

Confined Space Entry Program

I. Purpose

The purpose of this program is to ensure that Campus Facilities is complying with safe procedures for Permit Required Confined Space entry as referenced in Occupational Safety and Health Administration (OSHA) 1910.146. This program applies to all work operations at University of Missouri where Campus Facilities employees must enter a permit-required confined space as part of their job duties.

The CF Safety Training and Development Coordinator is the Program Administrator having overall responsibility for the Permit Required Confined Space Program.

Copies of the written program are maintained in the Campus Facilities Safety & Health Program book in the CF Safety Training and Development Coordinator's office in the General Services Building and in each CF Department.

II. Scope

Under this program, Permit-Required Confined Spaces are identified at the University of Missouri and training is provided for CF employees according to their responsibilities in this program. CF employees receive instructions for safe entry into our specific type of confined spaces, including testing and monitoring, appropriate personal protective equipment, rescue procedures, and employee responsibilities.

This program is designed to ensure that safe work practices are utilized during all activities regarding the Permit Required Confined Space to prevent personal injuries, illnesses and fatalities that could occur.

III. Definitions

1. **Authorized entrant:** an employee who is trained and authorized to enter a Permit-Required Confined Space.
2. **Attendant:** an employee who is stationed outside a confined space who monitors the authorized entrants and is trained in attendant's duties for confined space entry.
3. **Confined Space:**
 - ▶ 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 employee occupancy.
4. **Permit Required Confined Space:** (a confined space which also)
- ▶ contains or has potential to contain a hazardous atmosphere, or
 - ▶ contains a material with potential for engulfment of an entrant, or
 - ▶ has 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 health or safety hazard.
5. **Non-Permit Required Confined Space:** 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.
6. **Permit-Required Confined Space Entry Permit:** a written or printed document which allows entry into a permit-required confined space and one that is completed prior to an authorized entrant entering and performing work inside a permit-required confined space. The Permit must be initiated by the Entry Coordinator.
7. **Entry Coordinator:** a Campus Facilities Supervisor, Lead Person, Safety representative or designee who is trained and authorized to determine acceptable entry conditions; one who authorizes entry and oversees entry operations and terminates entry into a Permit-Required Confined Space.
8. **Hazardous Confined Space:** (anyone of the following)
- ▶ an oxygen deficient atmosphere containing less than 19.5% or an oxygen enriched atmosphere greater than 23.5% oxygen.
 - ▶ a flammable gas, vapor or mist in excess of 10% of the Lower Explosive Limit(LEL)
 - ▶ an airborne combustible dust at a concentration that meets or exceeds the Lower Flammable Limit (LFL). This concentration may be approximated when dust conditions obscure vision at a distance of 5 feet or less.
 - ▶ an airborne concentration of any material for which a permissible exposure limit (PEL) or Immediately Dangerous To Life (IDLH) value is published in the OSHA regulations and which could result in an employee exposure greater than it's permissible exposure limit.

- ▶ atmospheric condition that is imminently dangerous to life or health.
 - ▶ an unexpected release of energy to equipment or machinery.
 - ▶ a space which may present the danger of being trapped in a liquid or solid.
 - ▶ a space which may house physical dangers such as debris or slip, trip and fall hazards.
9. **Immediately Dangerous to Life or Health:** any condition which poses an immediate or delayed threat of life; may result in irreversible adverse health effects; or would interfere with an individual's ability to escape unaided from a permit-required confined space.
10. **Prohibited condition:** any condition in a permit-required confined space that is not allowed by the permit during the period when entry is authorized.

IV. Responsibilities/Procedures

1. Hazard Evaluation for Permit-Required Confined Spaces at the University of Missouri

To determine if there are permit-required confined spaces in University of Missouri, the CF Program Administrator, Campus E H & S representative or adequately trained department personnel will conduct a hazard evaluation of our work spaces and post appropriate signs at each location. This evaluation will provide information necessary to identify the existence and location of permit-required confined spaces in our workplace that must be covered by the Permit-Required Confined Space Entry Program. This written hazard evaluation is kept in the Campus Facilities Safety office.

