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## ***CONFINED SPACE***

All PFI Standards and Best Practices are advisory only. There is no agreement to adhere to any PFI Standard or Best Practice and their use by anyone is entirely voluntary.

## ***PFI Confined Space Best Practice***

An employer must evaluate their operations to determine if there are any permit-required confined spaces. If any are identified it is the responsibility of the employer to inform employees by posting danger signs to warn employees to the existence, location and danger posed by these permit-required confined spaces. Often times, mechanical contractors will function as both the employer and the employee through their services as a contractor. Contractors can serve in the employer capacity during fabrication in shops and in the employee capacity as the entry employer while performing field installations and maintenance operations for host companies. It is important to recognize that Contractors will have different responsibilities under each role. The fabrication of potential confined spaces (tanks, hoppers, carts, etc.) requires the identification and control of the hazards involved by the Contractor. The installation and maintenance operations which could involve potential confined space areas shall be the responsibility of the host employer to identify, correctly post warnings, and communicate the hazards involved with the designated area. The responsibilities of the entry employer while performing permit-required confined space work are as follows:

1. Obtain any available information regarding permit space hazards and entry operations from the host employer.
2. Coordinate entry operations with the host employer when both host employer personnel and contractor personnel will be working in or near permit spaces.
3. Inform the host employer of the permit space program that the contractor will follow, and of any hazards confronted or created in permit spaces.
4. Formulate, implement, enforce and review a permit-required confined space program.
5. Recognize that when performing work at a customer's site the site rules in most cases will take precedent.

## **DEFINITIONS**

**Competent Person** – Before beginning work a competent person must identify and evaluate all confined spaces in which employees are directed to perform work. The Competent Person must be capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them.

The Competent Person has the authority and shall determine a space to be classified as;

1. Permit Required Confined Space;
2. Non-Permit Required Confined Space;
3. Alternate Entry Space;

4. or at any time reclassify the space with management approval.

**Entry Supervisor** – The Entry Supervisor organizes and supervises all entry operations, including termination of entry. Responsibilities include obtaining equipment for safe entry, ensuring 4 gas air monitors are calibrated, communication devices are in place, permits are completed, and reassess conditions throughout Entry.

**Attendant** – A qualified person who shall be stationed outside of the space, understand the hazards associated with the space, maintain communication with the entrant, contact Rescue Service if necessary, perform non-entry rescue and perform no duty that may interfere with the duty to monitor and protect the entrants.

**Authorized Entrant** – A qualified person trained in confined spaces, able to identify hazards in these spaces, and competency in use of equipment during entries, properly use all required equipment, communicate with the attendant and exit from the permit space as directed or when a prohibited condition arises.

**Exposed Employees** – Employees that work in areas where confined spaces are present shall be aware of the existence, location and hazards posed by confined spaces, but are unauthorized to enter.

## **REQUIREMENTS AND PROCEDURES**

### **Pre-Task Plan Risk Assessment (This can be part of the permitting process)**

Prior to entering a confined space, the team working on the confined space should perform pre-task planning. This risk assessment should include:

- Identifying the confined space and designating the classification of the space (Non-Permit, Alternate Entry, or Permit Required)
- Identifying the roles personnel will be assigned during the entry (entrant, attendant, entry supervisor).
- Discussion with all affected team members to discuss job task(s) for the specific entry
- Identify the hazard associated with the space
- Identifying preventative and control measures resulting from the risk assessment
- Develop a rescue plan for the confined space entry.

## **OTHER ITEMS TO CONSIDER AS PART OF THE RISK ASSESSMENT**

### **Controlling Access to the Space**

Controlling of access to the space needs to be considered at all times. The space should be identified and protected from unauthorized entry. The opening shall be immediately

guarded by a railing, temporary barrier (cover, barricade) or other adequate means. The entrant's safe access to the space shall be considered and maintained.

### **Atmospheric Testing and Continuous Monitoring**

Each employee involved with Confined Space Entry shall be trained and qualified to operate monitoring equipment. Before entry into a confined space, the atmospheric conditions shall first be checked to ensure that acceptable entry conditions exist in the space. Only approved and calibrated direct-reading monitoring equipment shall be used to test for:

- 1) oxygen (O<sub>2</sub>), between 19.5 and 23.5%
- 2) carbon monoxide (CO), less than 25ppm
- 3) combustible gas and vapors (LEL), less than 10%
- 4) toxic gases and vapors (commonly H<sub>2</sub>S), less than 10ppm

Continuous air monitoring shall be performed to ensure acceptable conditions are maintained during entry. Ensure direct-reading monitoring equipment is operated within manufacturers recommendations.

- In environments where entry is into a tank it is important to note the reading should be taken before entry at the top, middle, and bottom of the tank or any time the entrant leaves space.

### **CLASSIFICATION OF CONFINED SPACE**

All Confined Spaces shall be evaluated by a competent person through monitoring and inspection to be accurately classified as one of the following:

- 1) non-permit space;
- 2) alternate entry space;
- 3) reclassified spaced;
- 4) or permit-required space.

