



Confined Space Safety Program

GENERAL

The UNCW Environmental Health & Safety Department (EH&S) is authorized by UNCW Policy 05.600 (http://uncw.edu/policies/documents/05_600_EHandSPolicy_5Feb2010.pdf) to develop and manage comprehensive environmental, health and safety programs. Additionally, they are tasked to identify and address regulatory requirements. In that spirit, this Confined Space Program has been developed to protect employees by ensuring that it contains the procedures that are needed to safely enter confined spaces and maintain regulatory compliance. This program is intended to meet the Occupational Safety and Health Requirements for General Industry outlined in 29 CFR 1910.146.

SCOPE

This program applies to all university employees regardless of status or type of employment. It may be used as minimum guidelines for contractors and/or vendors that are expected to maintain their own safety program.

APPLICATION

This written program outlines key terms, responsibilities, training, specific procedures and program review with regard to the Confined Spaces.

DEFINITIONS

Definition of Key Terms

In general, confined spaces are considered to be enclosures with depths that restrict the natural movement of air; or enclosures with limited openings for entry and exit. Examples of confined spaces include: storage tanks, process vessels, boilers, ventilation or exhaust ducts, sewers, underground utility vaults, tunnels, trenches, pits and pipelines.

1. Confined Space - 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 employee occupancy.

2. Permit Required Confined Space (PRCS) - A confined space that has at least one of the following characteristics:

- Contains or has the potential to contain a hazardous atmosphere;
 - Contains a material that has the potential for engulfing an entrant;
 - Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a smaller cross-section; or
 - Contains any other recognized serious safety or health hazard.
3. Alternate Procedure Confined Space - A confined space that has only a atmospheric hazard that can be controlled by continuous forced air ventilation.
 4. Hazardous Atmosphere - An atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (escape without help from others), injury or acute illness from one or more of the following causes:
 - Flammable gas, vapor, or mist in excess of **10%** of its Lower Flammable Limit (LFL);
 - 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 or less.
 - Atmospheric oxygen concentration below **19.5%** or above **23.5%**;
 - Atmospheric concentration of any substance for which a dose or permissible exposure limit is published in Subpart G, Occupational Health and Environmental Control or in Subpart Z, Toxic and Hazardous Substances, of the North Carolina Occupational Safety and Health Standards for General Industry 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 included.
 - Any other atmospheric condition that is Immediately Dangerous to Life or Health (IDLH).
 5. IDLH - Immediately Dangerous to Life or Health 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 space.

RESPONSIBILITIES

Environmental Health and Safety Department

1. Develop the University's written Permit Confined Space Program and update it when necessary.
2. Provide guidance in the selection of air monitoring equipment and training in its' proper use.
3. Help departments develop acceptable calibration and maintenance programs for air monitoring equipment.
4. Assist in the development of entry procedures, selection and use of respiratory protection and personal protective equipment.
5. Assist supervisors in identifying and classifying confined spaces.

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Supervisors shall:

1. Identify his/her personnel who will enter confined spaces.
2. Provide detailed instructions and training on confined space hazards and entry procedures to those who may enter confined spaces.
3. Identify and report work areas that have the potential to be confined spaces. A list of confined spaces shall be submitted to David Todd at EH&S, (toddd@uncw.edu).
4. Classify confined spaces as either "permit required" or "non-permit required".
5. Inform employees who may enter the PRCS by posting danger signs or by training.
6. Prevent unauthorized entry into spaces.
7. Evaluate respiratory hazards and train personnel on routine measurement of respiratory hazards in confined spaces.
8. Provide instruction to personnel on the proper use of equipment required for confined space entry.
9. Maintain equipment that is used to enter confined spaces.
10. Conduct annual work area audits to determine compliance with confined space entry procedures.
11. Maintain records of equipment maintenance and inspections
12. Maintain employee training records and record retention
13. Establish a Lockout/Tagout program.
14. Conduct pre-entry briefing to inform entrants of the possible hazards that may be encountered in a confined space.
15. Issue and cancel entry permits.
16. Maintain canceled permits on file for one year.

