



ARIZONA STATE UNIVERSITY

CONFINED SPACE ENTRY PROGRAM
Pursuant to 29 CFR § 1910.146
[Permit Required Confined Spaces]

Arizona State University
Department of Environmental Health & Safety

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ARIZONA STATE UNIVERSITY ENVIRONMENTAL HEALTH & SAFETY CONFINED SPACE ENTRY PROGRAM

Purpose and Application

The purpose of Arizona State University's (ASU) Confined Space Entry Program (CSEP) is to protect employees from the hazards associated with entering and conducting operations in confined spaces such as sewers, storage tanks and utility tunnels. This program applies to employees who, while performing their duties, enter a confined space. The Occupational Safety and Health Administration's (OSHA) Permit Required Confined Space Entry Standard, 29 CFR §1910.146, requires ASU to develop and implement guidelines for safe confined space entry. The ASU CSEP has been developed to protect ASU employees and contractors when working in confined spaces.

Departments and units are required to implement the practices and procedures outlined in this program including the Confined Space Pre-Entry Checklist (Appendix B) and the Confined Space Entry Permit (Appendix C) prior to conducting confined space entry operations. Confined spaces shall be considered permit-required confined spaces until the information obtained from the Confined Space Pre-Entry Checklist demonstrates otherwise.

Definition of a Confined Space

A confined space is a space that:

- Is large enough and so configured that an employee can bodily enter and perform assigned work; and
- Has limited or restricted means for entry or exit; and
- Is not designed for continuous human occupancy.

Examples of confined spaces include but are not limited to storage tanks, process vessels, bins, silos, boilers, ventilation or exhaust ducts, sewers, pipe chassis, electrical vaults, steam tunnels, underground utility vaults, tunnels, pipelines, manure pits or other similar types of enclosures.

A permit-required confined space means a confined space that has one or more of the following characteristics and therefore requires a permit:

- 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.
- Contains any other recognized serious safety or health hazard.

A non-permit confined space means a confined space that does not contain, nor has the potential to contain, any uncontrolled hazard capable of causing death or serious physical harm.

Confined Space Hazards

Completion of the pre-entry checklist may determine that a space presents no real danger for employees. However, until the space has been evaluated and tested, it shall be assumed to be confined and potentially dangerous. Once a space has been identified as confined, the hazards that may be present within the confined space must be identified. Before an employee enters the space, the internal atmosphere shall be tested, with a calibrated direct-reading instrument, for oxygen content, for flammable gases and vapors, and for potential toxic air contaminants, in that order. Any employee, who enters the space, or that employee's authorized representative, shall be provided an opportunity to observe the pre-entry testing.

Confined space hazards can be grouped into the following categories:

1) Oxygen-Deficient Atmospheres - The earth's atmosphere is composed of approximately 21% oxygen and 79% nitrogen. An atmosphere containing less than 19.5% oxygen shall be considered oxygen-deficient. The oxygen level inside a confined space may be decreased as the result of either consumption or displacement.

There are a number of processes which consume oxygen in a confined space. Oxygen is consumed during combustion of flammable materials, as in welding, cutting, or brazing. A more subtle consumption of oxygen occurs during bacterial action, as in the fermentation process. Oxygen can also be consumed during chemical reactions such as in the formation of rust on the exposed surfaces of a confined space. The number of people working in a confined space and the amount of physical activity can also influence oxygen consumption. Oxygen levels can also be reduced as the result of oxygen displacement by other gases.

2) Flammable Atmospheres - A flammable atmosphere is generally the result of flammable gases, vapors, dust mixed in certain concentrations with air, or an oxygen-enriched atmosphere (oxygen concentration greater than 23.5%). An oxygen-enriched atmosphere will cause flammable materials such as clothing and hair to burn violently when ignited.

Combustible gases or vapors can accumulate within a confined space when there is inadequate ventilation. Gases that are heavier than air will accumulate in the lower levels of a confined space and gases lighter than air will accumulate in the upper levels of a confined space. Therefore, it is important that atmospheric tests be conducted at all elevations within confined spaces.

The work conducted in a confined space can generate a flammable atmosphere. Work such as spray painting, architectural coating, or the use of flammable solvents for cleaning can result in the formation of an explosive atmosphere.

Welding or cutting equipment can also be the cause of an explosion in a confined space and shall be conducted according to the guidelines found in the Hot Work section of this program. Minimum ventilation for welding requires: (1) a minimum of 2000 cubic feet per minute per welder as general ventilation, or (2) local exhaust ventilation (at the point of contaminant generation) of 100 linear feet per minute (29 CFR § 1910.252). Welding machines and compressed gas cylinders must be kept outside of the space. Electrodes must be removed from the holder when welders exit the space; welding gas and related fuel gases must be turned off from outside of the space. Where practical, torches, cables and hoses should be removed from the space when welding is not in progress; oxygen and acetylene hoses may have small leaks in them which could generate an explosive atmosphere and, therefore, should be removed when not in use. The atmosphere shall be tested continuously while any hot work is being conducted within the confined space.

