

University of Tennessee Safety Program

Program Subject: Confined Spaces Safety Program	Approval Date: 10/1/15 (rev. 2)
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Contact Information: Program Owner: Environmental Health and Safety	

1.0 Purpose, Applicability, and Scope

- 1.1 **Purpose**- To establish a program for safe entry into permit-required confined spaces at the UT Knoxville campus. This program establishes the controls and responsibilities for entering, working in, and exiting permit-required and non permit required confined spaces.

- 1.2 **Applicability** – This shall apply to all students, staff and faculty on the UTK campus who enter and work in any permit-required and non-permit required confined space.

- 1.3 **Scope** –This covers all employees who enter a confined space on campus, such as ducts, tanks, manholes, etc, which may potentially contain hazardous atmospheres or conditions.

2.0 Abbreviations, Acronyms, and Definitions

2.1 Abbreviations/Acronyms

- ACGIH-American Conference of Governmental Industrial Hygienists
- LEL-Lower Explosive Limit
- PEL-Permissible Exposure Limit
- SDS-Safety Data Sheet
- TLV-Threshold Limit Value
- OSHA-Occupational Safety and Health Administration
- UEL-Upper Explosive Limit

2.2 Definitions

Authorized Entrants- Individuals who enter the permit-required confined space to perform work.

Authorized Attendants- Individuals stationed outside one or more confined spaces who monitor the authorized entrants.

Confined Space- An area which: has a size and shape large enough for a person to enter; has limited entrances and exits; is not designed for continuous occupancy. Some examples of confined spaces include: storage tanks; evacuations trenches; boilers; elevator pits; exhaust ducts; sewers; large pipes; dust collectors; utility pits/chases. Confined spaces are classified as either permit-required or non-permit required.

Entry- 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- A written authorization to enter a permit-required confined space. It defines the conditions under which the permit space may be entered. It states the reasons for entering, identifies all hazardous and identifies the entry supervisor.

Hazardous Atmosphere- At atmosphere that may expose employees to the risk of death, is toxic, is flammable or explosive, can results in incapacitation, interfere with an individual's ability to escape unaided from a space, or cause acute illness.

Isolation- The process by which a permit space is removed from service and completely protected against the release of hazardous 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/tagout of all sources of energy; or blocking or disconnecting all mechanical linkage.

Permit-Required Confined Space- According to the OSHA standard, this is a confined space and could potentially have one or more of the following hazards:

1. Atmospheric Hazards: which can be asphyxiating, toxic, flammable, explosive, or oxygen-enriched.
2. Engulfment Hazards: which occur when there is the potential to be trapped or enveloped by a dry, bulk granular material such as grains, soil or powdered cement.
3. Configuration Hazards: in which the size or shape of the space can trap an individual or make escape or rescue difficult.
4. Energy Hazards: which can happen if there is contact with electrical equipment, steam or other sources of energy inside the space.

Non-permit required confined spaces- Confined spaces that do not have, or have the potential to, contain any hazard or hazardous atmosphere capable of causing death or serious physical harm.

Qualified Employee- An employee that has been trained on confined space entry procedures and the use of confined space equipment, air-monitoring equipment, and ventilation equipment.

3.0 Roles and Responsibilities

a. Supervisors shall:

- i. Verify the purpose for each entry into a confined space and issue permits to protect entrants assigned to perform work.
- ii. Ensure that all assigned entrants have current training in the procedures and precautions for work to be performed.
- iii. Inform contractors of the confined space entry program requirements and of the potential hazards of each space to be entered.
- iv. Understand all of the hazards associated with a particular permit-required confined space where work will be performed.
- v. Verify that rescue services are available and there is a means available to summon them.
- vi. Prohibit any unauthorized individuals from entering the permit-required confined space.
- vii. Ensure that entry operations are maintained consistent with the permit.
- viii. Terminate entry and cancel the permit once work is completed.

b. Authorized Entrants shall:

- i. Know the hazards that may be faced during entry, including information on how hazardous exposure may occur, and the signs, symptoms and severity of overexposure.
- ii. Properly use any equipment needed to safely enter the space.
- iii. Sign the confined space entry permit prior to entering the space
- iv. Ensure that air monitoring has been conducted prior to entry.
- v. Maintain communication with the attendant outside the space, following warnings given by the attendant and exiting the space immediately when told to do so.
- vi. Alert the attendant whenever they recognize any warning sign or symptom of exposure to a dangerous situation, or the entrant detects a prohibited condition.

c. Attendants shall:

- i. Know the hazards associated with the confined space.
- ii. Recognize symptoms and health effects if overexposure occurs.
- iii. Order the entrants to evacuate the space if a new hazard or unusual behavior in the entrants is noted.
- iv. Maintain an accurate count of the number of authorized entrants in the space.
- v. Remain outside the space during entry operations until relieved by another attendant.

