



UNIVERSITY OF MINNESOTA  
University Health and Safety

Confined Space Entry Program

**Effective Date:** June 2015, revision November 2019

**I. PURPOSE**

The purpose of this program is to establish safe entry and monitoring procedures for working in confined spaces. These procedures are intended to prevent harm to personnel while entering or working in a confined space exposed to potential hazards such as air contaminants, oxygen deficient or enriched atmospheres, engulfment hazards, or configurations which may impede employee escape or retrieval in the event of an emergency.

**II. SCOPE**

This program applies to all University of Minnesota employees required to work in confined spaces.

**Note:** See the University of Minnesota's Electrical Safety Program on enclosed spaces for high voltage electrical vault entry procedures.

**III. DEFINITIONS**

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

**Authorized Entrant** - an employee who is authorized by the department to enter a permit required confined space. The authorized entrant must know the hazards they may encounter, be able to recognize signs and symptoms of exposure, and understand the consequences of exposure to the hazards.

**Confined Space** – A special configuration with the following properties:

- Limited or restricted means of entry or exit,
- Large enough for employee to enter and perform assigned work, and
- Is not designated for continuous occupancy by an employee.

**Confined Space, Permit Required** – A confined space with one or more of the following properties:

- 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 or tapers to a smaller cross section.
- Contains any other recognized serious safety or health hazard.

**Confined Space, Non-Permit Required** – A confined space that:

- *Does not* contain a physical hazard capable of causing death or serious physical harm to entrants.
- *Does not* contain or have the potential to contain a hazardous atmosphere capable of causing death or serious physical harm to entrants.

**Engulfment** – 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** – Any part of the body entering through the plane of the confined space opening.

**Entry Supervisor** - a person, designated by the department, who is responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, issuing confined space entry permits, and overseeing entry operations, and for terminating entry as required by this section.

**Hazardous Atmosphere** – An atmosphere presenting a threat of death, acute injury, illness or disablement due to the presence of flammable, explosive, toxic, oxygen deficiency or enrichment, or otherwise injurious substances as follows:

- Flammable gas or vapor concentrations greater than 10 percent of its lower explosive limit (>10% LEL).
- Combustible particulate concentrations greater than 10 percent of the minimum explosive concentration of the particulate (>10% MEC).
- Atmospheric oxygen concentration either below 19.5 percent or above 23.5 percent
- Toxic, corrosive or asphyxiate substance concentrations above Permissible Exposure Levels and/or Threshold Limit Values (> PEL and/or TLV).
- Any substance that is present at concentrations greater than the value established as Immediately Dangerous to Life and Health (> IDLH).

**Oxygen Deficient or Enriched** – An atmosphere containing less than 19.5% oxygen by volume or greater than 23% oxygen by volume.

**Physical Hazards** – Confined space physical hazards include items such as heat exposures, electrical hazards, fall hazards, stored energy sources and excessive noise.

## **IV. RESPONSIBILITIES**

### **Employee Responsibilities**

CSE Entrants: Entrants must receive authorization from the entry supervisor to enter permit-required confined spaces, use proper equipment, and observe entry procedures and permit requirements. Entrants must:

- Know the hazards that may be faced during entry.
- Perform necessary air monitoring.
- Obtain and properly use equipment required for safe entry.
- Maintain communication with the attendant.
- Alert the attendant if the entrant recognizes any warning signs or symptoms of exposure to a dangerous situation, or any prohibited condition is detected.
- Exit the confined space as quickly as possible when the order to evacuate has been given, or the entrant recognizes any warning signs or symptoms of exposure to a dangerous situation, or any prohibited condition is detected.
- Participate in initial and annual confined space training sessions.

CSE Attendants: At least one attendant remains outside the permit-required confined space for the duration of the entry operation. Attendants must:

- Know the hazards that may be faced during entry.
- Be aware of possible behavioral effects of hazard exposure on entrants.
- Continuously maintain an accurate count of entrants in the confined space.
- Remain outside the confined space during entry operation until relieved by another attendant.
- Maintain continuous communication with entrants, monitor entrant status.
- Order entrants to evacuate when necessary.
- Summon rescue and other emergency services as soon as the attendant determines the entrants need assistance to escape the confined space.
- Perform non-entry rescues when appropriate.
- Not allow unauthorized persons to enter the confined space.
- Only employees who are authorized and trained may enter a confined space or act as an attendant.
- Participate in initial and annual confined space training sessions.

