

# **CONFINED SPACE**

STUDENT WORKBOOK

**City of Eugene Wastewater Division**

410 River Ave  
Eugene OR 97404

Document WW-2267

# CONFINED SPACE

## Entrant, Attendant, & Entry Supervisor Training Student Workbook

**IMPORTANT NOTE:** This manual is intended to supplement, not replace, the policies, procedures, and trainings used at the City of Eugene Wastewater Division. All Wastewater Division staff who engage in confined space work must be fully trained by the Division, including the training associated with this workbook, on the job training, and supervisor sign-off.

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## Course Introduction

This course will cover:

- Confined Space and permit space definitions
- Roles and responsibilities of everyone on the confined space entry team
- How hazards are identified and controlled
- How we can get into and out of these spaces safely
- Wastewater Division procedures

## OSHA Confined Space Rule

The Oregon OSHA Confined Space Rule's purpose is to provide \_\_\_\_\_ to protect \_\_\_\_\_ from the \_\_\_\_\_ of entering and working in \_\_\_\_\_. OAR 437-002-0146

At the Wastewater Division...no one is to enter confined spaces without completing this training, on the job training, and displaying competence with supervisor's evaluation.

## Course Outline

This training is divided into four modules:

- Module 1: *Confined Space Basics* provides an introduction to definitions and responsibilities.
- Module 2: *Hazards* looks at the hazards associated with confined spaces.
- Module 3: *Making Safe Entries* describes how we will eliminate or control these hazards.
- Module 4: Wastewater Division Procedures

# Module 1: Confined Space Basics

## Definitions

A comprehensive list of definitions can be found: \_\_\_\_\_

Confined spaces have the following characteristics:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

## Confined Space Examples

Space	Yes	No	?
Crawlway under a building			
Finished attic			
Crane control cab			
Dumpster			
55-gallon drum			
Vactor truck collection tank			
Culvert under a highway			
Trench			

## “Permit-Required”

A Permit-Required Confined space will always be called \_\_\_\_\_ no matter what method of entry is used.

## Confined Space Accidents

Workers are Killed by:

Atmosphere: \_\_\_\_\_ %

Heat \_\_\_\_\_ %

Engulfment: \_\_\_\_\_ %

Electrocution: \_\_\_\_\_ %

Falling Objects: \_\_\_\_\_ %

Falls: \_\_\_\_\_ %

What do they all have in common?

\_\_\_\_\_

Untrained Rescuers react with \_\_\_\_\_, which reduces \_\_\_\_\_ . These reactions are impulsive and do not consider possible hazards.

### **Evaluation and Identification of Spaces**

What is a Permit-Required Confined Space?

It's a confined space with a \_\_\_\_\_ .

A serious safety hazard prevents \_\_\_\_\_ .

### **What is Entry?**

Entry into a Permit Required Confined Space occurs when \_\_\_\_\_  
\_\_\_\_\_ breaks the plane of the confined space. This can include just your \_\_\_\_\_ reaching past the opening.

### **How Do We Ensure Your Safety?**

- Identify/Assess Permit Spaces
- Develop Policies and Procedures
- Provide Equipment
- Use an Entry Permit (or Alternate Entry Form when conditions are met)
- Train Entrants, Attendants, and Entry Supervisors

### **PRCS Team**

Attendant: \_\_\_\_\_

Entrant: \_\_\_\_\_

Entry Supervisor: \_\_\_\_\_

Safety Manager: \_\_\_\_\_

Rescue Team: \_\_\_\_\_

## Roles & Responsibilities: Entrants, Attendants, Entry Supervisors

### Attendants:

- Know the hazards, including \_\_\_\_\_
- Be able to use all safety equipment and ensure entrants are using all \_\_\_\_\_ identified on the permit.
- Remain \_\_\_\_\_ until relieved by another attendant or entry is complete.
- Communicate with the entrants to monitor their status and issue an order to evacuate if \_\_\_\_\_.
- Monitor activities inside and outside the space to determine if it is safe for entrants to remain in the space. This may include hazards that \_\_\_\_\_.
- Ensure that the only people inside the space are the entrants identified on the permit.
- Contact rescuers (if needed).
- Never \_\_\_\_\_ the space.
- Order entrants to evacuate immediately under the following conditions:
  - When a \_\_\_\_\_ condition is detected
  - If the \_\_\_\_\_ of hazard exposure are detected
  - If there is a dangerous situation \_\_\_\_\_ the space
  - If the attendant cannot perform \_\_\_\_\_ required duties
- After directing entrants to evacuate, summon emergency services, if necessary
- 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. Call 9-1-1 for police assistance if unauthorized persons refuse to leave the space.
- Perform \_\_\_\_\_ following WW established rescue procedure.
- Do nothing that would interfere with monitoring and protecting an entrant.
- Be able to perform all their duties \_\_\_\_\_ if attending more than one space.