- vi. Maintain communications with authorized entrants to monitor their work activities and to alert them if evacuation becomes necessary.
 - vii. Call for rescue and other emergency services as soon as the attendant recognizes that the entrants may need assistance to escape from the space.
 - viii. Keep unauthorized persons from entering the space or interfering with the entry process.
 - ix. Initiate or perform non-entry rescues as outlined in the rescue plan.
 - x. Perform no other activities, which may interfere with the primary job of monitoring the safety and condition of those people inside the confined space.
- d. EHS shall:
- i. Conduct evaluations of confined spaces on campus, classify and document each as either a permit-required confined space or non-permit required confined space.
 - ii. Review and revise the written confined space entry program periodically.
 - iii. Develop and conduct confined space training upon request.
 - iv. Verify that all entry equipment is maintained and/or calibrated according to the manufacturer's specifications and the preventive maintenance procedures.
 - v. Offer advisement on the types of person protective equipment that will be required to enter the confined space.

4.0 Program Activities:

A. Determining Type of Confined Space

Before any confined space operations begin, it must be determined if the confined space is permit-required. If there is uncertainty of whether the confined space is permitted, or not, please contact EHS for guidance. If it is a permitted-required confined space, prior to beginning any confined space operations, the supervisor or project manager must develop procedures for the following:

1. Summoning rescue and emergency services
2. Rescuing entrants from permit spaces
3. Providing necessary emergency services for rescue
4. Preventing unauthorized personnel from attempting a rescue

Only those individuals who have received confined space training can perform the work in the confined space.

B. Permit

A permit must be issued for approval before any work can take place in a confined space defined as permit-required. The entry supervisor must document safety measures being taken by completing a Confined Space Entry Permit. Before entry, the supervisor must sign the permit to authorize entry.

The completed permit must be made available at the time of entry to all authorized entrants by posting it at the entry portal or by any other equally effective means, so that the entrants can confirm that pre-entry preparations have been completed. The duration of the permit may not exceed the time required to complete the assigned task or job identified on the permit.

A Confined Space Entry Permit at UTK will contain the following information:

- The location of the permit space to be entered.
- The purpose of the entry.
- The date and the authorized duration of the entry permit.
- The name(s) of the authorized entrants working within the permit space.
- The employee(s), by name, currently serving as attendant(s).
- The employee, by name, currently serving as entry supervisor, with a space for the signature or initials of the entry supervisor who originally authorized entry.
- The hazards of the permit space to be entered.
- The measures used to isolate the permit space and to eliminate or control permit space hazards before entry.
- The rescue and emergency services that can be summoned and the means (such as the equipment to use and the numbers to call) for summoning those services.
- The communication procedures used by authorized entrants and attendants to maintain contact during the entry.
- Equipment, such as personal protective equipment, testing equipment, communications equipment, alarm systems, and rescue equipment, to be provided for compliance with this program.
- Any other information whose inclusion is necessary, given the circumstances of the particular confined space, to ensure employee safety.
- Any additional permits, such as for hot work, that have been issued to authorize work in the permit space.

The permit will only cover one 8 hour shift. A new permit will need to be issued if confined space work will extend over one 8 hour shift period. When the work has been completed, the entrant will let the attendant know they are leaving the confined space. The attendant must visibly check and make sure all entrants have left the space and that no tools have been left behind.

C. Pre-Job Preparations

Before any confined space operations can take place, the following procedures must be followed:

- Isolate the permit space - Confined spaces that contain equipment or operations that through the activation of electricity, air, or hydraulics, may injure an

employee or cause property damage must be isolated by lock-outs and tags or other positive means of preventing an accident. All involved employees must take part in the lockout/tagout procedures. All electrical and mechanical systems must be tested prior to entry to ensure actual isolation of the systems.