Regardless of classification, all spaces shall have documentation of space determination, whether it is a permit, a reclassification form or documentation in daily pre-task planning (for non-permit and alternate entry).

### **Alternate Entry Procedure**

An Alternate Entry procedure occurs when after evaluation the only existing or potential hazard is atmospheric and can be controlled through forced air ventilation. Continuous forced air ventilation alone is sufficient to maintain the space safe for entry. If ventilation stops, work stops. The atmosphere within the space must be continuously monitored and show that ventilation is controlling the hazard.

### **Reclassified Space**

A Reclassified Space is a space that has no actual or potential atmospheric hazard and all hazards in space can be corrected without entry, testing and inspection during entry shows hazards in the space have been eliminated. If the permit-required space is to be reclassified to non-permit, the hazards that are identified and eliminated shall be documented. If at any time a hazard returns, all personnel shall evacuate the space, and the space shall be reevaluated and classified as a Permit-Required Space.

### **Permit-Required Confined Space Entry (PRCS)**

A permit required confined space contains one or more of the following characteristics:

- 1) an actual or potential hazardous atmosphere;
- 2) material that has the potential for engulfing an entrant;
- 3) an internal configuration that could trap or asphyxiate an entrant
- 4) any other recognized serious safety or health hazards (hazards that are immediately dangerous to life or health and interfere with ability to escape unaided).

## **PERMIT REQUIRED CONFINED SPACES**

### **Pre-Entry Briefing and Space Preparation**

All PRCS, require the need for training of all participants to enter the space. The training shall cover controlling atmospheric and engulfment hazards, surveying surrounding areas for monitoring, test of the atmosphere, entry procedures, roles of entrant, attendant and entry supervisor, and rescue operations. All spaces shall also maintain a written copy of tasks to be performed, non-entry or entry rescue procedures, and permits for the duration of the work. Before entering, the Controlling Contractor shall obtain from the Host Employer the location of the known confined spaces and hazards associated with them. Those hazards shall be communicated to the entry team. The entry team will then go through the permitting process.

### **Permitting Process**

Permitting starts once the space is determined to be a permit required space entry. The permit shall be filled out and signed by the Entry Supervisor. The permit shall identify all known hazards as discussed with the Controlling Contractor. The Controlling Contractor shall initial permit to show hazards have been communicated to the Entry Supervisor. The supervisor shall discuss all hazards and practices that will be implemented during the entry with all employees and the employees shall sign off on the permit. At all times during a confined space entry, there shall be continuous monitoring of the air. If additional atmospheric hazards are introduced causing monitor to alarm, evacuate the space and allow for ventilation of the space to occur before retesting the atmosphere for entry.

### **Lockout/Tagout**

Any physical hazards within the space – moving parts, pipes, pumps, or lines that could cause contaminants to flow into space shall be disconnected, shut down and locked out, physical barrier set in place, blanking and bleeding, disconnecting mechanical drives, or otherwise effectively isolated. This allows for the space to be isolated from any additional hazards within the space while work is performed.

### **Ventilation**

Ventilation systems shall be used in spaces that have or may contain a hazardous atmosphere. Outside air shall be provided for forced air ventilation into the space to remove harmful gases, vapors, and inert gases. Employees should try to open other openings into the space to allow for increased air circulation. **Forced ventilation shall not present an additional hazard. Ensure area outside of space is free of atmospheric hazards (propane welders, forklifts or other vehicles)** If the ventilation system stops working or if the four gas monitor alarms for any reason, all worker(s) shall exit the space until adequate ventilation is restored.

If a hazardous atmosphere cannot be controlled by ventilation, then personal respiratory protection will be necessary for safe entry.

### **Communication Devices**

Communication is necessary between entrant and attendant. Form of communication is situational. In the ideal conditions, the entrant and the attendant may use verbal communication throughout the entry. In some entries, workers may not be able to see each other. In those circumstances, a direction line of communication such as walkie talkies or another device will help maintain contact. Other communications equipment can include cellphones; however, the conditions of an enclosed space may make it difficult for phones to receive a signal. Devices may need to be rated intrinsically safe if operating in a potentially explosive atmosphere.

### **Suspension, Closing and/or Cancelling of Permits**

Suspension of Confined Space Entry permits may occur. If additional hazards are identified during entry, or an air monitor alarms, the employee shall leave the space immediately. The current permit should then be suspended. The permit shall be updated to show the new hazards identified in the space. Once hazards are controlled or eliminated, the same permit may be reopened and used as before. The atmosphere shall be retested before entry. The permit then can be used for duration of work or unless another hazard presents during Entry operations. Permits may also be closed or cancelled at any time instead of suspending. If the Competent Person determines due to new or existing hazards that have been identified the Entrant to be endangered, the Entrant(s) shall leave the space and the permit should be closed and the space

reevaluated. Return all closed permits to the Safety Department or Corporate office to maintained on file for a period of not less than one year.