## Roles & Responsibilities: Entrants, Attendants, Entry Supervisors

### Entrants:

- 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 \_\_\_\_\_ their status and warn them when they need to evacuate.
- Alert the attendant about hazardous conditions in the space or \_\_\_\_\_ of exposure.
- Exit the space immediately when:
  - An order to evacuate is given by the attendant or entry supervisor
  - An \_\_\_\_\_ recognizes any warning sign or symptom of exposure.
  - An entrant detects a dangerous or hazardous condition.
  - An evacuation alarm is activated.

### Entry Supervisors:

- Entry Supervisors must ensure the space is \_\_\_\_\_.
- Know the hazards that entrants may face during entry, including the signs, symptoms, and consequences of exposure.
- Understand how to \_\_\_\_\_ hazards associated with the space.
- Verify, by checking that the appropriate entries have been made on the entry form, that all tests specified by the entry form have been conducted and that all procedures and equipment specified by the form are in place \_\_\_\_\_ the entry form and allowing entry to begin.
- Inform entrants and attendants about the \_\_\_\_\_ associated with the space and the methods used to eliminate or control the hazards.
- Terminate the entry and cancel the entry form as required by the procedures.
- Call 9-1-1 for police assistance if unauthorized persons refuse to leave the space.
- 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.

**Rescue:**

Before entering 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. Rescue procedures must include:

- A process for summoning rescue and emergency medical services.
- A way for the Safety Data Sheet (SDS) or other similar written information to be kept at the worksite and be made available to the medical facility treating an exposed entrant.
- Where feasible, use non-entry retrieval systems or methods whenever an authorized entrant enters a permit space.

**Module 1: Progress Check**

- 1) For every initial victim in a permit space, how many would-be rescuers are killed (on average)? \_\_\_\_\_
- 2) List some common hazards that prevent self-rescue: \_\_\_\_\_  
\_\_\_\_\_.
- 3) Is a 55-gallon drum a confined space? \_\_\_\_\_ Why? \_\_\_\_\_.
- 4) A confined space becomes a permit-required confined space when there is a \_\_\_\_\_.
- 5) Place a check mark in the boxes on the right side of the table to indicate who on the entry team has which responsibility.

Responsibility	Entrant	Attendant	Entry Supervisor
Know the hazards, including signs of exposure			
Inform entrants about the hazards and conditions associated with the space and methods used to eliminate/control the hazards.			
Be able to use all the safety equipment			
Ensure that all entry procedures are completed and the space is safe to enter			
Maintain communication			
Monitor entrants			
Remain at the entrance			
Sound the alert if hazards arise that are not listed on the permit			
Contact the rescue team (in an emergency)			

## Module 2: Hazards

### Engulfment

- The surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can:
  - Be aspirated to cause death by filling or plugging the respiratory system
  - Exert enough force on the body to cause death by strangulation, constriction, or crushing
- Water or sewage flow
- Loose, granular materials stored in bins and hoppers – filter media, grain, sand, coal, etc.
- Crusting and bridging below a worker
- Flooding of a confined space

An engulfment hazard exists if, under the \_\_\_\_\_ scenario, we could not rescue a \_\_\_\_\_, unconscious entrant before the space filled with enough liquid to drown them.

### Configuration

- Has an \_\_\_\_\_ configuration such that an entrant could be trapped or asphyxiated by:
  - Inwardly converging walls, or
  - A floor which slopes downward and tapers to a smaller cross-section

### Atmospheric

- Flammable gas, vapor or mist in excess of \_\_\_\_\_ of its LEL.
- Airborne dust at a concentration that meets or exceeds its LEL (Rule of thumb: vision at \_\_\_\_\_). Can create explosive conditions by holding/discharging static.
- Oxygen < \_\_\_\_\_ % or > \_\_\_\_\_ %
- Atmospheric concentrations of substances above PEL (Permissible Exposure Limit).
- Other atmospheric conditions: IDLH ( \_\_\_\_\_, Standing \_\_\_\_\_ and excessive oxidizing (rust) can create oxygen deficient environments and should be considered in hazard analysis.

## Flammable Atmospheres – LEL

- Critical Factors:
  - \_\_\_\_\_ content in the air
  - Presence of flammable gas, or vapor
  - Presence of dust (visibility of 5' or less)
- Proper air/gas mixture is a condition for an explosion
- Typical Ignition Sources
  - Sparking or electric tool
  - Welding / Cutting operations
  - Smoking

To burn, a molecule must ignite the one next to it.