- Purge, inert, flush, or ventilate the permit space as necessary to eliminate or control atmospheric hazards.
- Provide pedestrian, vehicle, or other barriers as necessary to protect entrants from external hazards. This may include, but is not limited to, the following methods: set-up cones, post signs, partition-off the area with caution tape, erect barricades, arrange for traffic control with the UT Police. All permit-required confined spaces will be marked with signs stating:

DANGER FOLLOW CONFINED SPACE ENTRY PROCEDURE BEFORE ENTERING
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- Spaces not permanently marked (ex: manholes) shall be posted with a portable sign when access to the spaces are required.
- Confined Space operations involving entry into hot and cold environments may require use of appropriate protective clothing. Consult with EHS prior to selecting any form of personnel protective equipment (PPE), this may include; safety glasses, gloves, chemical resistant suits, hearing protection, etc.
- Equipment used in confined space work operations will only be issued to those employees who are trained in their use. This may include:
 1. Ventilating equipment needed to obtain acceptable entry conditions.
 2. Communications equipment necessary to enable the authorized entrant(s) and attendant maintain constant communication and to enable the attendant to summon rescue services without leaving his/her post.
 3. Personal protective equipment when feasible engineering and work practice controls do not adequately protect employees.
 4. Lighting equipment needed to enable employees to see well enough to work safely and to exit the space quickly in an emergency.
 5. Barriers and shields
- Obtain equipment, such as ladders, harnesses and lifelines needed for safe ingress and egress by authorized entrants.
- Obtain rescue and emergency equipment except to the extent that the equipment is provided by or for rescue services.
- Obtain any other equipment necessary for safe entry into and rescue from permit spaces.

D. Hazard testing before and during entry into confined space:

1. All confined spaces will be tested by a competent individual before and during entry, using properly calibrated and approved equipment, to evaluate any hazards in the confined space and to verify that the confined space is adequate for entry.
2. The air in the confined space will be tested for oxygen levels, flammable gases and vapors, and toxic air contaminants and airborne combustible dusts, which are OSHA mandated. The oxygen levels must be between 19.5-23.5%. The initial air readings must be recorded on the permit and kept at the worksite for the duration of the job.
3. If there is the possibility that conditions could change during the entry, continuous air monitoring will be maintained for oxygen, flammable gases and vapors, and toxic substances.
4. If work is stopped for any reason, the air tests must be re-taken if deemed necessary by the Entry Supervisor, prior to re-entry.

E. Eliminating hazards:

1. Mechanical ventilation will be provided when necessary. Follow these guidelines for ventilating confined spaces:
 - Begin ventilation in time to assure that the space is safe before entry.
 - Test the atmosphere before entry to confirm that the ventilation system is working properly and that the space is safe.
 - Continue ventilation as long as the space is occupied, or at least until the oxygen levels and hazardous concentrations are within safe limits.
 - If work inside the space can make the air unsafe (e.g., hotwork, painting, using solvents, sandblasting, etc.) continue ventilation as long as the work is in progress.
2. Protective equipment and respirators are to be used only when normal cleaning and ventilating procedures fail to reduce hazards to safe levels.

F. Rescue:

Caution: Confined space attendants shall not enter the confined space for rescue, unless they are qualified for such rescue and a qualified attendant is present to take their place.

As soon as the attendant determines that the entrants may need assistance to escape from the permit space hazards, the attendant shall do the following in the order given:

1. Immediately summon rescue services by calling UT Police at at **911** by cell phone, and identifying the site as accurately as possible.
2. If possible, attempt a non-entry rescue while rescue/emergency services are en route.

3. Using lifeline/mechanical retrieval device(s), extricate the entrant using care to prevent injury or entanglement of the entrant or lifeline within the space. A hoist or other mechanical device for personnel removal will be used for all spaces in excess of five (5) feet in depth. This equipment will be used in situations where it may be difficult to rescue the entrant. If extrication is successful, begin first aid (if trained) as required until relieved by rescuers.
4. Upon their arrival, inform rescuers of any known hazards within the space and make available any material safety data sheets pertinent to the rescue.