2. Preventing Unauthorized Entry

To provide a safe work environment for employees working in confined spaces and to prevent potential exposure to employees who may accidentally enter a confined space, the following procedures will be implemented to inform all employees of the existence, location, and danger posed by confined spaces in the University of Missouri:

- ▶ warning signs posted to identify Permit-Required Confined Spaces as referenced in the attachment.
- ▶ warning signs, a written Permit, locked access and a trained attendant to keep unauthorized persons out of permit-required confined spaces during any work in such space.

3. Permit Process

The CF Entry Coordinator is responsible for authorizing entry and issuing entry permits for work in Permit-Required Confined Spaces. The file of cancelled permits and related documents are kept in each department. The procedures for preparing, issuing, and canceling entry permits includes the following elements:

- ▶ Entry Coordinator reviews the work space with all entrants and attendant prior to entry, authorizes and issues Confined Space Entry Permit.
- ▶ the completed permit will be reviewed with entrants and the attendant.
- ▶ duration of entry is **valid only for period indicated on permit.**
- ▶ the Entry Coordinator will terminate the Confined Space Entry Permit when work has been completed or a prohibited condition occurs.
- ▶ at the end of the work or entry, the Entry Coordinator shall cancel the permit and return it to the department Supervisor.

4. Pre-Entry Evaluation

To ensure the safety and health of our employees and before allowing authorized workers to enter a Permit-Required Confined Space, conditions are evaluated in that space by a trained CF employee to determine if the conditions are safe for entry. Any employee who enters the space has the opportunity to observe the pre-entry and any subsequent atmospheric testing. The authorized entrant also has the option of requesting a reevaluation of the space if they feel that the evaluation was not adequate.

Campus Facilities follows the procedures to evaluate each permit space before entry according to OSHA requirements. This includes testing the internal atmosphere with a calibrated direct-reading instrument for oxygen content, flammable gases and vapors, and potential toxic air contaminants. Also a periodic test of the atmosphere in the space is done to ensure that continuous ventilation is preventing the accumulation of a hazardous atmosphere.

5. Basic Requirements for Entering a Permit-Required Confined Space

- ▶ Entry must be planned and authorized by the completion of an entry permit.
- ▶ All hazards must be identified and, where applicable, controlled by:
 - a. Purge-Flush and Vent

- b. Ventilation
 - c. Lockout/Tagout
 - d. Inerting
 - e. Personal protective equipment
 - f. Blanking, Blocking, Bleeding
 - g. External Barricades
 - h. Confined space Identification Signs
- if the **only** potential hazard in the space is a hazardous atmosphere which can be maintained safe by ventilation (meaning all other hazards are locked out and/or eliminated), then space may be entered without attendant and retrieval equipment (refer to Alternate Procedures on page 6).
The Location, Certification of Hazard Elimination and Atmospheric Monitoring Results sections must be documented on the Permit and the permit must be signed.

6. Entry Steps

- a) Identify the work to be performed.
- b) Identify who will perform the work.
- c) Determine when the work will be performed.
- d) Determine the types of hazards associated with the space.
- e) If the only potential hazard is atmospheric, ventilate the space as necessary and document information on the permit.
- f) If there are other potential hazards present, continue filling out the permit for the space.
- g) Obtain and visually inspect the necessary equipment before entering the space.
- h) Assemble the necessary personnel: attendant, entrant(s), entry coordinator.
- i) Review the permit requirements with all key personnel involved with the entry.
- j) Review the communication procedures with all entry participants.

- k) Verify procedures for notifying rescue personnel.
- l) Initiate lockout/tagout procedures and isolate the space.
- m) Clean and/or purge the space to remove hazardous contents.
- n) Ventilate the space if necessary to maintain satisfactory atmosphere.
- o) Verify atmospheric conditions according to the permit requirements.
- p) Enter the space and perform the work.
- q) Monitor the space continuously and record results every two hours.
- r) Exit the space and account for all entrants.
- s) Close out the permit.
- t) Perform appropriate maintenance as required to equipment used during the entry.
- u) Turn in the cancelled permit to the supervisor.