University employees who enter confined spaces shall:

1. Obtain the required training before entering a confined space.
2. Follow the confined space entry procedures and any additional instructions given by their supervisor.
3. Understand emergency procedures for confined space entry.
4. Not enter a confined space that is suspected of having a hazardous atmosphere, even to rescue a fellow employee.

Contractors shall:

1. Not allow their employees or subcontractors to enter a PRCS without having received confined space training and instruction in their individual duties.
2. Have a written PRCS Entry Program and Permit system that is in compliance with OSHA regulations.
3. Complete and sign the Contractor's PRCS Affirmation, (Appendix B), and return it to the Project Manager.
4. Obtain any available information regarding permit space hazards or necessary entry procedures from the University Project Manager. (Construction Management, Facilities Operations, Telecommunications, Other)
5. Coordinate entry operations with the University Project Manager when both University personnel and contractor personnel will be working in or near permit spaces.
6. Inform the University Project Manager of any hazards confronted or created in permit spaces, either through a debriefing or during the entry operation.

7. Upon request, provide a copy of the entry permit used for entry.

University Project Managers shall:

1. Inform the contractor in writing that the workplace contains permit spaces and that entry is allowed only by following a PRCS Program that complies with OSHA regulations and UNCW entry requirements. Project drawings, specifications, and bid documents must identify PRCS.
2. Notify the contractor of the hazards that have been identified and/or the experience that the University has had with the space.
3. Not allow a contractor to enter a confined space until a signed copy of the Contractor's PRCS Affirmation, (Appendix B), has been received. (This should be received during the bid process.)
4. Notify the contractor of any precautions or procedures that the University has in effect for employee protection in or near the space.
5. Coordinate entry operations with the contractor when both University and contractor personnel will be working in or near permit spaces.
6. Debrief the contractor at the conclusion of the entry operations regarding any hazards confronted or created in the space during entry.
7. Report any confined spaces not on the list to David Todd at EH&S, (toddd@uncw.edu).

TRAINING

Before participating as a member of an entry team, each employee shall be given confined space training as well as instruction in the specific duties to be conducted. The duties required for each role are listed in Appendix F, Duties of PRCS Entry Team Members. The training must provide employees with the necessary knowledge and skills needed to perform their duties safely.

Refresher training shall be given:

- When the employee's duties change
- When space hazards change or
- When inadequacies in entry operations have been identified.

Hands-on training in the proper use and care of tools and equipment is an essential part of the PRCS training program. This includes:

- Appropriate personal protective equipment (PPE),
- Air monitoring instrumentation,
- Ventilating equipment,
- Fire protection equipment,
- Intrinsically safe electrical equipment, and
- Retrieval and non-entry rescue equipment.

Training that has been successfully completed shall be documented by listing the names of the employees, the trainer, and the dates of training. This training certification shall be kept on file and available for inspection.

Confined space awareness training should be attended by supervisors who have employees that enter spaces, supervisors that have confined spaces in their work areas and anyone who hires contractor's that will be entering UNCW spaces. Confined space awareness training should also be included in new employee training.

SPECIFIC REQUIREMENTS

Procedural Requirements

Identification and Classification of Confined spaces

Each supervisor shall perform a workplace risk assessment to identify confined spaces, the hazards in or around the spaces, and the potential for hazards to develop in or around the spaces. The assessment shall identify all PRCS's, along with all energy sources, moving equipment and pipe inlets which must be controlled before entering the space.

Identifying Confined Space Hazards

Each supervisor shall evaluate the hazards of a confined space before allowing employees to enter. Identify any of the following:

- **Atmospheric Hazards:** Asphyxiating, Flammable and Toxic
- **Physical Hazards:** Moving machinery, Engulfment, Falls, Electrocution, Hazardous material Noise, Burns, etc.