G. Other Precautions:

1. If welding, cutting or brazing is to be performed in a confined space, ventilation will be provided. A hot work permit will be completed and attached to the confined space entry permit. (See UTK's Hot Work Program). Cylinders of compressed gas should never be permitted in a confined space.
2. The SDS for any hazardous materials being used in a confined space will be incorporated in the confined space entry permit.
3. Ground-fault interrupter-protected or low voltage power equipment shall be used in confined spaces that are conductive (e.g. a metal tank). Portable electrical equipment should be supplied power through a ground fault interrupter or be battery powered, especially when used in wet environments.
4. If the confined space contains, or is suspect to contain, combustible gases, employees must use explosion-proof or non-spark producing tools ONLY. No smoking is permitted in a Confined Space or near the entrance/exit area.
5. Harnesses, lifelines and lifting equipment may need to be provided, depending upon the depth or height of the confined space. The provided equipment must be made to prevent entanglement. For more guidance on fall protection equipment, please refer to UTK's Fall Protection program.
6. Trenching and Shoring
 - Some operations such as trenching result in confined spaces. Shoring systems are necessary to protect these spaces and reduce the chance for cave-ins.
 - A trench is a narrow excavation below the ground. Trenches are typically deeper than they are wide; however, the width of a trench is less than 15 feet.
 - A shoring system consists of a structure that supports the sides of an excavation and is designed to prevent cave-ins.
 - Employees must follow all the requirements associated with confined spaces when working within trenches.

H. Job Completion:

- When the job has been completed, the attendant will account for all entrants before they leave the job site.
- The entry supervisor must check to ensure all personnel are out, all equipment is clear, and when he/she is satisfied with the site conditions, he/she can close out the confined space entry permit, prior to allowing the confined space to be sealed.

5.0 Training:

Training will be provided to each affected employee:

- Before the employee is first assigned duties under this program.
- Before there is a change in assigned duties.
- Whenever there is a change in permit space operations that presents a hazard about which an employee has not previously been trained.
- Whenever there are deviations from the permit space entry procedures required by this program or that there are inadequacies in the employee's knowledge or use of these procedures.

Training content shall include:

- Duties of Entry Supervisor, Entrant and Attendants
- UTK's Confined Space Procedure and other procedures related to confined space entry (i.e. Lockout/Tagout, Hot Work, etc).
- Hazards of Confined Spaces
- Use of Air Monitoring Equipment
- Use of Ventilation Equipment
- Emergency Action and Rescue Procedures
- Confined Space Entry Equipment, including Personal Protective Equipment.
- Requirements of 29 CFR 1910.146 Permit Required Confined Spaces.

Training rosters shall indicate the employee's name, date, level of training (i.e. supervisor, entrant and/or attendant) and the instructor who performed the training.

6.0 Recordkeeping:

- OSHA Permit Required Confined Space Entry Standard requires that an accurate record be maintained for permitted entries and training. The permits for entries shall be maintained for one year after work has been completed.
- Training Documentation will be kept for all affected employees for three years.
- EHS shall maintain all equipment calibration records for three years.

7.0 Additional References / Standards:

OSHA 29 CFR 1910.146

UTK's Hot Work Permit Program

UTK's Lockout/Tagout Program

UTK's Electrical Safety Program

UTK'S Trenching and Shoring Program

9.0 Disclaimer

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Appendix A

Confined Space Entry Procedure Checklist

Step #	Process	Complete
1.	Isolate the Space from all hazards	
	a. Remove unauthorized personnel form the site of entry	
	b. LOTO	
	c. Blocking inlets, etc.	
2.	Ventilate the space (if required)	
4.	Fill out the Entry Permit	
5.	Evaluate the space	
6.	Test the atmosphere	
	a. Enter atmosphere readings on the permit	
	b. Place the completed permit on or near the PRCS	
7.	Enter the space and proceed with work	
	a. Is Supervisor available?	
	b. Attendant at the entry site	
	c. Harness	
	d. Required PPE	
	e. Retest atmosphere as needed / required	
8.	When the job is done:	
	a. Remove all personnel, tools and debris from the space.	
	b. Close the space	
	c. Cancel the permit	
	d. Review the job with the employer (hazards, problems, etc.)	
9.	File the completed and closed permit	

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