CSE Entry Supervisors: Entry supervisors review and authorize entry permits, equipment, and other relevant activities. Entry supervisors must:

- Know the hazards that may be faced during entry.
- Verify that tests and procedures specified by the permit are conducted and equipment is in place before endorsing the permit and allowing entry to begin.

- Terminate the entry and cancel the permit when the entry is complete or conditions warrant termination.
- Verify that rescue services and equipment are available and list emergency contact numbers on the entry permit.
- Prohibit unauthorized persons to enter or attempt to enter the confined space.
- Verify entry operations remain consistent with the permit terms and acceptable entry conditions are maintained.
- Ensure that attendants and entrants acquire the understanding, knowledge, and skills necessary for safe performance in confined spaces.
- Ensure employees maintain proficiency in the duties required for working in or around confined spaces.
- Ensure employees are trained to perform atmospheric monitoring in confined spaces on the proper use of the designated air monitoring equipment.
- Ensure that air monitoring equipment is calibrated according to manufacturer's specifications.
- Ensure employees are trained before initial confined space entry and annually thereafter.

### **Supervisor Responsibilities**

- Ensure the Confined Space Entry Program procedures are implemented by all entrants and attendants of confined spaces under their supervision.
- Ensure all employees assigned to a confined space entry have been appropriately trained. All entry supervisors, entrants and attendant personnel must be trained prior to entry and annually thereafter and whenever necessary due to changes in assigned duties or changes to entry or emergency procedures.
- Ensure an appropriate number of employees have trained and assigned to be CSE Entrants, CSE Attendants, and CSE Entry Supervisors.
- Contact University Health and Safety for assistance with any portion of these duties.

### **Departmental Responsibilities**

- Ensure this Confined Space Entry Program is implemented by supervisors and employees where confined space entry occurs.
- Ensure the equipment necessary for safe confined space entry is readily available for employee use.

### **Facilities Management Responsibilities**

- Establish and maintain an inventory of all assigned confined spaces on campus. The inventory should include: location, frequency of entry, and known or expected hazards of each space.
- Where practical, post confined spaces with identification labels.

### **University Health and Safety Responsibilities**

- Maintain the confined space entry written program.
- Inform affected departments of program requirements.

- Develop and provide training resources.
- Provide technical assistance to work area performing confined space entry.
- Monitor implementation of the written program.

## **V. PERMIT REQUIRED CONFINED SPACE ENTRY PROCEDURES**

Safe entry into a permit required confined space can only be accomplished when work procedures account for all potential hazards. All confined spaces must be atmospherically evaluated before entry and monitored continuously throughout the authorized entry. Work practices for safe confined space entry include the following:

### **A. Pre-entry Hazard Assessment – (see appendix A – Confined Space Evaluation Form)**

Prior to entering a permit required confined space, the space must be thoroughly assessed by:

- Determine what, if any, hazards may be present including, but not limited to: entry/exit restrictions, chemical, mechanical, physical, entrapment, engulfment or hazards related to the task to be performed.
- Take necessary precautions to minimize the risks based on the known or suspected hazards. This includes atmospheric testing of the confined space, lockout/tagout of energy sources, cleaning out of residual materials, purging lines, providing adequate means of entry/exit, etc.
- Conduct a hazard assessment of the work task(s) to be completed in the confined space to ensure all hazards that may be created by the work activities are accounted for and corrective actions taken. For example: If the work task includes welding or cutting, additional ventilation may be required to remove the smoke and fumes.
- Communicate the work plan to all the confined space entry team members.
- Evaluate whether or not the confined space entry can be completed safely within the scope of this program. If not, re-evaluate and contact University Health and Safety representative for consultation.

