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# ASU CONFINED SPACE PROGRAM

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ANGELO STATE UNIVERSITY

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## Scope

This work instruction covers OSHA's Confined Space Entry 29 CFR 1910.146 and applies to all Permit Required and Non-Permit Required Confined Space Entry work performed at the Angelo State University facilities in San Angelo, Texas.

## Overview

This work instruction provides the guidance needed to safely enter confined spaces. It specifies the controls that must be put in place to address the hazards associated with this type of work and specifies the responsibilities for carrying out these actions.

## Definitions

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

*Confined Space:* Is large enough or so configured that an employee can bodily enter and perform work; has limited or restricted means for entry or exit (i.e., tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means for entry); is not designed for continuous employee occupancy.

*Declassified Space:* A declassified space is a space which does not meet any of the characteristics of a Permit Required Confined Space [all hazards can be mitigated before and during work].

*Double Block And Bleed:* The closure of a line, duct or pipe by locking and tagging a drain or vent, which is open to the atmosphere in the line between two locked-closed valves. The drain or vent, which is locked open, must drain to a visible area.

*Entrant:* An employee who is authorized to enter a permit space

*Entry:* Occurs whenever any part of the body breaks the plane of the confined space opening

*Entry Supervisor:* Means the person responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, possible rescue activities and for terminating entry.

*Flammable:* Any material with a flashpoint below 100°F (37.8°C) or any material heated to or above its flashpoint.

*Hazardous Chemical:* Corrosive liquids and gases, hot (120°F or above) liquids or gases, toxic liquids and gases, flammable or explosive liquids or gases, *oxygen displacing gas*, and hot fly ash.

*Permit Required Confined Space (PRCS):* Means a confined space that has one or more of the following characteristics:

- Contains or has the potential to contain a hazardous atmosphere;
- Contains a material that has the potential for engulfing an entrant;

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

*\*NOTE: Although ASU has confined spaces on campus, ASU does not have any PRCSSs under normal operations. In the event of a gas line break, we may need a contractor to enter a permit required confined space (i.e., due to the gas leak) to isolate the break.*

*Pipe Blank:* A solid disk, typically equipped with a "T" handle that is placed between two flanges in a pipeline to positively stop the flow of material inside the pipe. Sometimes referred to as a "blind" or "pancake".

*Rescue Qualified Employee:* An employee who is rescue trained, qualified, and approved by EHSRM and is required to be part of the Rescue Team during a PRCSS entry. The local Fire Department is only used as a backup to a designated site rescue team.

*Shift:* The continuous work period of the Entry Supervisor up to a maximum of 16 hours.

*Ventilation:* Mechanical ventilation equipment (fans, blowers, air movers, etc.) that can provide a minimum of twelve (12) air changes per hour in confined space. Twenty (20) air changes per hour is preferred.

### **General Requirements**

No confined space shall be entered by any person until the procedures in this program have been implemented.

Prevention of unauthorized entry: Means to prevent unauthorized entry includes identifying all confined space entry locations in the plant and labeling them with appropriate signage. Other preventive measures include new employee training and periodic refresher training.

Identifying and evaluating the hazards prior to entry: Prior to entry a Confined Space Entry permit shall be used which specifies the entry hazards. Additionally, the responsibilities of confined space entry personnel identified in this policy must be followed as prescribed in this policy.

Alternative Entry Procedures: Before entering a confined space, methods of completing the work in an alternative method to avoid the entry must be considered.

Confined Space Isolation: The confined space must be isolated by the placing all valves feeding to, or from the space in the proper position (closed except when they serve as the bleed valve of a double block and bleed) and locked out in accordance with the Hazardous Energy Control procedure. Blanks may be used in lieu of valves when convenient. When piping carries a hazardous material, either a pipe blank must be inserted, misalignment of the remaining sections of pipe, or a double block and bleed used to isolate it from the confined space.

All mechanical equipment, exposed electrical equipment, or other potential energy source in the space must be locked out in accordance with the site Hazardous Control procedure.