What is the LEL of a 1% methane/air mix? \_\_\_\_\_%

## Other Hazards

- Noise
  - Amplified due to acoustics within the space
  - Damages hearing; affects communication
- Temperature
  - Extreme heat and cold
  - Steam cleaning
  - Wearing \_\_\_\_\_ can cause over-heating. Staff need to take breaks.
- Slick / Wet Surfaces (moss, ice, grease)
  - Slips and falls
  - Increased chance of electric shock
- Falling Objects
  - Topside openings expose workers inside confined space to falling objects

## Symptoms of Exposure

### Oxygen Deficient Atmospheres

	Minimum acceptable oxygen level
15-19%	Decreased ability to work strenuously. _____
12-14%	Respiration increases. Poor judgement.
10-12%	Respiration increases. _____
8-10%	Mental failure. Fainting. Nausea. _____. Vomiting.
6-8%	4-5 minutes – possible recovery 6 minutes – 50% fatal 8 minutes - fatal
4-6%	Coma in 40 seconds. Death

### Oxygen Enriched Atmospheres

- Oxygen level above \_\_\_\_\_%.
- Causes flammable and combustible materials to burn violently when ignited.
  - Hair, clothing, materials, etc.
  - Oil soaked clothing and materials.
- Never use pure \_\_\_\_\_ to ventilate.
- Never store or place compressed tanks in a confined space.

### Hydrogen Sulfide – H<sub>2</sub>S

- Decomposition of materials, human waste
- Naturally present in some oil/gas reservoirs
- Rotten egg odor at low concentrations – likely no smell at high concentrations
- Heavier than air, so it sinks into low spaces

PPM	Effect	Time
	Permissible Exposure Level (PEL)	8 Hours
20-100	Mild Irritation – eyes, throat	1 Hour
100-250	_____, Cough, Nausea	1 Hour
250-500	Difficulty breathing, Fluid in lungs, Vomiting, Dizziness, Loss of coordination	½ - 1 Hour
500-750	Stumbling/Collapse, Loss of Coordination	30 Minutes
>1000	Unconsciousness, Death	Minutes
In biogas, H <sub>2</sub> S can be in concentrations up to 1,500 ppm which is why it is important to be aware of any locations where H <sub>2</sub> S can settle into lower lying areas		

### Carbon Monoxide – CO

- Odorless, colorless gas
- A by-product of combustion
- You can quickly collapse at high concentrations

PPM	Effect	Time
	Permissible Exposure Level (PEL)	8 Hours
200		3 Hours
600	Drowsiness, Rapid breathing	1 Hour
1000-2000	Slight heart palpitation	30 Mins.
1000-2000	Stagger / Loss of Coordination	90 Mins.
1000-2000	Impaired judgement, Shortness of breath, Blurred vision	2 Hours
2000-2500	Unconsciousness and eventually death	30 Mins.

Toxic Atmospheres can come from:

- Product stored in a \_\_\_\_\_:
  - Gases released when cleaning
  - Materials absorbed into \_\_\_\_\_ of confined space
  - Decomposition of materials in the confined space
- Work performed in a confined space:
  - Welding, cutting, brazing, soldering
  - Painting, scraping, sanding, degreasing, \_\_\_\_\_
  - Sealing, bonding melting
- Hazards from areas adjacent to a confined space

## Module 2: Progress Check

- 1) How can noise impact safety in a confined space? \_\_\_\_\_  
\_\_\_\_\_
- 2) List some symptoms of Hydrogen Sulfide exposure. \_\_\_\_\_  
\_\_\_\_\_
- 3) Is an atmosphere with 19% oxygen safe? \_\_\_\_\_
- 4) A high level of methane in the air means there is a \_\_\_\_\_ level of oxygen.
- 5) What happens if you introduce a spark in a vessel that has 110% LEL? \_\_\_\_\_  
\_\_\_\_\_

## Module 3: Making Safe Entries

### Elimination and Control of Hazards

- Atmospheric hazards are controlled by \_\_\_\_\_
- Lockout is used for hazardous energy control
- Eliminate engulfment hazards. \_\_\_\_\_  
or blank/blind flange whenever possible. When only one valve can be closed and locked to control an engulfment hazard, an entry plan must be created. Entry Plan is described in the Wastewater procedures section.
- Turn sources of noise off
- When possible, clean/remove slippery surface before entry
- Platform for sloped floors

### Isolation

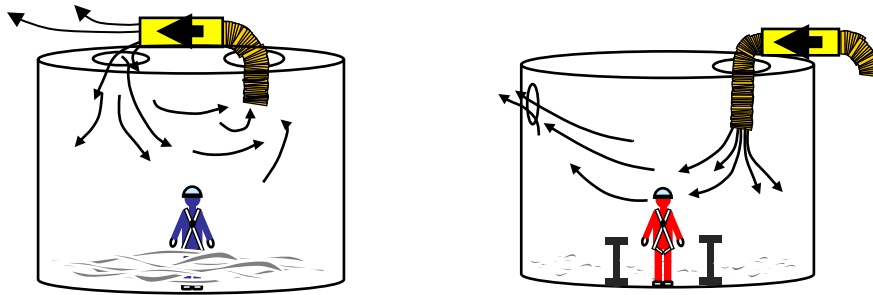
- The Process by which a permit space is removed from service and completely protected against the release of energy and material in the space. Examples include:
  - Barricades and Guardrails
  - Lockout/Tagout
  - \_\_\_\_\_
  - Draining
  - Flushing/Cleaning
  - Cooling/Heating

### Supply or Exhaust

- Supply (Dilution)
  - No single \_\_\_\_\_
  - Creates turbulence
- Exhaust (Source Capture)
  - Toxins produced at a \_\_\_\_\_
  - No turbulence

### Ventilation Practices

- Avoid Short Circuiting. May need additional duct on exhaust.
- Break up pockets. May need a rope tied to duct to direct air flow.