### **B. Preparing for Confined Space Entry – (see appendix B – Confined Space Equipment Checklist)**

Take all necessary precautions that will minimize or eliminate the risks based on the known or suspected hazards:

- Place guards or barriers to protect employees and the public from fall hazards and to prevent unauthorized entry into the confined space.
- Provide an adequate means of entry/exit from the confined space.
- Close valves and isolate energy sources in accordance with lockout/tagout procedures. When applicable, purging the contents of the confined space.
- Ventilate the space. When using positive pressure ventilation, locate the ventilator intake in an area with a clean air source.
- Perform atmospheric testing. When practical, remote probes are to be used for initial atmospheric testing of the confined space from outside of the space.

Atmospheric testing includes: oxygen level, flammable gases, toxic atmospheres and any additional testing for any suspected toxins.

- Evaluate whether or not the confined space entry can be completed safely within the scope of this program. If a confined space entry cannot be completed safely within the scope of this program, contact your University Health and Safety representative for consultation.

### **C. Complete the Confined Space Entry Permit – (see appendix C – CSE Permit)**

Before entering the confined space, the confined space entry permit must be completed. The entry permit verifies pre-entry procedures have been completed and the confined space is safe to enter. The permit must be completed by the entrant, and then signed and dated by the designated confined space entry supervisor immediately prior to entry. The entry permit must be posted at the entrance(s) to the confined space or otherwise be immediately available on-site at all times while the confined space is being occupied.

- The duration of the entry permit cannot exceed the time required to complete the work assignment or a maximum of one work shift.
- The entrant, or entry supervisor must terminate an entry and cancel the entry permit when:
  1. An assignment is complete,
  2. The shift is completed,
  3. Or when a new hazard or condition exists. Note: The new hazard or condition must be noted on the cancelled permit and used when issuing a new permit.
- Copies of the completed entry permit should be placed in a job file..

### **D. Safe Confined Space Entry –**

During entry and while working in a permit required confined space:

- Post the permit outside of the entrance to the space
- Maintain an attendant outside the permit required confined space by the entrance to:
  1. When practical, continuously ventilate the confined space.
  2. Continue atmospheric testing of the confined space.
  3. Maintain continuous communication with the entrant.
  4. Initiate evacuation and emergency procedures.
- When making a vertical confined space entry of greater than ten (10) feet, the following equipment must be utilized:
  1. Full body harness with attached lifeline.
  2. Hoist or other retrieval equipment.
- If a hazardous situation develops during the confined space entry, or if a serious potential risk for a hazardous confined space situation develops, or if the attendant instructs the entrants to exit the space, entrants must evacuate the confined space immediately.
- Remove the permit at the end of the entry.

## **VI. EMERGENCY PROCEDURES**

In case of emergency, the attendant must carry out the following responsibilities to ensure that no one, including the attendant, is put at unnecessary risk while attempting a confined space rescue.

- **ALWAYS CALL FOR EMERGENCY ASSISTANCE (911) BEFORE ATTEMPTING TO RESCUE THE VICTIM(S) IN THE CONFINED SPACE.** When contacting emergency assistance, explain the type of incident, location of the confined space and the hazards of the confined space.
- **DO NOT ENTER** the confined space until:
  1. Emergency Assistance has been called,
  2. Backup assistance is standing by to provide additional help,
  3. **AND** the confined space atmosphere has been tested and cleared for safe entry.
- **RESCUE/RETRIEVAL** – Begin preparations/attempts to retrieve the victim(s) from **OUTSIDE** the confined space after calling for emergency assistance.
  1. If a victim is wearing a full body harness with a lifeline attached, use a mechanical device to pull the victim from the confined space.
- **PREVENT RE-ENTRY** – Isolate the confined space to prevent re-entry until the situation has been stabilized and rendered safe.
- Surrender all rescue activities to the rescue team (local Fire Department) upon their arrival.
- Notify the Entry Supervisor of the situation.

## **VII. NON-PERMIT REQUIRED CONFINED SPACE ENTRY PROCEDURES**

If testing and inspection demonstrate that the hazards within the permit-required confined space have been eliminated, the permit-required confined space may be reclassified as a non-permit confined space for as long as the hazards remain eliminated.

Note: The control of atmospheric hazards through forced air ventilation does not constitute elimination of the hazards.