Space cleaning: The space must be drained (if necessary) and cleaned as needed, by reasonably available means such as purging with nitrogen, steaming, ventilating or water washing.

Multiple Space Attendant Monitoring: Only a single entry space shall be monitored by a single Attendant. In the event more than one space is required to be observed and monitored by an Attendant, the Entry Permit shall include the provisions necessary to assure a safe entry. Whether more than one Attendant is needed shall depend on the entry location and situation which will be reviewed during the permit process.

Review of Entry Operations: This policy shall be reviewed annually (unless no entry was performed) and shall be changed when necessary to comply with changing regulations and standards or whenever entry operations need to be revised. Review shall also be conducted in any event of an unauthorized entry of a permit space, the detection of a permit space hazard not covered by the permit, the detection of a condition prohibited by the permit, the occurrence of an injury or near-miss during entry, a change in the use or configuration of a permit space, and employee complaints about the effectiveness of the program.

Permit Required Confined Space Entry Permit Validity: The valid and properly completed permit must be conspicuously displayed at the entrance of any permit required confined space and must be protected against damage. A copy of the permit must be posted at each entry point of the permit required confined space.

When one entry shift relieves another, or an Attendant must leave the confined space, a new permit(s) must be issued. This issuance should be planned so that the work in the confined space can continue without interruption.

When Engineering, Technical, or similar personnel need to enter a confined space where work is being performed and an entry permit is in force, they must first contact the Permit Supervisor. Following this notification, they may enter but only after the permit has been revised to include their signature(s) and the Entrant responsibilities have been conducted in accordance with this procedure and the requirements of the permit.

When the required work has been completed and the confined space evacuated, the equipment in the space restored to service, and the space closed, the permit shall be canceled.

Any Entrant, Attendant, or Entry Supervisor may authorize evacuation, although the Entry Supervisor shall conduct the permit authorization and cancellation process.

### **Procedures and Responsibilities**

**Attendant**: The Attendant is responsible for the following:

1. Must know the hazards that may be faced during entry, including information on the mode, signs or symptoms and consequences of the exposure.

2. Is aware of possible behavioral effects of the hazard exposure in authorized entrants;
3. Shall be equipped with a two-way radio.
4. Continuously maintains an accurate count of authorized entrants in the permit space and ensures that the names of the authorized entrants accurately identify who is in the permit space.
5. Remain outside the permit space during entry operations until relieved by another Attendant.
6. Communicates with authorized entrants as necessary to monitor Entrant status and to alert Entrants of the need to evacuate the space,
7. Monitors activities inside and outside the space to determine if it is safe for entrants to remain in the space and orders the authorized entrants to evacuate the permit space immediately under any of the following conditions:
  - If the Attendant detects a prohibited condition
  - If the Attendant detects the behavioral effects of hazard exposure in the authorized Entrant
  - If the Attendant detects a situation outside the space that could endanger the authorized entrants, or
  - If the Attendant cannot effectively and safely perform all the Attendant's responsibilities.
8. Takes the following actions when authorized persons approach or enter a permit space while entry is underway:
  - Warn the unauthorized persons that they must stay away from the permit space,
  - Advise the unauthorized persons that they must exit immediately if they have entered the permit space, and
  - Inform the Entrants and the Entry Supervisor if unauthorized persons have entered the permit space,
9. Performs non-entry rescues, if trained when a retrieval harness, line and retraction system is used.
10. Performs no duties that might interfere with the Attendant's primary duty to monitor and protect the Entrants.

**Department Supervisor:** The Department Supervisor is responsible to assure that the Attendant, Entrant, and Entry Supervisor are properly training in permit confined space responsibilities and procedures prior to entry. The EHSRM should be consulted to assure proper training.