### Opening the Space

- Any opening in a walking-working surface poses an \_\_\_\_\_
- So we must \_\_\_\_\_

### Signage

- Employees must be able to recognize permit-required confined spaces. In addition to training, signs, labels or tags may be used.
- Only authorized employees, those that have been \_\_\_\_\_ as entrants by Wastewater and approved by their supervisor, are allowed to enter permit required spaces.

### Permit Entry Procedures

- Have and follow the written program
- Ensure all participating staff are \_\_\_\_\_ for their roles as Entrants, Attendant, or Entry Supervisor.
- Obtain a permit:
  - Evaluate the hazards of the space
  - Evaluate hazards of the work to be performed

- Identify safe entry conditions
  - Eliminate and/or control the hazards, as able
- Have a trained rescue crew present
- Identify \_\_\_\_\_ that will be required for the work

### **Alternate Entry**

Alternate Entry is a specific procedure for entering a Permit Required Confined Space without a full permit due to all hazards being controlled or eliminated prior to entry. This does not mean entering without any paperwork or a plan. The “permit” method of entry has more requirements to it due to uncontrolled hazards being present. Alternate Entry has fewer requirements due to the elimination and/or control of hazards prior to entry.

- Conditions required to be met for Alternate Entry include:
  - Eliminate all hazards, or
  - Eliminate all \_\_\_\_\_ in the space and \_\_\_\_\_ all atmospheric hazards with continuous ventilation and monitoring.
- For Alternate Entry, OR-OSHA requires documentation of each entry. The Wastewater Division utilizes an Alternate Entry Form for this step.

\*At the Wastewater Division, we only enter Permit Required Confined Spaces under Alternate Entry conditions.

The required items that must be documented for Alternate Entry are as follows, all of which are captured on our Alternate Entry Form:

- The location of the space
- The hazards of the space
- Measures taken to eliminate the hazards
- Measures taken to control the atmospheric hazards
- The identify 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 require the evacuation of the space
- The name, title, and signature of the person responsible for ensuring the safe entry conditions

## **Canceling Entry**

The person authorizing entry (Entry Supervisor) cancels the permit or form.

- Upon completion of the confined space work or expiration of the confined space entry form, and after all entrants have exited the permit space, the individual who authorized the entry shall cancel the form.
- No re-entry shall be made by any persons until a \_\_\_\_\_ permit or Alternate Entry Form is issued.
- Cancelled PERMITS are to be retained for one \_\_\_\_\_.
- Alternate Entry Forms are kept for a minimum of one \_\_\_\_\_.
- If any employees are exposed to atmospheric hazards during entry, the permit or form then becomes an exposure record and must be kept for a minimum of thirty years.

## **Prevention of Unauthorized Entry**

- The unauthorized entry into any confined space is strictly prohibited under any circumstance. Employee's entering without authorization can result in disciplinary action up to, and including, termination (APM 12.1.F).
- Prevention of unauthorized entry will be aided through training and posting of signs.
- Any person observing unauthorized entry or unsafe work practices in or around confined spaces will be responsible to warn the workers performing the confined space work of the perceived hazard(s) or immediately notify their supervisor or lead worker. If the person refuses to leave the space, call 9-1-1 for police.
- The entry supervisor shall terminate entry and cancel the entry when a condition that is not allowed under the entry form arises in or near the confined space.
- Confined spaces accessible by the general public must be locked.

## **Employee Rights**

- The OSHA standard adds the term authorized employee representatives and establishes that employees or their authorized representatives have the opportunity to observe pre-entry testing and subsequent monitoring of a confined space.
- In addition, employees or their representatives may request re-evaluation of the testing and monitoring.

### Module 3: Progress Check

- 1) What are examples of steps taken to isolate a permit space? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- 2) For entry into a space like a digester, which is the correct method of ventilation?  
\_\_\_\_\_
- 3) What authorization does an employee need to enter a permit-required confined space? \_\_\_\_\_  
\_\_\_\_\_
- 4) What is the biggest difference between entering by a permit versus entering under Alternate Entry conditions? \_\_\_\_\_  
\_\_\_\_\_
- 5) Who cancels entry? \_\_\_\_\_

### Module 4: Wastewater Division Procedures

#### Wastewater Permit Required Confined Spaces

All Permit Required Confined Spaces are marked with \_\_\_\_\_.