- If a confined space is classified as “non-permit required” the space may be entered without an attendant, continuous air monitoring, or documented rescue procedures.
- If hazards arise within a non-permit confined space, each entrant shall immediately exit the confined space, and the confined space will be reevaluated to determine whether it must be reclassified as a permit-required confined space.

## **VIII. APPENDICES**

- A - Confined Space Evaluation Form
- B - Equipment Checklist
- C - Confined Space Entry Permit

## **IX. REFERENCES**

29 CFR 1910.146 Confined Space Entry

# Confined Space Evaluation Form

## Appendix A

**THE CONFINED SPACE MUST BE EVALUATED IN ITS TYPICAL CONDITION  
(Prior to controlling any hazards)**

<b>Date of Evaluation:</b>		
<b>Space Location (Campus, Area/Building, Floor, Room):</b>		
<b>Space Description:</b>		
<b>Purpose of Entry:</b>		
<b>Does the space have the following characteristics (#1 – #3)?</b>		
1. Is the space large enough and so configured that a person can enter and perform work?	<b>Yes</b>	<b>No</b>
2. Does the space have a limited or restricted means of entry or exit?	<b>Yes</b>	<b>No</b>
3. Is the space <b>NOT</b> designed for continuous human occupancy?	<b>Yes</b>	<b>No</b>
<b>If any of questions 1-3 were answered “Yes”, the space <u>IS</u> a confined space. Continue with questions 4-8 to determine if the space is a permit required or non-permit required space.</b>		
4. Does the space contain, or have the potential to contain a hazardous atmosphere (including but not limited to: oxygen deficiency, explosive, carbon monoxide, hydrogen sulfide, chemical fumes/gases)? <u>Specify hazards:</u>	<b>Yes</b>	<b>No</b>
5. Does the space contain an engulfment hazard (i.e. sand, grain, water)? <u>Specify hazards &amp; possible controls:</u>	<b>Yes</b>	<b>No</b>
6. Does the space have inward converging walls that taper down to a smaller cross-section and could lead to entrapment or asphyxiation? <u>Specify hazards &amp; possible controls:</u>	<b>Yes</b>	<b>No</b>
7. Does the space contain any other recognized serious hazards (check those that apply): <input type="checkbox"/> Mechanical hazards <input type="checkbox"/> Exposed or potential electrical hazards or electrical equipment <input type="checkbox"/> Gas or chemical lines <input type="checkbox"/> Fall hazards <input type="checkbox"/> Temperature extremes/heat stress <input type="checkbox"/> Liquid, sludge or residue <input type="checkbox"/> Other(s) <u>Specify hazards &amp; possible controls:</u>	<b>Yes</b>	<b>No</b>
8. Will hot works be conducted?	<b>Yes</b>	<b>No</b>

**This confined space is a:**

**Permit Required Confined Space if:**

- Answered “Yes” to any question #4 - #7 and the hazards **CAN NOT** be controlled, Or
- Answered “Yes” to question #8

**Non-Permit Required Confined Space if:**

- Answered “No” to all questions #4 - #8, Or
- Answered “Yes” to #4 **and** the hazards can be controlled through forced air ventilation
- Answered “Yes” to #5 - #7 **and** the hazards can be eliminated without entry into the space

Name: \_\_\_\_\_ Department: \_\_\_\_\_

Check box if **Special Considerations or Additional Information** is continued on Page 2.





## Appendix B - Equipment Checklist



Check N/A for items that do not apply

	YES	N/A
<b>Entry Equipment</b>		
Entry permit		
Calibrated direct reading multi-gas monitor to test oxygen, carbon monoxide, hydrogen sulfide, and Lower Explosive Limit (LEL)		
Detector tubes with hand pump for suspected toxins		
pH paper to test for corrosives		
Lockout/Tagout equipment		
Ventilation – electric blower with flexible ducts & GFCI		
Guards/barriers to protect confined space opening		
Ladder or other safe means of access and exit		
<b>Rescue, Retrieval, &amp; Fall Protection Equipment</b>		
Hoist / tripod / davit / winch for retrieval & fall protection		
Full body harness		
Lifeline, compatible with body harness & hardware – for retrieval		
Lanyard, compatible with body harness & hardware – for fall protection in vertical confined space entry of greater than ten (10) feet.		
Cell phones / radios / access to phone line		
First Aid /CPR Supplies		
<b>Personal Protective Equipment</b>		
Respirators, air purifying. (No confined space that requires the use of a SCBA or airline respirator is to be entered by Facilities Management employees.)		
Protective clothing, gloves, hard hats, foot protection as needed		
Eye & face protection as needed		
Hearing protection as needed		
<b>Work Equipment</b>		
GFCI cord		
Hot Work Permit and Equipment (May require additional ventilation)		
Fire Extinguisher		
Lighting (Explosive Proof)		
Non-sparking tools		
Electric equipment listed Class I, Division I, Group D		
Localized exhaust ventilation for welding or chemical use		