**Entrant:** Authorized entrants shall be responsible for the following:

1. Know the hazards that may be faced during entry, including information on the mode, signs or symptoms and consequences of exposure,
2. Use the following equipment properly:
  - Testing and monitoring equipment
  - Ventilating equipment
  - Communications equipment
  - Personal protective equipment
  - Lighting equipment
  - Barriers and shields
  - Ingress and egress equipment such as ladders
  - Rescue and emergency equipment needed to safely extract the Entrant in the event of an emergency, if trained.
  - Any other equipment necessary for safe entry into and rescue from permit spaces.
3. Communicate with the Attendant as necessary to enable the Attendant to monitor the Entrant status and to enable the Attendant to alert the Entrants of the need to evacuate the space as needed,
4. Alert the Attendant whenever:
  - The Attendant recognizes any warning sign or symptom of exposure to a dangerous situation, or
  - The entrant detects a prohibited condition
5. Exit from the permit space as quickly as possible whenever:
  - An order to evacuate is given by the Attendant or the Entry Supervisor,
  - The Entrant recognizes any warning sign or symptom of exposure to a dangerous situation
  - The entrant detects a prohibited condition, or
  - An evacuation alarm is activated.

**Entry Supervisor:** The Entry Supervisor of the confined space entry is responsible to assure the following tasks are performed:

1. Knows the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure;
2. Verifies, by checking that the appropriate entries have been made on the permit, that all tests specified by the permit have been conducted and that all procedures and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin. This includes specifying the Attendant(s) and Entrant(s);
3. For spaces with a potential for a toxic atmosphere, verifies that airline respirators provided for emergency rescue are present by the space, connected to the air supply and that the

breathing air bottles (if used in lieu of the plant breathing air connections) have at least 1000 psi of air.

4. Verification is also required to assure electrical equipment to be used by the Entrants in the space is less than 12 volts or is connected to a ground fault circuit interrupter and is intrinsically safe.
5. Assures that Entrant(s) and Attendant(s)
  - Are informed of any known or suspected hazardous materials or conditions which might be encountered,
  - Are equipped with all required PPE and rescue equipment for the tasks to be performed
  - Emergency equipment is immediately ready for use,
  - Have conducted initial monitoring and that the monitoring results are acceptable,
6. Removes unauthorized individuals who enter or who attempt to enter the permit space during entry operations; and
7. Determines whenever responsibility for a permit space entry operation is transferred and at intervals dictated by the hazards and operations performed within the space that entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained.
8. Review the completed permit with the Entrants and Attendants and posts a copy of the permit at/near the space entry point.
9. Terminates the entry and cancels the permit when:
  - The entry operations covered by the entry permit have been completed; *or*
  - A condition that is not allowed under the entry permit arises in or near the permit space.

Rescue Attendant: The Rescue Attendant is required to be part of the team when a space cannot be declassified. The Rescue Attendant:

1. Coordinates the rescue effort if the Attendant determines that Rescue is needed to escape from permit space hazards.
2. If the Rescue Team cannot complete rescue from outside the space, further assistance will be needed from the San Angelo Fire Department. This can be accomplished by contacting SAFD using 911.

### **Ventilation**

Mechanical ventilation equipment (fans, blowers, air movers, etc.) must be used for all entries in atmospheres with potentially hazardous atmospheres. The ventilation system must move air continuously *through* the confined space while the work is being performed.



Ventilation equipment must not block the exit from the confined space nor the view of the Attendant.

Should the ventilation system fail all entrants must exit the space immediately until ventilation can be re-established. If this is over one-hour atmospheric monitoring will again be required.

A minimum of twelve air changes per hour is required for adequate ventilation, although twenty air changes per hour is preferred.

The ventilation air should be ducted (directed) into the space as this reduces the possibility of stagnant air pockets. If the air turbulence is expected to adversely affect welding in the space, air may be exhausted as a ventilation alternative if continuous monitoring for oxygen is provided. Also, in this situation, a ventilation device that utilizes a hose must be used and the intake end of the hose positioned so as to draw the welding fumes away from the breathing zone of the affected employee(s).

A confined space which exceeds the lower explosive limit must not be ventilated to achieve acceptable entry conditions since the combination of potential oxygen enrichment and a potential ignition source in the confined space may create a potential fire hazard. Steam or other appropriate methods should be used to remove the flammables before ventilation is introduced.

Air eductors (air moving device) used for ventilating confined spaces must be grounded while in service.