Non-permit Confined Spaces

A Non-permit-required confined space is a confined space that does not contain any physical or atmospheric hazards; nor is there a potential for these hazards to develop. Entry into confined spaces that do not require a permit should still be made with caution.

Persons desiring to enter a non-permit confined space shall:

1. Enter the space only under the direction of their supervisor,
2. Notify the supervisor in charge of the area where the space is located that an entry will take place,
3. Determine if there has been any changes in the use or configuration of the space that will change its classification,
4. Determine if any activities in the area could cause a hazardous atmosphere to build up in the space,
5. Not perform any activities in the space that could cause a buildup of a hazardous atmosphere, (i.e. welding, painting, or use of chemicals).
6. Never work alone.
7. Use continuous forced air ventilation for spaces that are below ground.

WARNING: Hazardous substances that are produced by activities in the general area of a confined space can migrate to and accumulate in the space creating an unseen hazard to an unsuspecting entrant.

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The potential for a hazardous atmosphere to develop requires the space to be classified as a PRCS.

Alternate Procedure Confined Space

An alternate procedure confined space is a confined space in which the only hazard is an actual or potential hazardous atmosphere, and continuous forced air ventilation alone is sufficient to maintain safe entry conditions. The control of atmospheric hazards by forced air ventilation does not eliminate the hazards. The space, therefore, cannot be considered a non-permit space. The atmosphere must be continuously monitored to verify that acceptable entry conditions are present. The entry permit is used to document that acceptable entry conditions can be maintained.

Persons desiring to enter an alternate procedure confined space shall:

1. Review the permit information and instructions.
2. Test atmosphere.
3. Ventilate space for a minimum of five (5) minutes. (See Appendix D)
4. Re-test atmosphere to confirm that acceptable entry conditions are present.
5. Enter space and check for hazards that may not have been detected.
6. Monitor atmosphere throughout entry and record results every 30 minutes.
7. **Exit the space immediately if any of the following occurs:**
 - A hazardous atmosphere is detected.
 - Any health or safety hazard is detected.
 - If entrants start to show signs of exposure to atmospheric hazards.
 - Reevaluate space and modify entry procedure before reentering.
8. When work is completed, return space to proper condition and secure opening.
9. Return entry permit to supervisor.

For entries made into manholes or vaults that will last longer than 30 minutes, the entrant should wear a body harness with a line attached.

For further guidance review the following appendixes:

- Appendix D, Confined Space Ventilation
- Appendix C, Confined Space Entry Procedures

Permit Required Confined Space (PRCS)

A permit required confined space is a confined space in which there is a physical hazard or an atmospheric hazard that cannot be controlled by continuous forced air ventilation alone. The Environmental Health & Safety Department should be contacted at 962- 3057 for assistance in evaluating hazards and developing an entry procedure that will protect the entrants.

Persons desiring to enter a PRCS shall:

1. Review permit information and instructions (Appendix H).
2. If possible, eliminate the physical hazards by:
 - o Locking out - electrical sources at switches that are remote to the space.
 - o Blanking & bleeding - pneumatic and hydraulic lines.

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- Disconnecting - mechanical linkages and belt or chain drives.
- Securing - mechanically moving parts with chains, blocks or other devices.
- Plugging - pipe inlets

If all physical hazards can be eliminated, the space can be entered as either a Alternate Procedure or Non-permit space, depending on the condition of the atmosphere.