# Appendix C - CONFINED SPACE ENTRY PERMIT



Date and Time Issued:		Date and Time Expires: (Upon completion of work or shift)			
Job Site/Space I.D.:		Work to be performed:			
Equipment to be worked on:					
1. Initial Atmospheric Check (with GX-2003, GX-2009 or similar models):					
Oxygen _____ % Time _____ (>19.5 and <23.5)	LEL _____ % Time _____ (<10 LEL)	H2S _____ ppm Time _____ (<10)	CO _____ ppm Time _____ (<25)		
2. Atmosphere Tester's Name:  (Please Print)		6. Communication Equipment On Site and Tested:		Yes <input type="checkbox"/>	No <input type="checkbox"/>
3. Source Isolation/LOTO (Before Entry):		7. Rescue Procedure: <b>Call 911. Do not enter until atmosphere is tested to be safe and backup is standing by.</b>			
Pumps or lines blinded, disconnected, or blocked	N/A <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>	8. Authorized Entrant, Attendant, & Entry Supervisor completed required training	
Hot works permit required	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	9. Equipment:	
4. Ventilation of Space:		Direct reading gas monitor – tested (GX-86, GX-94 or GX-2003)		<input type="checkbox"/>	<input type="checkbox"/>
Electric Blower (Mechanical Ventilation)		Yes <input type="checkbox"/>	No <input type="checkbox"/>	Safety harnesses and lifelines for all entrants	
Anticipated Hazards (Atmospheric and Physical):		Hoisting/Retrieval Equipment		<input type="checkbox"/>	<input type="checkbox"/>
		Protective Clothing		<input type="checkbox"/>	<input type="checkbox"/>
		All electric equipment listed Class I, Division I, Group D and Non-sparking tools (list examples of types):		<input type="checkbox"/>	<input type="checkbox"/>
5. Atmospheric Check After Isolation And Ventilation (with GX-2003, GX-2009 or similar models):					
Oxygen _____ % Time _____ (>19.5 and <23.5)	LEL _____ % Time _____ (<10 LEL)	H2S _____ ppm Time _____ (<10)	CO _____ ppm Time _____ (<25)		
10. Periodic Atmospheric Tests (with GX-2003, GX-2009 or similar models):					
Oxygen _____ % Time _____	LEL _____ % Time _____	H2S _____ ppm Time _____	CO _____ ppm Time _____		
Oxygen _____ % Time _____	LEL _____ % Time _____	H2S _____ ppm Time _____	CO _____ ppm Time _____		
Oxygen _____ % Time _____	LEL _____ % Time _____	H2S _____ ppm Time _____	CO _____ ppm Time _____		
Oxygen _____ % Time _____	LEL _____ % Time _____	H2S _____ ppm Time _____	CO _____ ppm Time _____		
We have reviewed the work authorized by this permit and the information contained here-in. Written instructions and safety procedures have been received and are understood. This permit is not valid unless all appropriate items are completed.					
Entry Supervisor Name (PRINT): _____					
Entry Supervisor Approval - Before Entry (SIGNATURE): _____					
Attendant(s):					
(PRINT) Authorized Entrant Name(s):		(SIGNATURES)			
(PRINT)		(SIGNATURES)			
Any comments or problems encountered during entry? Yes <input type="checkbox"/> No <input type="checkbox"/> If yes, please describe on back side of Permit.					
This permit is to be kept at job site. Send original copy to department office for filing.					