Examples include:

- Wet wells
- \_\_\_\_\_
- Tanks
- Grit Channels

Spaces that become Permit-Required when there is no power:

- Pump stations with wet wells in the building (Barger/Greenhill, Glenwood)
- Tube stations and vaults that have \_\_\_\_\_.
- Pump stations that are underground (Irvington, West Irwin, Willakenzie, Terry Street)
- Heavy Solids building (Secondary or “The Dungeon”)
- \_\_\_\_\_
- Lower final bisulfite area
- BMF Valve Vault Room

Always check that the ventilation is working prior to entering these spaces by \_\_\_\_\_ coming out of the exterior air vents or opening the door and listening prior to entry. After power loss, forced air ventilation is required prior to entry.

Take the vault lock with you or lock it prior to entering to ensure no one locks you inside.

### **Entry Plan**

When a single valve is the only control holding back an engulfment hazard from a confined space where staff will be entering, an entry plan is necessary. The entry plan needs to:

- Analyze and document the \_\_\_\_\_ of the space
- Document hazard mitigation strategies such as:
  - Blank flanging
  - Pipe removal
  - Pump \_\_\_\_\_
  - Rescue lifeline setup and position for use
  - Multiple person entry
  - And all other hazard mitigations (continuous ventilation and air monitoring, electrical hazard lockouts, PPE, etc.)
- Document entry and non-entry rescue plan in event of catastrophic valve failure
- Risk matrix for categorizing risk level of potential harm to entrants

### **Hazard Assessment & Mitigation**

As covered earlier in this training, assessment of hazards in the to-be-entered permit space must be conducted along with all mitigation methods to control atmospheric hazards and eliminate all physical hazards.

At Wastewater, we only enter using the Alternate Entry method. This method of entry does not require a \_\_\_\_\_ but does require documentation. Under Alternate Entry, all hazards must be eliminated or controlled; there is not the possibility of entry into a confined space with uncontrolled hazards present.

## Alternate Entry Procedures & Form

- Obtain Confined Space Alternate Entry Form
- Survey the space prior to authorization to identify all hazards and how to mitigate them. To ensure all hazards have been identified and eliminated or controlled, a pre-entry planning meeting by involved workgroups will take place.
- Identify \_\_\_\_\_ that will be required for the work
- Identify all lockout/tagout (LOTO) points and list them on the form. Use LOTO procedure, if \_\_\_\_\_.
- It is a Wastewater Division best practice to have two or more entrants for confined space entry work when feasible.
- Give a copy of entry form to Operations prior to entry.
- At completion of entry, give form to the Safety Manager.

The Confined Space Alternate Entry Form is the only written form acceptable at Wastewater for use in authorizing entry into any permit required space. The form must include:

- Location of the permit space (be specific and use proper space name)
- Purpose of entry
- Entry date and the time employees will enter
- Authorized entrants' names
- Authorized attendants' names
- Entry Supervisor's name and signature
- Hazards in the space
- How hazards will be controlled so that the space is safe to enter
- Acceptable entry conditions
- Testing data and tester's initials that certify the space is safe to enter
- Names of emergency responders and instructions for contacting them
- Communication procedures used by entrants and attendants
- A list of all equipment, including PPE, necessary to ensure entrants' safety
- A description of any other permits that entrants need to work in the space

\*A copy of the form is given to Ops Console prior to work conducted at the Plant.

## **Alternate Entry Form**

The form covers ONE confined space and cannot be used for entry into multiple spaces, even if they are similar. For example, if breaking the plane on multiple manholes for sampling, a new form is needed for each location.

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## Canceling the Alternate Entry Form

The person authorizing entry (Entry Supervisor) cancels the form.

- Upon \_\_\_\_\_ of the confined space work or \_\_\_\_\_ of the confined space entry form, and after all entrants have exited the permit space, the Entry Supervisor shall cancel the form.
- The Ops Console is to be notified that the confined space work has been completed for permit-required confined space entry that occurs at the Plant. For entry that occurs at BMF or Pump Stations, staff must notify their supervisor or lead.
- \_\_\_\_\_ shall be made by any persons until a new Alternate Entry Form is issued.
- The canceled entry form is given to the Safety Manager and retained for at least one month.
- Safety Manager audits permits monthly and will follow up with employees on any unusual entry conditions or if the entry form was not executed properly. Incorrect entry can result in reassigning required trainings, documentation, and/or disciplinary action as appropriate (APM 12.1.F). Staff are required to follow all safety procedures and ask questions if anything is unclear.

## Entry Supervisor Must Sign the Entry Form

- The Entry Supervisor is not necessarily the same as the work section supervisor or lead. Entry Supervisor refers to a person with a particular set of responsibilities and \_\_\_\_\_.
- The Entry Supervisor authorizing the entry may sign the Alternate Entry Form allowing entry \_\_\_\_\_ initial atmospheric testing and all other actions and conditions necessary for safe entry have been performed.
- Entry Supervisors may also perform the confined space work as an attendant, but not as an \_\_\_\_\_.
- A safety contact must have a radio on them, in addition to their work cell phone, and be available throughout the duration of the confined space entry. This is so if the attendant is on the phone with 9-1-1, they have an additional means of communicating with their safety contact without getting off the phone with 9-1-1.

\* Radio is not required for Breaking the Plane Only circumstances.