3. Assign all entry team members a specific role to serve with detailed instructions.
4. Determine method of communication between entrants and attendant.
5. Test atmosphere.
6. Ventilate space for a minimum of five (5) minutes. (See Appendix D)
7. Retest atmosphere to confirm that acceptable entry conditions are present. Contact EH&S at 962-3057 or 910-254-5830 (emergency pager) if continuous ventilation cannot maintain acceptable entry conditions.
8. Set up non-entry rescue equipment, (tripod and host).
9. Put on body harness with line attached, (entrants only).
10. Connect body harness to line from tripod.
11. Enter space and check for hazards that may not have been detected.
12. Monitor atmosphere throughout entry and record results every 30 minutes.
13. **Exit the space immediately if any of the following occurs:**
 - A hazardous atmosphere is detected.
 - Any health or safety hazard is detected.
 - If entrants start to show signs of exposure to atmospheric hazards.

(Reevaluate space and modify entry procedure before reentering.)

14. When work is completed, return space to proper condition and secure opening.
15. Note problems encountered on the permit.
16. Return entry permit to your supervisor.

For further guidance review the following appendixes:

- Appendix D, Confined Space Ventilation
- Appendix C, Confined Space Entry Procedures
- Appendix H, Entry Permit

Permit Required Confined Space Program - Program Components

Preventing Unauthorized Entry

Supervisors shall prevent unauthorized entry into PRCS's by one or more of the following:

- Locking entry point covers or requiring special tools to open
- Training of employees
- Posting warning signs
- Providing information to contractors / visitors
- Erecting barriers

All supervisors shall assure that all PRCS's in their area are accessible only by deliberate acts, or it is very clear that only authorized personnel are allowed to enter.

Safe Entry Procedures

Supervisors shall implement the procedures needed for a safe entry into a PRCS. The entry procedure shall include, but is not limited to:

- Acceptable conditions for entry. (See Appendix E, Confined Space Atmospheric Testing)
- How to isolate the permit space.
- How to eliminate or control atmospheric hazards by purging, inerting, flushing or ventilating the permit space. (See Appendix D, Confined Space Ventilation)
- The Lock-out/Tag-out requirements.
- Personal Protective Equipment is required. (See Appendix A)
- The means of communication between entrants and attendants.
- Specific actions to be taken in case of an emergency.

The entry procedure shall be reviewed with all participants during the pre-entry briefing.

PRCS Equipment

Each department shall make available any equipment necessary for the safe entry into a PRCS; including, but not limited to:

- Testing and monitoring equipment
- Ventilation equipment
- Communications equipment,
- Personal Protective equipment (PPE)
- Lighting
- Barriers and shields
- Ladders
- Specialized tools
- Non-entry rescue and emergency equipment

All equipment shall be maintained and supervisors shall ensure that employees use the equipment properly. (See Appendix A)

Evaluation of Entry Conditions

Atmospheric testing is required to confirm acceptable entry conditions. Acceptable entry conditions shall meet the following basic requirements:

1. Oxygen (O₂) - greater than **19.5%** and less than **23.5%**,
2. Lower Flammable Limit (LFL) - less than **10%**,
3. Carbon Monoxide (CO) - less than **35 ppm**,
4. Hydrogen Sulfide (H₂S) - less than **10 ppm**.

Note: The multi-gas monitor used should automatically alarm if any of the above values are exceeded.

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If any other toxic or hazardous substance is present, or has the potential to be present, the proper monitoring equipment shall be obtained and operated by an individual who has been trained in its use.

The PRCS shall be monitored to ensure that acceptable entry conditions are being maintained throughout the entry operation. If conditions deteriorate during entry, all entrants shall exit immediately and the space reevaluated.

If acceptable entry conditions cannot be maintained with continuous forced ventilation, contact the Environmental Health & Safety Department 962-3057.

Appendix E, Confined Space Atmospheric Testing shall be followed and a copy shall be present at the job site during entry.

PRCS Attendants

An attendant shall be provided outside the PRCS to monitor the entrants for the duration of entry operations. The attendant shall be trained in confined space entries and instructed in his duties listed in Appendix F, Duties of PRCS Entry Team Members

Monitoring Multiple Spaces

It is not recommended that an attendant be responsible for monitoring more than one space at a time. However, it is allowed by the regulations if there is a way for the attendant to respond to an emergency in one or more of the spaces while still monitoring the other spaces. A radio, pull rope, whistle, horn, or some other means of communication must be set up for each space to notify the attendant of a problem. If an emergency, or any other situation arises that would require the full attention of the attendant, the attendant shall instruct the entrants of all spaces to exit immediately.