3) Toxic Atmospheres - Toxic atmospheres may be present within a confined space as the result of one or more of the following:

When a product is stored in a confined space, it can be absorbed by the walls and give off toxic vapors when removed or when cleaning the residual material. The toxic vapors can remain in the atmosphere due to poor ventilation.

The work conducted in the confined space can generate toxic atmospheres, including welding or brazing with metals capable of producing toxic vapors, painting, scraping and sanding. Many of the solvents used for cleaning and/or degreasing produce highly toxic vapors.

Toxic vapors produced by processes near the confined space may enter and accumulate in the confined space, e.g., if the confined space is lower than the adjacent area and the vapor is heavier than air it may settle into the confined space.

4) Mechanical and Physical Hazards

Mechanical and physical hazards may include rotating or moving mechanical parts or energy sources that can create hazards within a confined space. All rotating or moving equipment such as pumps, process lines and electrical sources within a confined space must be identified. Physical factors such as heat, cold, noise, vibration, and fatigue can contribute to accidents. These factors must be evaluated for all confined spaces.

Excavations could present the possibility of engulfment. Employees shall be protected from cave-ins by sloping, trenching, or shoring systems when the depth of the excavation is more than four feet, in accordance with 29 CFR § 1926.652.

Appendix C contains the definitions for the ASU CSEP.

Responsibilities

Environmental Health & Safety

Environmental Health & Safety (EH&S) shall:

- Provide the Confined Space Entry Program to departments that make entry into any confined space
- Provide guidance for the proper selection and use of appropriate air monitoring equipment, respiratory protection and personal protective equipment to meet the requirements of this program
- Assist each department or unit supervisor in identifying confined spaces encountered by his/her employees
- Review the CSEP by auditing work operations and documentation using retained canceled permits within 1 year after each entry and revise the program as necessary to ensure that employees participating in entry operations are protected from permit space hazards and to evaluate the overall effectiveness of the confined space entry program
- Investigate and document all accidents or near misses reported as a result of a confined space entry or an aborted entry attempt
- Revise the program as needed. Examples of circumstances requiring the review of the permit space program are: any 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, or employee complains about the effectiveness of the program

Departments

Department supervisors shall:

- Implement all provisions of the CSEP for work or research areas under their control
- Identify and report job areas and locations that are or may be confined spaces, when a new confined space is created or an existing confined space changes in configuration, use or hazard potential submit a list of identified confined spaces to EH&S. This responsibility may be delegated to a competent person within the department provided he/she is qualified. The list should include department name, location of the space, description of space, atmospheric hazard, physical hazard, unusual hazards, orientation (vertical or horizontal), number of entry points, reason for entry, potential energy hazard, entry action, entrant title/specific job hazard, frequency of entry, comments, surveyors name and a date. The Permit-Required Confined Space Decision Flow Chart in Appendix E can assist in determining if a space is consider permit required.

The following hazards shall be identified prior to entry into a confined space:

Atmospheric hazards
Asphyxiating atmospheres
Flammable atmospheres
Toxic atmospheres
Burn hazards
Heat stress hazards
Mechanical hazards
Engulfment hazards
Physical hazards (falls, debris, slipping hazards)
Electrocution
Danger of unexpected movement of machine

- Identify authorized confined space entrants and assure that each entrant attends an approved confined space entry training course
- Provide site-specific training to authorized confined space entrants regarding the specific equipment and practices used during entry for the spaces each entrant is authorized to enter
- Identify individuals that are authorized to sign the ASU permit for permit-required confined space entry
- Assure that warning signs are posted immediately outside of entrances to confined spaces, and that such signs are secured. (Underground utility access vaults may not be posted. Employees will be informed of the confined space classification of these spaces during confined space training.)
- Interface with confined space supervisors where enforcement of this program is required

It is the responsibility of the department or unit supervisors to evaluate potentially hazardous spaces within facilities or areas under their control and ensure that the proper precautions are taken for safety. Departments and units requiring assistance are responsible for contacting EH&S to schedule an evaluation 48 hours prior to conducting confined space entry to determine whether a permit is required. In addition, the department shall provide the proper protective equipment when such equipment is necessary to protect the health and safety of the employee.

Capital Programs Management Group

Facilities Planning and Construction shall:

- Provide EH&S with the information necessary to update the Confined Space Inventory when confined spaces are created or modified during campus constructions and renovation projects
- Oversee contracts requiring confined space entry
- Identify requirements for compliance with applicable confined space entry regulations and applicable portions of this program in contract specifications
- Notify the contractor of the locations of permit-required confined spaces (as identified by the Confined Space Inventory) where contractors will require access

to inventoried confined spaces in order to complete work under the scope of a contract

- Interface with contractors where enforcement of confined space contract provisions is required

Entry Supervisor

Confined Space Entry Supervisor(s) shall:

- Adhere to all requirements of the CSEP and supplemental entry procedures
- Complete all safety training requirements, request further instruction if unclear on any part of the training and comply with documentation procedures
- Knows the hazards that may be faced during entry including information on the mode, signs or symptoms, and consequences of exposure
- Ensures that entry, standby, and backup employees are properly trained and authorized for their designated functions
- Verifies the Permit-Required Confined Space Entry Permit has been completed prior to entry and verifies that all precautions and pre-entry procedures have been fulfilled prior to entry
- Terminate the entry and cancels the permit when 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
- Verifies the rescue services are available and that the means of summoning them operable
- Assure that appropriate personal protective equipment is available and used by entrants
- Assure that unauthorized people do not enter the confined space during the time that authorized entry is in progress. If an unauthorized person is located in a confined space, ASU Police shall be called to enforce trespass prohibitions;
- Report all accidents or near misses as a result of a confined space entry or an aborted entry attempt to EH&S
- Assure that original entry permits are forwarded to EH&S upon completion or termination of a Permit-Required Confined Space Entry

Attendant

Confined Space Entry Attendant(s) shall:

- Adhere to all requirements of the CSEP and supplemental entry procedures
- Complete all safety training requirements, request further instruction if unclear on any part of the training and comply with documentation procedures
- Knows the hazards that may be faced during entry including information on the mode, signs or symptoms, and consequences of exposure
- Is aware of possible behavioral effects of hazards exposure in authorized entrants

- Continuously maintains an accurate count of authorized entrants in the permit space which will enable the attendant to determine quickly and accurately which authorized entrants are inside the permit space
- Remains outside the permit space during entry operations until relieved by another attendant
- Communicated with authorized entrants as necessary to monitor entrants if it is safe for entrants to remain in the space or evacuate the permit space. Entrants should be evacuated if the attendant detects prohibited operations, behavioral effects of hazards exposure in authorized entrants, a situation outside the permit space that could danger the authorized entrants, or if the attendant cannot effectively and safely perform all their duties
- Summon rescue and other emergency services as soon as it is determined that authorized attendants may need assistance to escape from the permit space
- Warn unauthorized persons they must stay away from the permit space
- Advise unauthorized persons to exit immediately if they have entered the permit space
- Inform authorized entrants and the entry supervisor if unauthorized person have entered the permit space
- Performs no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants
- Assure that original entry permits is turned in to the entry supervisor upon completion or termination of a Permit-Required Confined Space Entry.

Authorized Entrant

Authorized Entrant(s) shall:

- Conduct confined space operations in accordance with ASU CSEP including the Confined Space Entry Permit Procedures (Appendix B) and the Pre-Entry Checklist (Appendix C)
- Attend confined space entry training and demonstrate the knowledge necessary to conduct confined space entries safety
- Knows the hazards that may be faced during entry including information on the mode, signs or symptoms, and consequences of exposure
- Communicate with the attendant as necessary to enable the attendant to monitor entrant status and to enable the attendant to alert entrants of the need to evacuate the permit space. Attendant should be alert when entrant recognizes any warning sign or symptom or exposure to a dangerous situation, entrant detects a prohibited condition
- Exit the permit space when ordered to evacuate by the attendant, entrant recognizes any warning sign or symptoms of exposure to dangerous situation, entrant detects prohibited conditions, or an evacuation alarm is activated.
- Store, clean, maintain and guard against damage, equipment used for confined space entry
- Understand the emergency procedures in case of an accident in a confined space
- Report any deficiencies or malfunction of equipment to a supervisor

- Under no circumstance enter a confined space that is suspect of having a non-respirable atmosphere, even to rescue a fellow employee

Identification of Confined Spaces

All confined spaces located within ASU property shall be identified by department or unit supervisors and reported to EH&S. All employees shall be made aware of these confined spaces through training or instruction provided by their department or designated representatives. Training assistance is provided by EH&S.

Preventing Unauthorized Entry

All employees shall be instructed by their department or unit, that entry into a permit-required confined space is prohibited without an authorized permit. Department or unit supervisors shall instruct all employees to list their names on the authorized permit before they will be allowed to enter a confined space. If an unauthorized person is located in a confined space and will not leave, ASU Police shall be called to enforce trespass prohibitions.

Permits

When a confined space must be entered, a permit shall be completed and authorized by department heads, supervisors, or their designated representatives prior to entry of the confined space. This permit shall serve as certification that the space is safe for entry. The permit shall contain the date, the location of the space, and the signature of the person providing the certification.

A permit shall not be authorized until all conditions of the permit have been met. The permit to be used by Arizona State University personnel can be found in Appendix B.

Planning A Confined Space Entry

The first step towards conducting a safe confined space entry is planning. This will allow for the identification of all hazards, and for the determination of all equipment necessary, to complete the project. The Confined Space Pre-Entry Checklist (Appendix B) and the Confined Space Entry Permit (Appendix C) assist in determining the following factors:

- The name and/or location of the confined space;
- The specific reason for entering the confined space;

- If hot work will be done; and
- The contents of the confined space (any chemicals or other materials and energy that are usually present in the confined space).