### Breaking the Plane Only

- When a confined space will be breached solely by breaking the plane with \_\_\_\_\_ (NOT entering), the Alternate Entry form is used and the “Breaking the Plane Only” checkbox is checked. At Wastewater certain vaults (e.g. communication vault) are accessed in this manner and the Sampling Team may conduct work in this manner.
- Breaking the Plane procedures vary from full entry procedures in several significant ways. For example: an attendant is not required; rescue procedures are not required; and there are fewer documentation requirements.
- You need to do the following:
  - Eliminate all hazards, or
  - Eliminate all physical hazards in the space and \_\_\_\_\_ all hazardous atmospheres with continuous ventilation.

### Personal Protective Equipment

PPE does not eliminate or control a hazard, but it does provide extra protection to the employee \_\_\_\_\_ and in the correct situations.

Respirators are for particulate filtration. Respirators do not protect from atmospheric gas hazards.

See WW-1253 PPE Procedure for a comprehensive overview.

Obtain Gas Meters, PPE, and Other Safety Equipment.

The following equipment are provided at no cost to the employee:

- Testing and monitoring equipment
- Lighting equipment
- Ventilation equipment
- Communication equipment: phone, radio, blow horn
- PPE (safety glasses/goggles, gloves, hard hat, etc.)
- Respirators (must follow Respiratory Protection Program)
- Barriers & shields
- Ingress/egress equipment (ladders. Etc.)
- Rescue & emergency equipment
- Rope
- Other needed entry/rescue equipment

## Air Monitoring & Gas Meters

Ventilate and Test the Atmosphere. Prior to authorization or entry, a pre-entry test with an approved meter that has been bump tested for oxygen content, flammable gases and vapors (LEL), for potential toxic air contaminants (H<sub>2</sub>S), and carbon monoxide (CO), in that order must be performed.

- Before opening the cover; when possible, test the atmosphere for Oxygen, LEL, H<sub>2</sub>S, and CO prior to opening the space via a small opening or if possible, sliding the cover enough to test the air.
- After removing the cover, place the appropriate \_\_\_\_\_.
- Begin forced air ventilation, if necessary. Take care to ensure the fan is not located near a vehicle exhaust or any other contaminant.
- Now test the atmosphere with an approved meter for Oxygen, LEL, H<sub>2</sub>S, and CO. Testing at approximately every 4 feet of the confined space is necessary for potential stratification. For example, methane rises and H<sub>2</sub>S sinks. Personal meters are to be worn by the entrant(s). If there are not enough personal meters, entrant(s) may not wear the personal meter as long as they are working right next to an entrant wearing a personal meter.
- If the air is still reading atmospheric hazards out of the acceptable range, continue forced ventilation and retest until atmospheric hazards are \_\_\_\_\_.

No entry will be made into a \_\_\_\_\_.

Confined spaces that contain a hazardous atmosphere must be completely ventilated, or otherwise rendered safe, and retested for the presence of a hazardous atmosphere prior to authorization of entry.

At Wastewater, we never enter a Permit Required Confined Space if uncontrolled hazards are present. Ensure the conditions of \_\_\_\_\_ are met prior to entry.

- The attendant shall continuously monitor the atmospheric conditions of the confined space, record readings every \_\_\_\_\_ on the entry form, and must instruct all entrants to exit the confined space if hazardous atmospheric conditions begin to develop.

- If after entry, an atmospheric hazard appears, the attendant must immediately revoke the entry form and no re-entry may be made until a \_\_\_\_\_ Alternate Entry Form is obtained.

Attendant Responsibilities specific to Wastewater Division procedures:

- The attendant will use a cell phone or \_\_\_\_\_ to notify their supervisor/lead immediately prior to initial entry.
- The attendant will have a radio with them for communicating emergencies to the supervisor/lead and Operations Console.
- Ops Console is the emergency contact for work done at the Plant. They are familiar with the confined space locations and capable of guiding emergency vehicles to the specific location. Ops Console is responsible to maintain contact availability for the duration of the confined space work.
- For BMF and Pump Stations, the emergency contact is the work section supervisor or lead.

In case of emergencies, the Attendant will call 9-1-1 and state “\_\_\_\_\_.” Then contact the emergency contact and apprise them of the emergency. This rescue plan is for Alternate Entry entries only.

Entrant Air Monitoring

- Entrants must wear a personal gas meter to continuously monitor for the presence of hazardous atmospheric conditions.
- If multiple staff are working \_\_\_\_\_, one personal meter can be used.
- Personal meters are not in lieu of space meters, they are \_\_\_\_\_ to the space meters. Test the atmosphere for all identified atmospheric hazards before entering the space.

**Gas Meters**

The Wastewater Division has three types of gas meters:

- Pump/Space units
- Personal Gas Meters (PGM)
- Purging Meters

Both pump units and PGM types can be used as a \_\_\_\_\_ meter.