Designation of Roles

All employees participating in a PRCS entry shall be assigned one of the following specific roles to fulfill:

- Entrant
- Attendant
- Entry Supervisor (May also be an entrant.)

The duties required for each role are listed in Appendix E, Duties of PRCS Entry Team Members.

Rescue and Emergency Services Procedure

Under no circumstances shall unauthorized personnel enter a confined space to attempt a rescue. At the present time there are no University employees authorized to perform confined space rescues.

The Wilmington Fire Department (WFD) has the Hazardous Materials and Technical Rescue teams that are needed for a confined space rescue. New Hanover County Emergency Medical Services (EMS) is responsible for providing emergency medical treatment.

In case of an emergency:

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- Call 911
- Contact **UNCW Campus Police** by one of the following methods:
 1. Radio - declare an emergency and instruct the UNCW Police (or anyone near a phone) to call - **(911)**
 2. Campus Phone - **(2222)**
 3. Blue light call box - push call button
- Call EH&S Emergency Pager: 910-254-5830

University employees shall facilitate **non-entry** rescue by using retrieval systems and methods whenever entry into a PRCS is required, unless the retrieval equipment would increase the overall risk of the entry or would not contribute to the rescue of the entrant.

A retrieval system should consist of a chest or full body harness with a retrieval line attached at the center of the entrant's back near shoulder level, or above the entrant's head. The other end of the retrieval line shall be attached to a mechanical device or fixed point outside the permit space in such a manner that rescue can begin as soon as the attendant becomes aware that a rescue is necessary. For vertical spaces that are more than five (5) feet deep, a mechanical device (tripod with a hoist), shall be available to retrieve personnel. In spaces where the entrant is not able to have a revival line attached, a full body harness should still be worn.

If an entrant is exposed to a substance that is required to have a Material Safety Data Sheet (MSDS), that information shall be available to the EMS personnel treating the entrant.

Written Permit System

Each supervisor shall document the completion of preparation needed for a safe permit space entry by preparing an entry permit. The permit shall include the following:

- acceptable entry conditions;
- procedures needed to isolate the permit space;
- steps necessary to control atmospheric hazards;
- barriers needed to protect entrants from external hazards; and
- steps necessary to ensure acceptable enter conditions are present throughout the entry;

The entry supervisor shall sign the permit to authorize entry. The completed permit shall be reviewed with all authorized entrants and posted at the site of entry. The duration of the permit shall not exceed the time required to complete the assigned task. The entry supervisor shall terminate the entry and cancel the permit when:

- the task listed on the permit has been completed; or
- a condition that is not allowed under the permit arises in or near the space.

Each canceled entry permit shall be kept on file for 1 year to facilitate the annual PRCS program review. Comments concerning problems with entry operations should be noted on the permit so that entry procedures can be evaluated and revised if necessary.

Coordinating Entry Operations

When employees of more than one employer are working in or near the same PRCS, entry operations shall be coordinated through the University's Project Manager so employees of one employer do not endanger the employees of another employer.

Contractors are responsible for having their own PRCS program for their employees and shall be informed of any University specific safety information, such as how to contact UNCW EH&S Department. A copy of the contractor's PRCS program shall be kept on file by the University's project manager.

All contractors shall be informed of any known hazards and/or past experiences that University employees may have had with the PRCS that is to be entered. At the conclusion of a contractor's entry operations, the University's Project Manager shall debrief the contractor regarding the entry procedures that were used and if the contractor encountered any hazards that were not known or if any hazards were created during entry.