### **Atmospheric Monitoring**

In a potentially hazardous atmosphere, atmospheric monitoring shall be conducted in accordance with Appendix B of OSHA 29 CFR1910.146. The Attendant or Entrant (as previously agreed prior to entry) shall monitor the confined space in the following listed order:

*Oxygen deficiency.* The acceptable range is between 19.5% and 23.5% oxygen.

*Flammable gases.* The acceptable range is below 10% of the substance LEL.

*Airborne hazardous chemicals:* Atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in Subpart G, Occupational Health and Environmental Control, or in Subpart Z, Toxic and Hazardous Substances, of this Part and which could result in employee exposure in excess of its dose or permissible exposure limit.

Monitoring shall be conducted at the entry point and in the area where the work is to be performed. If a wand or extension tube cannot reach the work area, the Attendant may be required to enter the confined space to monitor the space but must not enter without the appropriate respiratory and rescue equipment and PPE. All entrants are required to wear a personal monitor while in the confined space. These situations will require the Permit Authority to have an Attendant stationed at the entrance of the confined space, with the required emergency equipment, while the Entrant or first Attendant is completing the atmospheric monitoring.

Monitor results shall be recorded and initialed by the Attendant. These readings are considered valid for only one shift, although a single shift may last up to 16 hours. The Entrant or Attendant must monitor the confined space within 30 minutes of the beginning of a new shift.

In the event the LEL concentrations do not pose a fire hazard, but hazardous chemical concentrations do pose a health hazard even with mechanical ventilation, the Site Safety Professional must be contacted for advice regarding possible options for entering the space using respiratory protection.

The Entrant or Attendant may conduct subsequent monitoring tests of the confined space. Where activity in the confined space could generate, or liberate a hazardous chemical, monitoring is required for that hazardous chemical and continuous oxygen monitoring is also required unless a history of negative results has been established, documented, and approved by EHSRM.

Each authorized Entrant shall be permitted to observe any monitoring, testing, and results for permit spaces.

### **Rescue and Emergency Services**

If rescue is required, the team will call 911. Remember to discuss emergency procedures prior to any confined space entry.

### **Personal Protective & Emergency Equipment**

All Entrants to spaces that can't be declassified must wear a safety harness with an attached lifeline. Other personal protective equipment must be used as dictated by the type of work being performed.

### **Portable Lights & Electrical Tools**

Only low voltage portable lighting (12 volts or less) or 110-volt with external ground fault circuit interrupters can be used inside confined spaces. The transformer must be kept outside the area. The lights must be equipped with protective guards over the lamps. Where possible, the pneumatic tools are preferred over electrical tools to avoid the potential ignition source of an electric arc. Where electrical tools or lighting that is greater than 12 volts must be used inside the area, ground fault circuit interrupters (GFCIs) must be used and the GFCIs must be kept outside the confined space.

### **Training**

Personnel involved in the confined space entry procedure shall be trained prior to entry. This training shall begin with employment orientation that will include restrictions for working in confined spaces. Training has been added to ASU Blackboard and will be assigned based on employee position. Additional general awareness training includes safety meetings that can include the use of immediately available videos. Prior to an initial entry, the entry supervisor shall train any personnel who are new to confined space entry requirements. This training is

provided in addition to the routine entry meeting to discuss the hazards and procedures of the specific entry.

### **Contractors**

Contractors must adhere to OSHA 29 CFR 1910.146 when entering a confined space.

Where Angelo State University employees must enter a permit required confined space to check on the progress of a contractor's work, they may enter the space in accordance with the contractor's permit(s) and Attendant(s). Prior to entry, the Angelo State University employee must contact the contractor's Supervisor responsible for the job and place his/her individual lock on the contractor's lockout box, or individual lockouts and inform the Requestor of his/her intent to enter the confined space.

### **Annual Review**

The Confined Space Entry Program will be reviewed annually to address any changes or deficiencies in the program or regulatory changes, etc.

### **References**

Occupational Safety and Health Administration, *Permit Required Confined Spaces*. 29 CFR 1910.146. Superintendent of Documents, Library of Congress, Washington, DC 20202.