Identifying the Hazards

It is recommended that atmospheric tests be conducted by the entry supervisor prior to the opening of any covers or entrances of potential confined spaces. The entry supervisor will determine the oxygen content and describe the testing procedures and equipment used to the entry employees. The entry supervisor will then determine flammable gas content and again describe the testing procedures and type of analyzer used.

If a toxic substance is determined to be present in the confined space during testing by the entry supervisor, EH&S shall be contacted to assist in obtaining a Material Safety Data Sheet or other chemical information to determine what type of personal protective equipment is required, the potential health effects, the Permissible Exposure Limits, and any other information needed to safely conduct the work.

Department heads or their designated representatives will determine mechanical and physical hazards. They should list all items and energy that will require lockout/tagout, blanking and bleeding, disconnecting, or securing. Physical hazards should also be listed.

The following precautions shall be followed when entering a confined space located along a roadway, parking lot or any areas where traffic flow may cause a potential hazard:

- Approach the area cautiously and activate flashers upon approach to the confined area to be entered
- Park any vehicles in such a way that traffic will flow in the most unobstructed manner, and where possible, the vehicle should provide protection for the entry crew
- Park the vehicle in such a manner that exhaust fumes are not drawn down into the manhole, if this is not possible, extend the exhaust stack above the vehicle
- Before uncovering a manhole, place traffic safety cones around the manhole and vehicle, visible to traffic in all directions. Place cones to protect the crew and to channel traffic flow. The cones should be placed at sufficient distances and intervals to adequately warn oncoming traffic. In areas of high traffic volume or other sites warranting additional highly visible safety equipment, use illuminating traffic arrows, barricades, and "Men Working" signs
- When placement of the vehicle creates a situation of having only one open lane of traffic in a congested area, use a flag person to direct traffic flow. When a flag person is necessary, an additional crew member is required to attend the employee in the manhole. Wear traffic safety vests or equivalent at all times when working on the street or easement surface in the field

- In the case of an opening or obstruction in the street or sidewalk being worked on or left unattended, effectively display danger signals such as warning signs, cones and flags. Under these same conditions at night, prominently display warning lights
- Enclose excavations and openings with suitable barricades

Hot Work Requirements

Hot work (HW) operations may create hazardous conditions and fire danger. To adequately address hazards all personnel involved in HW operations must follow the following procedures. This will help ensure compliance of applicable codes and regulations, including 29 CFR § 1910.252-257, and promote a safe environment.

It is the responsibility of the welders, cutters, and their supervisors to ensure the following fire protection and prevention procedures are applied to all HW operations.

Fire Prevention and Protection

- Remove all sources of ignition (combustible and flammable materials) from the work area/hazard zone. If all fire hazards cannot be removed, then appropriate shielding shall be provided to prevent sparks, slag, or heat from igniting the fire hazards
- A fire watch shall be provided during HW activities and shall continue for a minimum of 30 minutes after the conclusion of the operation. Individuals designated for the fire watch shall have fire-extinguishing equipment readily available and must be trained in use and capabilities of such equipment.

Hot Work Area

An area that is exposed to sparks, hot slag, or radiant or convective heat as a result of the HW must be inspected prior to commencing work to ensure the following:

- Proper safety precautions/measures are taken to prevent fire danger. Inspection must confirm the HW area is free of debris and that flammable liquids or vapors, lint, dust, or combustible materials/storage is not at risk of ignition from sparks or hot metal
- Openings or cracks in walls, floors, ducts or shafts are tightly covered to prevent passage of sparks or slag
- A minimum of 2-A, 20BC fire extinguisher must be readily available (contractors must provide their own fire extinguishers).

Hot Work Equipment

Equipment includes, but is not limited to, oxygen/fuel gas welding and cutting, ARC welding and cutting, and metal cutting equipment.

- Hot Work equipment must be inspected by the operator prior to use
- Portable oxygen/fuel gas welding and cutting equipment located inside of a building must be stored in a well-ventilated dry location at least 20 feet from combustible materials and away from elevators, stairs, or means of egress
- Emergency disconnects must be provided, e.g., a switch or circuit breaker must be provided to ARC welding equipment (the disconnect shall be labeled "Emergency Disconnect" and must be visible).

Health/Safety Protection and Ventilation

Contamination and exposure provisions must be established to monitor the work area conditions of the following:

- The material used to perform work has the potential of producing fumes that may pose exposure conditions to personnel (Information can be obtained by reading and reviewing Material Safety Data Sheets on products used for operation)
- The dimension of the space vertically or horizontally confines movement of operation or restricts egress
- Number of Hot Work equipment and personnel performing the operation confine movement of operation or limit egress
- Inadequate ventilation for work area
- Whenever the area is considered a confined space

Posting Requirements and Signage

Permit-Required Confined Spaces listed on the ASU Confined Space Inventory are required to be posted with a sign reading "DANGER - PERMIT REQUIRED CONFINED SPACE - NO ENTRY Please contact The Department of Environmental Health & Safety at 965-1823 for access. Each departmental designee will assure that the permit-required confined spaces accessed by individuals in their department are and remain posted with appropriate signs.