7. Testing a Confined Space for the Presence of a Hazardous Atmosphere

- ▶ Select a properly calibrated air testing device that is capable of detecting potential air contaminants within the space.
- ▶ Check the confined space atmosphere before entry is made and then continuously during the entry.
- ▶ Always perform air tests before, during and after ventilating a confined space.
- ▶ Slowly check the entire depth of the space. Some hazardous gases are lighter than air and will be near the top (for example, methane) while other hazardous gases are heavier than air and will be near the bottom (for example, hydrogen sulfide).
- ▶ Record monitoring results on permit.

8. Conditions of Entry

- ▶ The following conditions of entry must be satisfied:

Condition	Minimum Requirements
Oxygen	Minimum 19.5% and Maximum 23.5%
Flammable Gases	No greater than 10% for lower flammability limit (LEL)
Hydrogen Sulfide (H ₂ S)	No greater than 20 parts per million (ppm)
Carbon Monoxide (CO)	No greater than 35 parts per million (ppm)
Other Toxic Substances	No greater than substance's permissible exposure limit (PEL)
Flammable Dusts	Must not reduce visibility to 5 feet or less
Engulfment Hazards	No engulfment hazard may be present
Hazardous Flows	Must be secured and locked/tagged out
Hazardous Energies	Must be secured and locked/tagged out
External Hazards	External hazards must be controlled

- ▶ Entrants shall wear retrieval equipment unless the use of retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant.
- ▶ Retrieval equipment must include a full body harness attached to a retrieval line. The opposite end of the retrieval line must be fastened at a point on the exterior of the confined space.
- ▶ When the space is deeper than five feet, the retrieval line must be connected to a mechanical lifting device designed for human lifting.
- ▶ Attendant shall be stationed at the opening.
- ▶ Attendant and/or entrant shall test and monitor continuously throughout entry for the presence of a hazardous atmosphere.

9. Ventilating a Confined Space

- ▶ Confined spaces must be ventilated to:
 - a. Eliminate a hazardous atmosphere that has been detected through air testing.
 - b. Reduce high temperatures.
 - c. Improve environmental conditions.

- ▶ Provide ventilation by supplying clean fresh air into the space.
 - a. Never use pure oxygen.
 - b. Discharging air into the space is more efficient than exhausting air from the space. Fans used to exhaust flammable atmosphere must be explosion proof.
- ▶ Place the blower so that vehicle exhaust and/or air discharged from the space does not enter the blower intake.
- ▶ Ventilate the entire space.
 - a. Use a blower of sufficient capacity to meet the minimum conditions and requirements for entry.
 - b. Allow sufficient time for complete ventilation.
 - c. Create turbulence by discharging air into corners.

10. Alternate Procedures for Entry

- ▶ A permit-required confined space may be entered without an attendant and retrieval equipment if the following conditions are satisfied:
 - a. All physical hazards (for example, hazards capable of causing death or serious injury) are eliminated. This means that the only hazard posed by the permit space is an actual or potential hazardous atmosphere and that forced air ventilation alone is sufficient to maintain that the permit space is safe for entry. If entry is required to eliminate hazards, the space must be entered according to permit-required confined space procedures.
 - b. The work does not introduce hazards.
 - c. Continuous ventilation is necessary to maintain safe atmosphere for entry.
 - d. Hazard elimination must be certified in writing on the permit with date, location of the space and signature of Entry Coordinator.
 - e. If hazards are observed or perceived, the space must be immediately evacuated and re-evaluated for entry on a new permit form.
 - f. Perform work safely and remain alert for hazards.
 - g. The Alternate procedures must be documented on the permit and the permit must be kept on file (**Refer to Section IV. 5 above**).

11. Equipment

To ensure the safety and health of employees, the Campus Facilities Department provides appropriate equipment to all employees who work in or near permit confined spaces as follows:

- ▶ To facilitate **non-entry rescue**, retrieval systems or methods will be used when an authorized entrant enters a permit confined space unless the retrieval equipment would increase overall risk of entry or would not contribute to rescue of the entrant. Each authorized entrant will use a chest or full body harness, with a retrieval line attached at the center of the entrants back near shoulder level, above the entrants head, or at another point which Campus Facilities can establish presents a profile small enough for the successful removal of the entrant. Wristlets may be used instead of the chest or full body harness if University of Missouri can demonstrate that the use of a chest or full body harness is infeasible or creates a greater hazard and that the use of wristlets is the safest and most effective alternative.