Concluding Entry Operations

Once the entry is completed, verify that all entrants have left the space and that all equipment and supplies are accounted for. Check any gaskets or seals for damage and secure all openings. Use the PRCS Entry Permit to identify any locked-out/tagged-out or isolated equipment and return it to its normal operating condition. Clean and inspect all entry equipment. Any items that were damaged during entry should be removed from service and repaired or replaced. Return equipment to its proper storage place.

Make notes on the PRCS Entry Permit concerning any problems encountered during entry, or suggestions that would improve the PRCS Entry Program. Close and properly file the entry permit. Completed permits must be kept for one year and used to evaluate the PRCS Entry Program.

Review of Entry Operations

Supervisors shall review entry operations when there is reason to believe that the measures taken are not sufficient to protect employees. Examples of circumstances requiring the review of entry operations include:

- an unauthorized entry into a PRCS
- the detection of a hazard not covered by the permit
- the detection of a condition that is prohibited by the permit
- the occurrence of an injury or near-miss during entry
- a change in the use or configuration of a space
- employee complaints about the effectiveness of the program

Environmental Health & Safety should be contacted to assist with the review.

Program Review

Annual Program Audit

The PRCS Program shall be reviewed annually by examining the canceled permits to ensure that employees participating in entry operations are protected from permit space hazards. Alternate entry certifications should also be reviewed.

Contractor PRCS entries

If an outside contractor is hired to work in a PRCS, it is the University's responsibility as a host employer to ensure that the contractor has a written PRCS program, uses an entry permit, and uses only workers that have been trained in PRCS operations. As a means to determine this, the contractor shall complete Appendix B, Contractor's PRCS Program Affirmation, and return it to the project manager.

The project manager shall ensure that the contractor is:

- informed in writing of the hazards that have been identified in/or near the space,
- informed of any past experiences that University employees may have had in the space,
- informed of any University safety procedures that are in place for the space,
- debriefed afterwards as to the PRCS program followed and any hazards that were encountered or created in the space during entry.



Confined Space Program Appendices

Appendix A

Basic Confined Space Entry Equipment

Equipment should include, but is not limited to:

- Personal Protective Equipment (PPE): safety glasses, hard hats, ear plugs, etc.
- Manhole hook
- Manhole barricade
- Traffic cones
- Safety signage
- Multi-gas monitor
- Ladder
- Lights
- Fire extinguisher
- Ventilating fan (with power source)
- First-aid Kit

Permit-required Entries

Additional Equipment Required for PRCS:

- Body harness
- Safety ropes
- Non-entry rescue equipment (tri-pod/ hoist)
- Communication Equipment (for entrants and attendants or to contact rescue services)
- Entry permit and procedures



Confined Space Program Appendices

Appendix B

Contractor’s Permit-Required Confined Space Program Affirmation

To be completed by the contractor and returned to the UNCW’s Project Manager.

_____ hereby affirms the following in regards to the

(Name of company/ contractor)

_____ project scheduled to start on _____.

(Project name or number)

(Date)

The contractor has a written Permit Required Confined Space (PRCS) program that includes the following:	Yes	No
1. Procedures for safe PRCS entry operations.		
2. Means of specifying acceptable entry conditions.		
3. Procedures for isolating the PRCS.		
4. Procedures for eliminating or controlling atmospheric hazards. (blower and duct)		
5. Means of providing barriers as necessary to protect from external hazards.		
6. Means of verifying acceptable conditions throughout entry operations.		

The contractor will use and Entry Permit that documents compliance with OSHA Regulations and identifies the following:	Yes	No
1. The permit space to be entered		
2. The purpose of the entry		
3. The date and duration of the entry permit		
4. The names of entrants, attendants and entry supervisor		
5. The hazards of the PRCS to be entered		
6. The means of isolate the PRCS and controlling the hazards		
7. The acceptable entry conditions		
8. The results of initial and periodic atmospheric testing		

9 The means of summoning Rescue Services in an emergency		
10. The communication procedures used between entrants and attendants (radio, cell phone)		
11. Equipment needed such as PPE, atmospheric testing, rescue devices, tools, etc.		
12. Any other information needed to ensure employee safety		
13. Any additional permits needed, such as hot work permit etc.		

