for combustible gases was not conducted in the immediate area of the crack just prior to the initiation of the welding or in the adjacent space where flammable gas was present. Personnel were inadequately trained on the use of the specific combustible gas detector that was used and no hot work permit had been issued prior to commencing the welding.





Woodpecker Trucking  
Pendleton, Oregon  
October 2008

An employee was strengthening baffles inside a truck-mounted water tank. The tank was divided into three compartments by two baffles. The employee had tools that included a wire fed welder with argon gas, a pneumatic grinder, an oxygen/acetylene cutting torch and various hand tools. A fire broke out approximately 15 minutes after the employee entered the tank and lasted for approximately 2 minutes. The employee was killed by inhaling superheated gases.

Several items, including a Bic lighter, were found in compartment #2. It was determined the fire started in compartment #2 and moved to compartment #3, apparently following the employee. The Bic lighter was considered a possible source of ignition, although the possibility of sparks from rivets on the employee's clothing was not ruled out. Oxygen from the cutting torch, which was attached to an oxygen/acetylene manifold and had been left in the tank overnight. The employee had an airline respirator, but the space did not appear to be ventilated at the time of the incident.





# **Appendix E**

## **Resources**



[www.orosha.org](http://www.orosha.org) (Oregon OSHA)

[www.osha.gov](http://www.osha.gov) (Federal OSHA)

[www.cdc.gov/niosh](http://www.cdc.gov/niosh) (Centers for Disease Control and Prevention/ National Institute of Occupational Safety and Health)

[www.elcosh.org](http://www.elcosh.org) (Electronic Library of Construction Occupational Safety & Health)

[www.croetweb.com](http://www.croetweb.com) (Oregon Institute of Occupational Health Sciences)



# **Appendix F**

## **Answer Key to Workbook Activities**



Activity pages 6-7 – Look at the photos in this section. Are they exempted activities? Why or why not?



#### Pipe in Excavation:

- The work is covered by the Confined Space rule if you have to bodily enter the sewer space, which is an existing sewer pipe or manhole, or new construction connected to an existing sewer.
- The work does not fall under the Confined Space Rule if the sewer space is large enough to bodily enter but entry is not required. If the work is not covered by the Confined Space Rule, then Division 3/P Excavations applies, which has its own requirements about hazardous atmospheres.
- If work is performed in an underground pipe that is not part of or connected to a sanitary sewer and is not part of excavation work, then the work is covered by the Confined Space Rule.
- Note: this photo shows a shield height violation because it's not tall enough.



#### Welding During Tank Construction:

- As shown, this is not a confined space so it isn't covered by the Confined Space Rule. However, if work continues and the space changes to a confined space, it could be covered under the rule, if there are hazards in addition to those related to welding. Said another way, if the space is a confined space but the only hazards are related to welding, then it is covered by Division 2/Q Welding.



#### Grain Elevator Headworks:

- As shown this is not covered by the Confined Space Rule because it is a grain storage facility. It is covered by 1910.272 ,Grain Handling Facilities.

Activity page 9-11: Identify the confined spaces in the following photos:



Sport Utility Vehicle – not a confined space, since it is designed for continuous human occupation.



Plastic Tanks –the larger ones are confined spaces, the two smaller ones appear to be too small to enter bodily.



Tank Under Construction –not a confined space as shown, but could become one later during construction.



Cement Mixer – cab is not a confined space since it is intended for continuous human occupation. Drum is a confined space.



Cement Mixer Drum – confined space.



Produce Washer – confined space



Fermentation Tank – confined space



Manhole in Excavation – Excavation is not a confined space, but the manhole is a confined space.



Underground Utility Tunnel – is covered under the Confined Space Rule, unless it is covered by 1926.953, Division 3/V Electric Power Generation, Transmission And Distribution for enclosed spaces.

Activity page 16: Can this four-gas monitor be used to measure all atmospheric hazards? Why or why not? What can it measure?