The following additional equipment is provided to all employees who work in or near permit-required confined spaces:

- ▶ Additional lighting, ventilation equipment, personal protective equipment, rescue equipment, atmospheric testing equipment, ladders, etc.

All equipment is maintained in excellent working condition and all Confined Space entrants are trained in the correct usage of this equipment.

12. Duties: Authorized Entrants

Those persons who have completed the training and are authorized to enter permit-required confined spaces to perform work. Duties and responsibilities include:

- ▶ Read and abide by the Permit conditions and special procedures. Be knowledgeable of hazards associated with confined spaces.
- ▶ Identifying and recognizing the signs and symptoms and consequences of hazard overexposure.
- ▶ Ensuring that atmospheric monitoring has been conducted and that appropriate personal protective equipment and rescue equipment has been made available.
- ▶ Properly use required personal protective equipment including donning full body harness with retrieval line rescue equipment prior to entry when applicable.
- ▶ Maintain communication with the attendant and notify the attendant of self evacuation from the confined space.

- ▶ Inform the attendant whenever he/she feels there is a danger or when a prohibited condition is noted.
- ▶ Exit the confined space as quickly as possible when the attendant or Entry Coordinator orders evacuation, an alarm is activated or danger is perceived.

13. Duties: Attendants

Attendants are those persons who have completed the training and are authorized to be permit-required confined space attendants.

Duties and responsibilities include:

- ▶ Remain outside the confined space at all times during entry operations including during any emergency inside the confined space.
- ▶ Having means for summoning emergency help from outside the confined space at all times.
- ▶ Maintain communication with entrants.
- ▶ Maintain accurate accounting of all entrants authorized to work in the confined space.
- ▶ Monitor activities inside and outside the confined space to ensure that it is safe.
- ▶ Ensure that rescue equipment is available and adequate for rescue.
- ▶ Warn entrants when conditions occur which may interfere with or cause a safety hazard for the entrants.
- ▶ Order the entrants to evacuate the confined space immediately if the attendant recognizes an unsafe condition that could endanger the entrants.

14. Duties: Entry Coordinator

Entry Coordinators are those persons who have completed the training and have been designated as a permit-required confined space Entry Coordinator. Duties and responsibilities include:

- ▶ Know the hazards faced during confined space entry.
- ▶ Ensure that authorized entrants and attendants are designated and trained in their responsibilities prior to entry.
- ▶ Verify that all safety conditions and requirements of the Confined Space Entry Permit have been evaluated and met.

- ▶ Ensure that all hazardous conditions are rendered safe prior to entry.
- ▶ Terminate entry and cancel the permit when work has been completed or when a prohibited condition occurs.
- ▶ Verify that all rescue equipment and personal protective equipment is available and used.
- ▶ Determine throughout entry that all entry operations remain consistent with terms of the entry permit.

V. Training Program

Every Campus Facilities employee who faces the risk of confined space entry is provided with training so that they acquire the understanding, knowledge and skills necessary for the safe performance of the duties assigned to them as described in the program. The CF Program Administrator or authorized designee with skills and knowledge will conduct the Permit-Required Confined Space training. All training related materials and records are kept in CF Training Department.

Classroom training, videos, handouts and hands-on practice are used for this training. New employees are trained before their initial assignment of duties. When changes occur in permit-required confined space areas, additional training will be done. If there is a reason to believe that an employee has deviated from a previously trained upon procedure or that their knowledge seems inadequate, refresher training will be done for that employee. Refresher training will be conducted every three years or more often as necessary.