Where it is not practical to post signs at the entrance to a space (e.g., underground utility access vault covers), employees will be informed of the classification of these spaces during confined space training and will receive instructions for access to the Confined Space Inventory.

Note: Any conditions making it unsafe to remove an entrance cover shall be eliminated before the cover is removed.

Ventilation of the Confined Space

Indicate whether mechanical or natural ventilation will be used. Describe the procedures to be used.

NOTE: If mechanical ventilation is to be used, the exhaust must be pointed away from personnel or ignition sources. Also, mechanical ventilators should be bonded to the confined space.

Isolating the Confined Space

Describe the procedures for disconnecting equipment or lockout and tagout. All mechanical, electrical, or heat-producing equipment should be disconnected or locked and tagged out. This would also include any pumps that pull fluid from, or pump fluid into, the confined space.

Cleaning, Purging, Flushing or Ventilation

Many confined spaces need specific treatment – such as cleaning, purging, inerting (i.e., making the atmosphere non-flammable, non-explosive and non-reactive), flushing, ventilating – by trained individuals before and/or during a safe entry.

Indicate if the confined space will be purged. Purging with inert gas is not recommended. If the space must be purged, describe the procedures.

Indicate the type of cleaning methods to be used. If chemical cleaners are to be used, name the type and describe the procedures. The MSDS for the chemical should be consulted prior to use.

NOTE: When introducing a chemical into a confined space, the compatibility of that chemical with the contents of the confined space must be checked. If in doubt, consult EH&S.

NOTE: If steam is to be used, the hose should be bonded to the confined space.

Placement of Warning Signs

Indicate if warning signs or barriers will be needed to prevent unauthorized entry or to protect workers from external hazards. If the confined space will be left open and unattended for any length of time, warning signs and barriers will be required.

Identifying All Personnel

List all authorized entrants that will be required to prepare the confined space and complete the work inside the space.

Identifying Necessary Equipment

List all equipment that will be necessary to complete the project.

Training

Before initial work assignment begins, employees who are required to work in permit spaces must be provided proper training by their department or unit. Upon completing this training, the instructor must ensure that employees have acquired the understanding, knowledge, and skills necessary for the safe performance of their duties. Additional training is required when:

- the job duties change
 - there is a change in the permit-space program or the permit space operation presents a new hazard
 - when an employee's job performance shows deficiencies
- The instructor must certify that training has been accomplished. Upon completion of training, employees must receive a certificate of training that includes the employee's name, signature or initials of trainer(s), and dates of training. The certification must be made available for inspection by employees. In addition, the supervisor must ensure that employees are trained in their assigned duties.

Pre-Entry Training

Once the entry has been planned, department or unit supervisors must train all employees who will be involved in the entry. The training should be conducted as close to the date of entry as possible.

1. Identify the confined space and the reason(s) for entry
2. Identify the work detail.
3. Assign each employee the job(s) he/she is to perform in the entry project (entrant, standby person, etc.)
4. If an employee is required to use a piece of equipment, be sure that he/she is capable of using the equipment properly
5. Inform all personnel that no one is to enter the confined space unless the attendant is present at the work site
6. Inform entrants of all known or suspected hazards
7. Inform personnel of any access or exit problems
8. Inform personnel of all equipment that must be locked out or tagged out
9. Inform personnel of the contents of the confined space
10. Inform personnel of all atmospheric levels that must be maintained before entering and while working in the confined space

11. If a toxic atmosphere or substance is present or could become present, the following additional training must be completed:
- If respiratory protection is not going to be used, inform personnel of the maximum permissible exposure level (PEL) that can exist within the confined space, and the method used to monitor PEL. Persons should not be assigned to tasks requiring use of respirators unless it has been determined that they are physically able to perform the work and use the equipment. A physician shall determine what health and physical conditions are pertinent. The respirator user's medical status should be reviewed annually
 - Inform personnel of the potential health effects of exposure to the toxic atmosphere or substance.
 - Inform personnel of the signs and symptoms of exposure to the contaminant.
 - Inform personnel of the personal protective equipment (PPE) that they will be required to wear and provide specific training.
 - Identify isolation procedures and inform the personnel responsible for the lockout/tagout of all equipment that must be isolated and the methods to be used
 - Identify purging and/or ventilation procedures and inform all personnel responsible for performing this function of the methods to be used
 - Identify all equipment needed and inform personnel involved in the project of all equipment that will be necessary to complete the project. Make sure that all employees are capable of using their assigned equipment properly
 - Determine necessary personal protective equipment and inform personnel of all PPE that must be used to ensure their safety. Ensure that all personnel required to use PPE are trained in the proper use of the equipment
 - Establish communication and inform all entrants that they are required to maintain communication with the standby person. Inform standby person that he/she must maintain constant contact with all entrants. Inform personnel of the type of communication they are to use
 - Protect from external hazards by informing personnel where signs and barriers will be placed to prevent unauthorized entry and protect entrants from external hazards
 - Pre-plan rescue procedures including informing the designated standby person(s) of the rescue procedures to be followed. The standby person should be informed that he/she has no other duty but to maintain contact with personnel inside the confined space and that they must not enter the confined space under any circumstances
 - Place the confined space back into service by informing personnel of the steps to be taken to place the confined space back into service