The contractor will use only the employees or subcontractors that have current training in PRCS entry operations, rescue procedures and use of monitoring equipment.		
The contractor will provide a copy of the Entry Permit to the University's project manager.		
The contractor will provide information to the University's Project Manager regarding hazards that were encountered or created during entry.		

Comments: _____

Contractor's Signature Date

Reviewed by: (UNCW Project Manger) Date



Confined Space Program Appendices

Appendix C

Confined Space Entry Procedures

Non-Permit Entry

For spaces that do not have a physical or atmospheric hazard and do not have the potential to develop a physical or atmospheric hazards

1. Enter space only under the direction of your supervisor.
2. Notify the supervisor in charge of the area where the place is located that an entry will take place.
3. Determine if there have been any changes in the use or configuration of the space that could change its classification as a Non-permit space.
4. Determine if any activities in the area could cause a hazardous atmosphere to build up in the space.
5. Do not perform any activities in the space that could cause a buildup of a hazardous atmosphere. (i.e. welding, painting, or use of chemicals)
6. Never work alone.

Permit Entries

Preparation

1. Determine if entry into the space is necessary.
2. Review available information on the space. (Confined Space Database)
3. Identify possible hazards and control measures.
4. Perform initial atmospheric testing. ([Appendix E](#))
5. Determine if work to be carried out could create a hazard in the space.
6. Determine which Entry Level is required. (Alternate Procedure or Permit Required)
7. Identify equipment and PPE needed for entry.
8. Document entry plan by completing a Confined Space Entry Permit
9. Assemble all equipment.
10. Erect barriers around opening if necessary.
11. Provide traffic control if necessary.

Alternate Procedure Entry

For spaces that have only atmospheric hazards that can be *controlled* by continuous ventilation.

1. Review-permit information and instructions.
2. Perform pre-entry atmospheric testing. Record results on Permit.
3. Ventilate space for a minimum of 5 minutes. ([Appendix D](#))

4. Re-test atmosphere to confirm that acceptable entry conditions are present.
5. Enter space and check for hazards that may have not been detected.
6. Monitor atmosphere throughout the entry and record results every 30 minutes.
7. **Exit the space immediately if any of the following occurs:**
 - A hazardous atmosphere is detected.
 - Any health or safety hazard is detected.
 - If entrants start to show signs of exposure to atmospheric hazards.
 - Re-evaluate space and/or modify entry procedure before re-entering.
8. When work is completed, return space to proper condition and secure opening.
9. Return Entry Permit to supervisor to be filed.

Permit Required

For spaces that have physical hazards or an atmospheric hazard that cannot be controlled with continuous ventilation.

1. Review the permit information and instructions.
2. If possible, eliminate physical hazards by:
 - **Locking out** - electrical sources at switches that are remote to the space.
 - **Blanking & bleeding** - off pneumatic and hydraulic lines.
 - **Disconnecting** - belt and chain drives and mechanical linkages.
 - **Securing** - mechanically moving parts with chains, blocks, or other devices.

Note: If the physical hazard can be eliminated, the space can be entered as a Non-permit or Level 1 Entry, depending on the atmospheric conditions. If the physical hazard cannot be eliminated, notify EH&S for assistance in developing an entry procedure that will protect the entrants.