VI. Rescue and Emergency Services

University of Missouri utilizes the Columbia City Fire Department to perform rescue and emergency services in the event of a Permit Confined Space incident. To familiarize this service with our facility and emergency needs, access is provided to the Fire Department to all permit spaces from which rescue may be necessary so the rescue team can develop appropriate rescue plans and practice rescue operations. Campus Facilities also informs the rescue team of the hazards they may confront when called on to perform rescue at the site.

VII. Multiple Employer Entry Procedures

When outside employers/contractors enter our facility to perform work in Permit-Required Confined Spaces, entry and work operations are coordinated through Campus Facilities to ensure that the contractor is made aware of confined spaces and any hazards involved.

VIII. Post-Operations Procedures

Upon completion of work in a permit required confined space, methods used to cease operations in the space and cancel the permit are as follows:

- ▶ Entry Coordinator terminates entry and cancels permit.
- ▶ The space is sealed or closed to prevent unauthorized entry.
- ▶ Once the entry permit has been cancelled, a new entry permit must be implemented using the Permit-Required Confined Space Entry procedures outlined in this program to reenter the confined space.

IX. Review-Procedures

Canceled Confined Space Entry Permits from the past 12 months are retained. Campus Facilities Safety Coordinator performs a single annual review covering all entries performed during a 12-month period. If no entry is performed during a 12-month period, no review will be performed.

X. Enforcement

Constant awareness of and respect for Permit-Required Confined Space entry hazards, and compliance with all safety rules are considered conditions of employment. Supervisors and individuals in the CF Safety and CF Personnel Department reserve the right to issue disciplinary action to any CF employee, up to and including termination, for failure to follow the guidelines of this permit entry program.

XI. RESPONSIBILITIES

Managers

- a. Work Group Managers have the primary responsibility to maintain a safe work environment within their jurisdiction, by monitoring and exercising control over their assigned areas.
- b. Ensure that health and safety responsibilities are carried out in their work groups. This includes assuring compliance with applicable Confined Space Entry procedures.
- c. Ensure implementation of the Confined Space Entry Program.
- d. Provide financial support for the Confined Space Entry Program.

Environmental Health and Safety

- a. Provide guidance for proper selection and use of appropriate air monitoring equipment, ventilation equipment and ancillary safety devices as required.
- b. Periodically assist with audit operations, documentation, and training to ensure compliance with the program.
- c. Assist each work group in identifying confined spaces and entry restrictions.
- d. Assist in providing training and training programs.

Safety Coordinator

- a. *Develop the written Confined Space Entry Program with assistance from the Standards Committee and revise the policy, when necessary.*
- b. Be thoroughly informed of the Confined Space Program, rules and procedures and how it specifically applies to their responsibilities and authority.
- c. Perform investigations of any confined space related incidents.
- d. Administer training as needed in conjunction with the supervisors.
- e. Work in conjunction with managers and supervisors in determining and labeling of confined spaces.
- f. Make revisions to this program as necessary.

Supervisors

- a. Be thoroughly informed of the Confined Space Entry Program, rules and procedures and how it applies to their areas of responsibility and authority.
- b. Periodically review work practices to ensure compliance.
- c. Take prompt corrective action when unsafe conditions, practices, or equipment is reported or observed.
- d. Identify areas and locations that are confined spaces and report to the CF Safety Coordinator.

- e. Identify personnel who may enter confined spaces, and ensure that they are trained.
- f. Inspect and ensure proper maintenance of equipment.
- g. Ensure permits are properly completed.
- h. Ensure identified confined spaces are properly posted with warning signs.
- i. Maintain records of employee training and equipment maintenance.
- j. Contact CF Safety Coordinator with any questions concerning the classification of a space or any entry questions.
- k. Maintain copies of entry permits.
- l. Update CF Safety Coordinator with additions and deletions to confined space list.
- m. Conduct periodic inspections of confined space entry procedures in order to maintain safe and healthful conditions and address any deficiencies that are identified.

Employees

- a. Follow all provisions of the Confined Space Entry Program and procedures.
- b. Do not perform any function or operation that is considered hazardous, or is known to be hazardous without proper instruction and authorization.
- c. Report all unsafe conditions, practices, or equipment to the supervisor or Safety Coordinator.
- d. Only use equipment and materials approved or provided by the supervisor.
- e. Properly wear or use prescribed protective equipment.
- f. Inspect, properly store and maintain equipment used for confined space entry.
- g. Immediately report equipment malfunctions to supervisor.