Emergency Rescue

In the event of any emergency situation requiring rescue from a confined space, employees shall not attempt to enter the space to perform rescue. The attendant on duty shall immediately dial 9-1-1 from a phone or contact ASU Police Dispatch directly

at 480-965-3456 to request local Fire Department rescue services. At off-campus locations, the attendant must call local fire and rescue services directly by dialing 9-1-1 or another designated phone number. The phone number must be in the attendant's possession prior to and during any entrant entry. In no case shall the attendant be required to relay emergency information through a third party unless the third party location is fully staffed during the entire entry.

Rescue services that can be performed safely from outside of the confined space (e.g. hoisting a harnessed entrant) shall be undertaken. Other entrants in the space shall immediately exit the confined space and only provide such assistance that will not endanger themselves.

Emergency rescue services will be provided for all confined space emergencies by the local Fire Department or local rescue services at off-campus locations, e.g., Camp Tontazona. Local fire and rescue services will provide their own equipment and training in accordance with federal and state regulations.

APPENDIX A

DEFINITIONS

Definitions

Acceptable entry conditions means the conditions that must exist in a permit space to allow entry and to ensure that employees involved with a permit-required confined space entry can safely enter into and work within the space.

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

Authorized entrant means an employee who is authorized by the employer to enter a permit space.

Blanking or blinding means the absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or a skillet blind) that completely covers the bore and that is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.

Confined space means a space that:

1. Is large enough and so configured that an employee can bodily enter and perform assigned work; and
2. Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry.); and
3. Is not designed for continuous employee occupancy.

Double block and bleed means the closure of a line, duct, or pipe by closing and locking or tagging two in-line valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves.

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

Entry means the action by which a person passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.

Entry permit (permit) means the written or printed document that is provided by the employer to allow and control entry into a permit space and that contains the information specified in this program.

Entry supervisor means the person (such as the employer, foreman, or crew chief) responsible for determining if acceptable entry conditions are present at a permit space where

entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required by this section.

NOTE: An entry supervisor also may serve as an attendant or as an authorized entrant, as long as that person is trained and equipped as required by this program for each role he or she fills. Also, the duties of entry supervisor may be passed from one individual to another during the course of an entry operation.

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

1. Flammable gas, vapor, or mist in excess of 10 percent of its lower flammable limit (LFL);
2. Airborne combustible dust at a concentration that meets or exceeds its LFL;

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

3. Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent;
4. Atmospheric concentration of any substance for which a dose or a permissible exposure limit is published by the Occupational Safety and Health Administration in Subpart G, Occupational Health and Environmental Control, or in Subpart Z, Toxic and Hazardous Substances, of the Confined Space Entry Standard and which could result in employee exposure in excess of its dose or permissible exposure limit;

NOTE: An atmospheric concentration of any substance that is not capable of causing death, incapacitation, impairment of ability to self-rescue, injury, or acute illness due to its health effects is not covered by this program.

5. Any other atmospheric condition that is immediately dangerous to life or health.

NOTE: For air contaminants for which OSHA has not determined a dose or permissible exposure limit, other sources of information, such as Material Safety Data Sheets, published information, and internal documents can provide guidance in establishing acceptable atmospheric conditions.

Hot work permit means the employer's written authorization to perform operations (e.g., riveting, welding, cutting, burning, and heating) capable of providing a source of ignition.

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 – (e.g., hydrogen fluoride gas and cadmium vapor), 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 means the displacement of the atmosphere in a permit space by a non-combustible gas (such as nitrogen) to such an extent that the resulting atmosphere is non-combustible.

NOTE: This procedure produces an IDLH oxygen-deficient atmosphere.

Isolation is the process by which a permit space is removed from service and completely protected against the release of energy and material into the space by such means as: blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; a double block and bleed system; lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages.

Line breaking means the intentional opening of a pipe, line, or duct that is or has been carrying flammable, corrosive, or toxic material, an inert gas, or any fluid at a volume, pressure, or temperature capable of causing injury.

Non-permit confined space means a confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

Oxygen deficient atmosphere means an atmosphere containing less than 19.5 percent oxygen by volume.

Oxygen enriched atmosphere means an atmosphere containing more than 23.5 percent oxygen by volume.

Permit-required confined space (permit space) means 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 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.

Permit-required confined space program (permit space program) means ASU's overall program for controlling, and, where appropriate, for protecting employees from, permit space hazards and for regulating employee entry into permit spaces.

Permit system means ASU's written procedure for preparing and issuing permits for entry and for returning the permit space to service following termination of entry.