It cannot measure all atmospheric hazards. There may be toxic chemicals present it cannot measure because a specific sensor is required. It can measure the following:

Oxygen (O<sub>2</sub>) level in percent (%)

Oxygen deficiency is the lack of oxygen in the air that can lead to dizziness, nausea, impaired thinking, and death. It has poor warning properties, because we can't smell, taste, touch or hear it. It can be caused by anything that consumes oxygen, or displaces it. Curing of paint or coatings, burning of fuels like propane or gasoline, and rust all consume oxygen. Purging a space with an inert gas, such as argon, displaces oxygen. To work in an oxygen deficient atmosphere oxygen must be provided by forced-air ventilation or a supplied-air respirator. A filtering face-piece respirator is not enough. Oxygen enrichment is a surplus of oxygen in air that can lead to an explosion if ignited, or accelerate a fire.

Flammable or explosive atmospheres in percent lower explosive limit (% LEL)

Examples include gases, liquids, vapors, mists, fibers or dusts that will burn or explode if ignited. Ignition sources can include static electricity, light bulbs, hand tools and power tools, welding, cutting, burning, brazing, and grinding.

Toxic materials Carbon Monoxide (CO) and Hydrogen Sulfide (H<sub>2</sub>S) in parts per million (ppm)

Carbon monoxide poisoning can lead to sleepiness, dizziness, headaches, nausea, impaired thinking and death. It also has poor warning properties. Burning fossil fuels like propane, gasoline, and diesel, in addition to wood products, produces carbon monoxide. To work in a space with carbon monoxide, forced-air ventilation or a supplied air respirator must be used. Carbon monoxide can't be filtered out.

Hydrogen sulfide is a product of rotting organic material and is also known as "sewer gas". It has a very distinctive warning property – it smells like rotten eggs! However, the smell usually goes away fairly quickly. Not because the hydrogen sulfide has gone away, but because we experience olfactory fatigue. Forced-air ventilation may be used to protect employees, or an acid gas cartridge used with the appropriate respirator.

A couple of examples of common atmospheric hazards that require a specific sensor or device to measure include the following:

### Ammonia

Ammonia is a colorless gas with a distinct odor. It is commonly found in household and industrial cleaners, in fertilizer and as a refrigerant. It can cause irritation and burning of the skin, mouth, throat, lungs and eyes. Other symptoms include pain, coughing and difficulty breathing. High levels can be deadly.

### Chlorine

Chlorine has a distinctive, pungent odor that many people recognize as bleach, and is yellow-green in color as a gas. It is one of the most commonly used industrial chemicals and is also found in household cleaners. Symptoms include pain and burning of the skin, eyes, nose and throat, coughing and difficulty breathing, and nausea and vomiting. High levels can be deadly.

Activity p.17: Under what conditions would the confined spaces shown below be permit-required confined spaces?.



#### Excavation

- The work is covered by the Confined Space Rule if you have to enter the sewer space, such as an existing sewer pipe or manhole, or new construction connected to an existing sewer.
- The work does not fall under the Confined Space Rule if the sewer space is large enough to enter but entry is not required.
- If the work is not covered by the Confined Space Rule, then Division 3/P Excavations applies, which has its own requirements about hazardous atmospheres.
- If work is performed in an underground pipe that is not part of or connected to a sanitary sewer and is not part of excavation work, then the work is covered by the Confined Space Rule.



#### Tank

The tank is a confined space, and a permit space if a hazard is present, such as baffles that present a configuration hazard, mixers that present a mechanical hazard or chemicals (including cleaning chemicals) that present an atmospheric hazards. LOTO and ventilation could potentially be used to allow use of alternate entry procedures.



#### Cement mixer cab and drum –

The cab of the truck is not a confined space.

The drum is a confined space, and is a permit space on the basis of hazardous energy alone. Other potential hazards are: noise caused by jackhammering out cured concrete if the noise interferes with communication or warnings; atmospheric hazards caused by cleaning chemicals; and hazards caused by welding on baffles inside the drum. Hazards would have to be controlled or eliminated to enter using alternate entry procedures.



Activity page 29: Name the types of equipment in the pictures



Lighting



Non-sparking tools



Respirator



Air-monitoring equipment (four-gas meter)



Rescue equipment



Ventilation Equipment



Barrier

Activity page 36: Can a space be modified to make rescue easier and/or safer? While not always an option, it may be possible in some situations. For example, in a large silo with openings only at the top, could another entrance or opening be built in at ground level? Instead of rescuers having to climb or be lifted to the top of the silo, and then pulling the person to the top and letting them back down to the ground, they could go directly through the opening at ground level.



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