## **Rescue and Emergency Services**

### **Non-Entry Rescue**

Non-entry rescue is a system designed to remove a co-worker from a space without entering. The system shall have a full-body harness for vertical entry or horizontal entry, a retrieval line attached to an anchor point attached to a mechanical device or fixed point outside the permit space to allow for rescue as soon as deemed necessary. An Attendant shall be in constant contact with the workers in the space and have no other duties but to be an Attendant.

### **Emergency Services Coordination**

Coordinate with local emergency services. Make local services aware of entry to provide a backup to non-entry rescue, determine if they have rescue capabilities. Local Emergency Services may not be able to be relied on as first form of rescue.

### **Third Party Entry Rescue Service**

In evaluating a space, if it is determined that non-entry rescue will NOT be sufficient, then an Emergency Rescue Service shall be necessary and obtained. The entry rescue service shall show the ability to respond in a timely manner and workers with the hazards identified, perform the rescue in the identified space, and equipped to perform rescue with hazards that are present. If the Entry Rescue Service is unavailable, they shall immediately notify the entry supervisor that they are unable to provide rescue. Work shall be suspended until service becomes available again.

## **TRAINING & COMPETENCY**

All employees exposed to confined spaces shall be trained in the confined space entry program. Training shall be documented as instructed within the program. All employees exposed to confined spaces shall be trained on identification and procedures for work in and around confined spaces, as well as specific roles in confined space entry procedure. A competency test or evaluation shall be done to ensure employees understand the requirements of this practice.

# Confined Space Entry Permit

Date and Time Issued: \_\_\_\_\_  
 Date and Time Expired: \_\_\_\_\_  
 Job Site Location: \_\_\_\_\_  
 Job Supervisor: \_\_\_\_\_

Equipment to be worked on: \_\_\_\_\_  
 Work to be performed: \_\_\_\_\_

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

<b>Atmosphere prior to entry:</b>		<b>Atmospheric check after isolation and ventilation modifications.</b>
Oxygen _____ %		Oxygen _____ % (19.5% to 23.5%)
LEL _____ % LEL		Explosives/Flammables _____ % LEL (less than 10%)
H2S _____ PPM		H2S _____ PPM (less than 10 PPM H2S)
CO _____ PPM		CO _____ PPM (less than 25 PPM CO)

Signature of Authorized Tester: \_\_\_\_\_

<b>Source Isolation (No Entry):</b>	<b>N/A</b>	<b>YES</b>	<b>NO</b>	<b>Ventilation Modification:</b>	<b>N/A</b>	<b>YES</b>	<b>NO</b>
Pumps or lines blinded, disconnected, or blocked	_____	_____	_____	Mechanical	_____	_____	_____
Lockout/Tag out procedure in place	_____	_____	_____	Natural Ventilation only	_____	_____	_____
				Mechanical and Natural Ventilation	_____	_____	_____

Communication and rescue procedures: \_\_\_\_\_

<b>Entry, standby, and back-up persons:</b>	<b>N/A</b>	<b>YES</b>	<b>NO</b>	<b>Entrants Initials</b>
Successfully completed the required training	_____	_____	_____	_____
The training is current and up to date	_____	_____	_____	_____

<b>Equipment:</b>	<b>N/A</b>	<b>YES</b>	<b>NO</b>	<b>Entrants Initials</b>
Direct reading gas monitor	_____	_____	_____	_____
Safety harness and lifelines for entry and standby personnel	_____	_____	_____	_____
Hoisting equipment	_____	_____	_____	_____
Powered communication	_____	_____	_____	_____
SCBA's for entry and standby personnel	_____	_____	_____	_____
Adequate Personal Protective Equipment provided	_____	_____	_____	_____
All electrical equipment listed Class I, Division I, Group D, and Non-sparking tools	_____	_____	_____	_____
All electrical equipment continuity tested and labeled correctly	_____	_____	_____	_____
<b>Is this space Permit-Required?</b>	<input type="checkbox"/>	<b>YES</b>	<input type="checkbox"/>	<b>NO</b>

**Periodic atmospheric tests:**

<b>Oxygen</b>	<b>Time</b>	_____	_____	_____	_____	_____	_____	_____
	<b>%</b>	_____	_____	_____	_____	_____	_____	_____
<b>Explosives</b>	<b>Time</b>	_____	_____	_____	_____	_____	_____	_____
<b>(% LEL)</b>	<b>%</b>	_____	_____	_____	_____	_____	_____	_____
<b>Toxic</b>	<b>Time</b>	_____	_____	_____	_____	_____	_____	_____
<b>(H2S)</b>	<b>%</b>	_____	_____	_____	_____	_____	_____	_____

We have reviewed the work authorized by this permit and the information contained here-in. Written instruction and safety procedures have been received and are understood. Entry cannot be approved if any squares are marked in the "No" column. This permit is not valid unless all appropriate items are complete.

Permit Prepared by (Supervisor): \_\_\_\_\_ Approved by (Supervisor): \_\_\_\_\_  
 Reviewed by (Safety Professional): \_\_\_\_\_  
 Print Name Signature

This permit is to be kept at the jobsite throughout the duration of confined space work.