- h. Follow all provisions of the confined space entry program and procedures.

References

OSHA 1910.146 Permit-Required Confined Space.

Attachments:

1. Campus Facilities Permit Required Confined Space Entry Permit
2. Example of Permit-Required Confined Space sign

Date: December 4, 2003

Revised: December 11, 2003

Revised: June 10, 2004

Revised: June 14, 2004

Revised: July 1, 2004

Revised: August 2, 2004

Revised: August 3, 2004

Revised: August 5, 2004

Revised: August 11, 2004

Revised: September 10, 2004

Revised: September 14, 2004

Revised: January 20, 2006

Revised: January 25, 2006

Revised: April 1, 2011

Emergency Numbers:
COLUMBIA FIRE: 911
CF SAFETY: 573-884-3224
EHS: 573-882-7018
CF COMMUNICATIONS: 573-882-3301

CONFINED SPACE ENTRY PERMIT

*Do Not Destroy This Permit
 After Cancellation, This Entry Permit
 Must be Retained by Supervisor
 for at Least One Year*

Location of
 Confined Space _____

Purpose
 of Entry _____

Date of Entry _____ Authorized Duration
 of Entry Permit _____

Authorized Entrants _____

Attendants _____

Entry Supervisor _____
 Authorizing Entry _____

Signature

Date & Time

Record Hazards of the Permit Space to be Entered				Check or list the measures used to isolate the permit space and to eliminate or control permit space hazards before entry.
Hazard	Yes	No	N/A	
Lack of Oxygen				<input type="checkbox"/> Purge-Flush and Vent
Oxygen Enrichment				<input type="checkbox"/> Ventilation
Combustible Gases/Vapors				<input type="checkbox"/> Lockout/Tag Out
Toxic Gases/Vapors				<input type="checkbox"/> Inerting
Chemical Contact				<input type="checkbox"/> Blanking, Blocking, Bleeding
Electrical Hazards				<input type="checkbox"/> External Barricades
Mechanical Hazards				<input type="checkbox"/> Confined Space Identification/Signs
Temperature				
Engulfment				
Entrapment				
Others				

Test(s) To Be Taken	Permissible Entry Levels	Readings: Test 1	Test 2	Test 3	Test 4
A. Percent of Oxygen	19.5% to 23.5%				
B. Combustibles	<10% LEL				
C. Carbon Monoxide	≤ 35 ppm				
D. Hydrogen Sulfide	≤ 20 ppm				
Name or Initials of Tester					
Test Times					

Equipment Supplied to the employee			
Yes	No	N/A	Description
			(i) Gas Test and Monitoring Name _____ Model/Type _____ Serial/Unit No. _____
			(ii) Ventilating
			(iii) Communications
			(iv) Personal Protective Equipment <input type="checkbox"/> Safety Harness With Life Lines <input type="checkbox"/> Respiratory <input type="checkbox"/> Hard Hats <input type="checkbox"/> Eye <input type="checkbox"/> Ear <input type="checkbox"/> Face <input type="checkbox"/> Hand <input type="checkbox"/> Foot <input type="checkbox"/> Clothing
			(v) Lighting
			(vi) Barriers/Shields <input type="checkbox"/> Pedestrian <input type="checkbox"/> Vehicle <input type="checkbox"/> Other
			(vii) Safe Ingress/Egress <input type="checkbox"/> Ladders
	Radio Service Desk to call 911		(viii) Rescue and Emergency <input type="checkbox"/> Lifelines <input type="checkbox"/> Hoists <input type="checkbox"/> Resuscitators-Inhalator
			(ix) Other Safety Equipment

THIS CONFINED SPACE ENTRY PERMIT HAS BEEN CANCELLED:

By _____ AM/PM _____
 Entry Permit Supervisor Time Date



DANGER

**PERMIT REQUIRED
CONFINED SPACE**

DO NOT ENTER