Prohibited condition means any condition in a permit space that is not allowed by the permit during the period when entry is authorized.

Rescue service means the personnel designated to rescue employees from permit spaces.

Retrieval system means the equipment (including a retrieval line, chest or full-body harness, wristlets, if appropriate, and a lifting device or anchor) used for non-entry rescue of persons from permit spaces.

Testing means the process by which the hazards that may confront entrants of a permit space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit space.

NOTE: Testing enables employees 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.

APPENDIX B

CONFINED SPACE PRE-ENTRY CHECKLIST

Pre-Entry Checklist

ARIZONA STATE UNIVERSITY Confined Space Pre-Entry Checklist

Job Location _____

Entry Supervisor _____

Date _____

Signature _____

Time _____

This checklist must be used prior to entering any confined space to determine whether a confined space permit is required.

- | | <u>Yes</u> | <u>No</u> |
|---|------------|-----------|
| Did your survey of this surrounding area indicate hazards such as drifting vapors from tanks, vehicles, motors, piping, sewers, combustible materials/debris, etc.? | () | () |
| Did this confined space contents, (for example- industrial or other discharges, mechanical or electrical systems) indicate this area may contain dangerous air contaminants and other hazards while occupied? | () | () |
| Will work being performed in this confined space create a hazardous atmosphere or condition? | () | () |

Atmospheric Monitoring

Record Initial and Continuous Monitoring Results every Hour

Gas Monitor Make: _____ Gas Monitor Model: _____ Gas Monitor Serial No.: _____

Time								
Oxygen (Acceptable 19.5% thru 23.5%)								
LEL (Acceptable <10%)								
CO (Acceptable <35ppm)								
H₂S (Acceptable <10ppm)								

If you answered "Yes" to any one of the above statements, you must complete the bottom portion of this checklist and obtain a confined space permit, and inform your supervisor before proceeding. "No" responses to all statements indicates this is a "Non-Permit Required Confined Space" and you may proceed with the entry.

- | | <u>Yes</u> | <u>No</u> |
|---|------------|-----------|
| Have you been trained in the operation of the gas monitor to be used? | () | () |
| Has the gas monitor been calibrated today prior to use for this job? | () | () |
| Did you test the atmosphere of the confined space prior to entry? | () | () |
| Did the atmosphere check as acceptable (no monitor alarms)? | () | () |
| Will the atmosphere be continually monitored while the space is occupied? | () | () |

If you answered "No" to any one of the statements above, DO NOT ENTER. Contact your supervisor for further instruction. If you answered "Yes" to all statements above, proceed to completing the "Confined Space Entry Permit". Dial 911 and ask for ASU Police or directly 480-965-3456.

APPENDIX C

CONFINED SPACE ENTRY PERMIT PROCEDURES

Confined Space Entry Permit

ARIZONA STATE UNIVERSITY Confined Space Entry Permit

Permit Valid for Issued Work Shift only. This permit shall remain on site until job is completed.

Date & Time Permit Issued: _____ Date & Time Permit Expires: _____

Job Location: _____

Supervisor(s) in charge of crew: _____ Phone Number: _____

Entry Supervisor: _____

Attendant: _____

Authorized Entrant(s): _____

Equipment to be worked on: _____

Communication Procedures: _____

Rescue Procedures: Dial 911 and ask for ASU Police or call ASU Police direct at 480-965-3456

Entry Checklist to be Completed and Reviewed Prior to Entry

Requirements Completed	Yes	No	Item does not Apply (N/A)
Lock Out/De-energize/Try-Out	()	()	()
Line(s) Broken-Capped-Blank (utility pipes)	()	()	()
Cleaning, Purging, Flushing or Ventilation (special ventilation procedure if needed)	()	()	()
Ventilation (forced air ventilation)	()	()	()
Secure Area (mark off area from non-authorized entrants)	()	()	()
Respirator(s) (Air Purifying)	()	()	()
Standby Safety Personnel	()	()	()
Full Body Harness with "D" ring	()	()	()
Emergency Escape Retrieval Equipment	()	()	()
Lifelines (cable, rope, ect.)	()	()	()
Protective Clothing	()	()	()
Burning and Welding Permit (Hot Work Permit)	()	()	()
Direct Reading Gas Monitor (Calibrated)	()	()	()

Atmospheric Monitoring

Record Initial and Continuous Monitoring Results every Hour

Gas Monitor Make: _____ Gas Monitor Model: _____ Gas Monitor Serial No.: _____

Time							
Oxygen (Acceptable 19.5% thru 23.5%)							
LEL (Acceptable <10%)							
CO (Acceptable < 35ppm)							
H₂S (Acceptable <10ppm)							

Rescue Procedures: Dial 911 and ask for ASU Police or call ASU Police direct at 480-965-3456