- X-doc bump stations store daily calibration memory of the meters. Data is extracted annually to USB storage and held by the Mechanical Maintenance Supervisor.
- In a large confined space use \_\_\_\_\_ pump meters.
- Clean the meter prior to returning it to the charging station.
- Purge meters are not covered in this training, but staff need to know that purge meters are programmed to report on gases differently and specific training is needed prior to use.
- \_\_\_\_\_ of air monitoring equipment is required prior to every use within a shift. Keep in mind that a bump test confirms that the monitor reads a given substance, as opposed to zeroing, which means nothing is detected.
- If the bump test fails or other failure, put the meter on Mechanical Maintenance Supervisor’s desk with a Post-it note stating the bump test failed or other failure details.
- Calibration gases must be within their expiration dates.
- See the Mechanical Maintenance Supervisor for equipment specific training and questions.

Always test the air at various levels to be sure the \_\_\_\_\_ space is safe.

Good air need the opening does NOT mean there is good air at the bottom.

GAS DENSITY:

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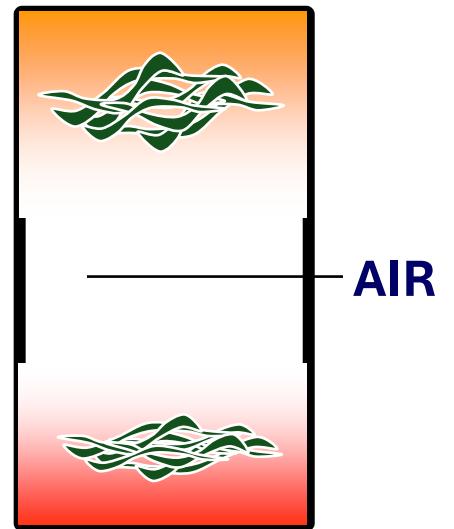
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## Hot Work in Confined Spaces

No hot work is to be performed unless authorized by permit. If hot work is to be performed in the permit space, a separate Hot Work Permit must be completed and attached to the entry form. This is necessary to prevent explosions where an ignition source is introduced into an explosive gas environment.

- Obtain a Hot Work Permit
- Follow permit required confined space entry procedures
- Monitor atmosphere for LEL, oxygen content, CO, H<sub>2</sub>S or other toxic gases.
- Follow Lockout Tagout procedures
- Provide means for readily turning off power, gas, and other supplies from \_\_\_\_\_ the confined space.
- Protect or remove any hazardous materials or materials which may become hazardous when exposed to hot work.
- Continuously ventilate and monitor air to ensure fumes and gases do not exceed safe exposure limits. Ensure a \_\_\_\_\_ is also worn.
- 29 CFR 1910.252(c) and 1926.353(c) require the use of local exhaust ventilation or supplied air respiratory protection when hot work is performed in a confined space where there is a potential for exposure to fluorine compounds (fluxes and rod coatings), zinc, lead, cadmium, or mercury. When beryllium is present, use both local exhaust and a supplied-air respirator. **Wastewater staff are not trained or equipped to use supplied-air respirator.**
- 29 CFR 1926.353(c) requires the use of local exhaust ventilation or supplied air respiratory protection when hot work is performed in a confined space where there is a potential for exposure to chromium or when Gas Metal Arc Welding is performed on stainless steel. **Wastewater staff are not trained or equipped to use supplied-air respirator.**
- If above situations do not apply, use a NIOSH approved Powered Air Purifying Respirator (PAPR) that is compatible with a welding helmet. A PAPR is not a supplied-air respirator.
- Place as much \_\_\_\_\_ as possible outside the confined space. Keep unnecessary personnel and equipment out of the way. Ensure equipment is not blocking the exit route or would hinder rescue efforts.

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## Rescue

For Confined Space Entry Rescue, the Wastewater Division relies on the City of Eugene's Rescue Team which is Eugene Springfield Fire Technical Rescue Team. Call 9-1-1. You must let the dispatcher know that it is a "confined space rescue." These words are critical for \_\_\_\_\_.

Safety Data Sheets (SDS) are available online. Go to the Wastewater Home Page and click the SDS Online link. Review all related hazardous chemical SDS \_\_\_\_\_ to entering a confined space.

If Alternate Entry conditions cannot be met, then a trained rescue team must be onsite for the duration of the entry. Contact your supervisor to coordinate this service.

Wastewater will aid the Fire Department by \_\_\_\_\_ in periodic rescue drills.

### Harness with Retrieval Line

- Entrants must wear a harness with an attached retrieval line except when the use of either causes a hazard or would not serve any useful benefit during rescue.
- Davit arm is located in the \_\_\_\_\_ to the west of Digester #4. This is a fall protection suspension system used by workers to complete tasks in confined spaces. Additional lifelines are in \_\_\_\_\_.
- If the confined space work performed by the entrant is \_\_\_\_\_ feet or higher off the bottom floor of the space, e.g. working from a ladder, the entrant is required to utilize a lifeline and wear a full-body harness.
- Lifelines must be strong enough to provide fall arrest.
- Anchor points must be rated to withstand 5,000 lbs of force.
- Inspect your harness before \_\_\_\_\_.
- If a retrieval line is not used, the entrants must still wear a chest or full body harness.