Entry Supervisor (Print & Sign Name) _____

Attendant (Print & Sign Name) _____

APPENDIX D

EXAMPLE PERMIT-REQUIRED CONFINED SPACES AND HAZARD IDENTIFICATION

**ARIZONA STATE UNIVERSITY
 CONFINED SPACE OVERVIEW AND HAZARD IDENTIFICATION**

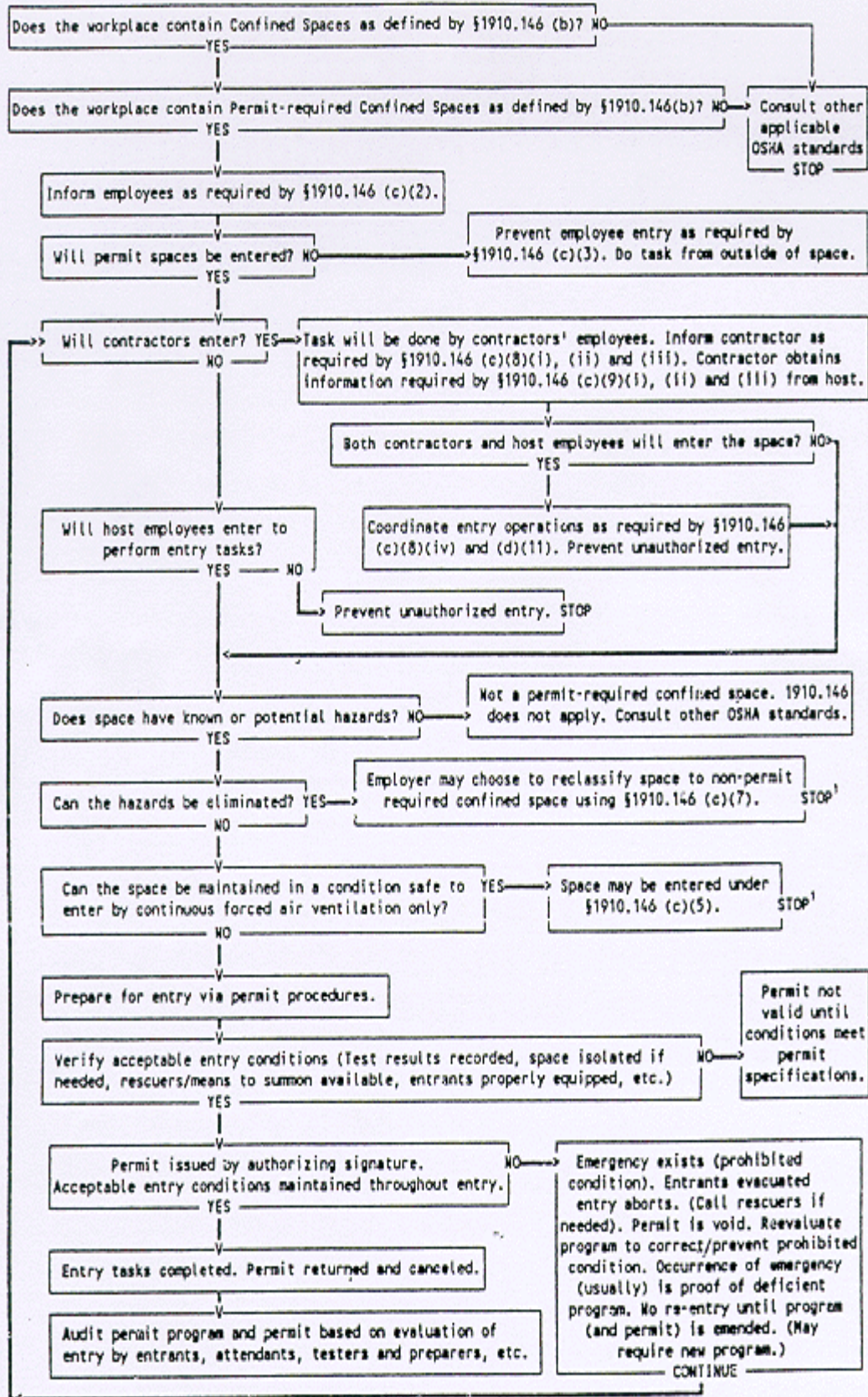
Permit Required Confined Spaces	Potential Hazards							
	Oxygen Deficiency	Mechanical	Biological	Suffocation	Hydrogen Sulfide Gas	Methane Gas	Chlorine Gas	Products of Work Activities
Sewer Manholes	X		X	X	X	X		X
Swimming Pool Tanks at Mona Plumber	X	X		X	X		X	X
Sump Pits	X		X		X	X		X
Air Handlers		X						X
Drywells Pits	X		X		X	X		X
Water Tanks under the Soccer Field	X			X				X
Boiler Tanks	X			X				X
Tunnels - normally non-permit required, certain areas may contain:	(as a result of work activities)							X

APPENDIX E

PERMIT REQUIRED CONFINED SPACE DECISION FLOW CHART

Appendix A. Permit - Required Confined Space Decision Flow Chart

APPENDIX A TO §1910.146—PERMIT-REQUIRED CONFINED SPACE DECISION FLOW CHART



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