## No-Entry Rescue

When even the remotest possibility of an atmospheric hazard exists, NO STAFF MAY ENTER TO PROVIDE AID.

The only NO-ENTRY options for rescue are:

- Self-Rescue
- Use Davit arm to retrieve entrant using rope/harness.

## Entry Rescue

Entry Rescue means someone goes into the confined space. The rescuer must have equipment and training and follow all requirements of the OSHA rule. No Wastewater staff are approved confined space rescuers.

If an entrant needs to be rescued, the attendant is to call 9-1-1 and request a “Confined Space Rescue. You will need to answer the following questions:

- Q: 9-1-1 What is the location of your emergency?
  - A: \_\_\_\_\_
- Q: What is the nature of your emergency?
  - A: We need a \_\_\_\_\_
- Q: What is the depth of the confined space?
  - A: Give your best estimate.
- Q: What hazards are associated with the confined space?
  - A: Describe current and potential atmospheric hazards. Fall from heights. Any equipment, temperature, or explosive hazards, and any other hazards associated with the space and situation. Refer to the Entry Form.

## Entry Rescue: Additional Entrant

If any potential for atmospheric hazard exists (CO, H<sub>2</sub>S, LEL, low/high oxygen) NO WASTEWATER EMPLOYEE IS TO ENTER TO PROVIDE AID. Even if the entrant was injured for another reason (tripped and fell), if evidence exists that there could also be an atmospheric hazard, DO NOT ENTER.

If there is absolutely no evidence that an atmospheric hazard is present and the entrant was clearly injured for an unrelated reason (severely bleeding from an equipment injury, fall from heights, conscious with a broken bone and can communicate) an additional entrant other than the attendant may be permitted to enter and provide aid. This may only happen by following these steps:

1. Radio the supervisor/lead – say you need a second entrant to provide medical aid
2. Supervisor is to analyze for any potential atmospheric hazard. If none exists, will add entrant to the entry form for entry and advise second entrant to enter cautiously, with \_\_\_\_\_ required PPE (harness, PGM, safety boots, hearing protection, etc.)
3. Second entrant to provide aid until Fire Department arrives to conduct rescue.

### **Contractors**

When the Division Staff arranges to have employees of another employer (contractor) perform work that involves permit space entry, the designated plant representative shall:

- Inform the contractor that the workplace contains permit spaces and that permit space entry is allowed only through compliance with a permit space program meeting the requirements of 437-002-0146 and 29 CFR 1910.146. If the work involves modification or new construction, only 29 CFR 1926, Division 3 standards may apply to the contractor.
- Inform the contractor of the elements, including the \_\_\_\_\_ identified and the plant's experience with the space, that make the space in question a permit-space.
- Inform the contractor of any precautions or procedures that the Division has implemented for the protection of employees in or near the permit spaces where contractor personnel will be working.
- A designated plant representative will \_\_\_\_\_ entry operations with the contractor when both plant and contractor employees will be working in or near permit spaces as required by paragraph (d) (11) of 29 CFR 1910.146 and OAR 437-002-0146.
- The plant representative shall debrief the contractor at the conclusion of their confined space entry regarding the plant program and any hazards confronted or created in permit spaces during entry operations.

### **Records**

- After a permit required confined space entry, give cancelled forms to the Safety Manager. Forms will be kept for at least one month from the date it expires.
- There is a special relationship between permits, entry forms, and 1910.1020 "Access to Employee Medical and Exposure Records." If the permit or 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.
- Retain training records – this must include training roster with trainer’s wet signature.

### **Training Requirements**

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

- For all \_\_\_\_\_ employees
- Before an employee is assigned permit-space duties
- Before there is a \_\_\_\_\_ in an employee’s assigned \_\_\_\_\_
- When there is a hazard for which an employee has not been trained
- When there are changes to the confined space entry program
- When the permit audit shows \_\_\_\_\_
- When there is a deviation from established procedures or an employee’s knowledge of the procedures is inadequate
- Repeat training when there is a change in the written program and when there are new or previously unidentified permit spaces.
- Awareness training is required for employees who work or may work in areas where permit spaces are present.

## Module 4: Progress Check

1. What are examples of confined spaces located at Wastewater?

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2. When is an Entry Plan needed? \_\_\_\_\_

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3. True or False – In order to meet Alternate Entry conditions, all hazards must be eliminated or controlled.

4. If an air monitor alarms while entrants are in the confined space, do they need a new Alternate Entry form prior to re-entry? \_\_\_\_\_

5. Why must you always test the air at various depths of the confined space?

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6. When should you inspect your harness? \_\_\_\_\_

7. Who is approved to perform entry rescue at Wastewater? \_\_\_\_\_

The most important thing to remember...

Ask questions when you are unsure or notice any red flags. Do not put your life on the line to get work done faster or to avoid awkward interactions. The safety of Wastewater staff is our top priority.