3. Assign all entry team members a specific role to serve with detailed instructions.
4. Determine method of communication between entrants and attendant.
5. Test atmosphere to identify all possible hazards. Note: Specialized monitoring equipment and/or training may be required. ([Appendix E](#))
6. **Ventilate** the space for a minimum of **5 minutes**. ([Appendix D](#))
7. Retest atmosphere to confirm that acceptable entry conditions are present. If continuous ventilation cannot maintain acceptable entry conditions.
8. Set up non-entry rescue equipment, (tripod and host)
9. Put on body harness, (entrants).
10. Connect body harness to line from tripod.
11. Enter space and check for hazards that may have not been detected.
12. Monitor atmosphere throughout the entry and record results every 30 minutes.
13. **Exit the space immediately if any of the following occurs:**
 - A hazardous atmosphere is detected.
 - Any health or safety hazard is detected.
 - If entrants start to show signs of exposure to atmospheric hazards.
 - Re-evaluate space and/or modify entry procedure before re-entering.
14. When work is completed, return space to proper condition and secure opening.
15. Return Entry Permit to supervisor to be filed.



Confined Space Program Appendices

Appendix D

Confined Space Ventilation

Continuously moving fresh, uncontaminated air through a confined space is the most effective means of controlling an atmospheric hazard. Ventilation dilutes and displaces air contaminants, assures that an adequate oxygen supply is maintained during entry, and exhausts contaminants created by entry activities such as welding, oxygen-fuel cutting, or abrasive blasting.

Before entering a confined space, members of the entry team must have watched the *Confined Space Ventilation* training video and reviewed the handbook that goes with it. Subjects covered in this training include:

- Local exhaust vs general ventilation,
- Exhaust ventilation vs supply ventilation,
- Ventilation safety,
- Effective ventilation:
 - Avoiding recirculation and short-circuiting,
 - Use of duct work,
 - Fan placement for different space shapes.

The *Confined Space Ventilation* training video is available from the EH&S Dept. by calling 910-962-3057 or (pager) 910-254-5830.

In general, ventilation should produce approximately **10 air exchanges per hour**. The amount of time required for one exchange can be determined by dividing the volume of the space by the flow rate of the fan, (flow rate is stated on the fan's label).

Procedure

1. Select a fan with enough capacity to quickly replace the volume of air in the space.
2. Use only fans in good working order. (No frayed wires)
3. Observe safety and warning labels on fan.
4. Position fan where it will take in clean, fresh air. Be very careful about automobile and generator exhaust fumes.
5. Use a flexible duct to deliver air into all areas of the space. (Generally, the duct must be at least **3 feet** into the space.)
6. Ventilate for a minimum of **5 minutes** before verifying acceptable entry conditions are present and entering.
7. Continue to ventilate throughout the entry operation.
8. Contact EH&S if ventilation does not achieve acceptable entry conditions.



Confined Space Program Appendices

Appendix E

Confined Space Atmospheric Testing

Atmospheric testing is necessary to evaluate airborne hazards present in the permit space, and to verify that acceptable entry conditions are present.

1. **Evaluation**

Initial evaluation of the atmosphere of a confined space should be analyzed with a EH&S approved instrument that is sensitive enough and designed to evaluate any hazardous atmospheres that may exist or arise. The results of the atmospheric testing will have a direct impact on the:

- Development of the entry procedure,
- Selection of PPE,
- Duration of worker exposure, or
- Whether an entry will be made at all.

The Environmental Health and Safety office should be called for assistance with the evaluation and interpretation of the data, and the development of the entry procedure.

2. **Verification**

Prior to entry, a PRCS which may contain a hazardous atmosphere shall be tested for residues of all contaminants identified by the evaluation testing using an instrument specified in the entry permit. Results of testing shall be recorded on the entry permit and compared to the acceptable entry conditions. If testing reveals oxygen deficiency or the presence of toxic gases or vapors, the space must be ventilated or purged and retested before entry. The atmosphere shall be tested continuously during entry operations.

3. **Measurement duration**

The measurement of each atmospheric parameter shall be made for at least the minimum response time of the test instrument specified by the manufacturer. It is recommended that the measurement be made for twice (**2x**) the response time.

4. **Stratified atmospheres**

The density of gases and vapors will cause them to be:

- Heavier than air, and settle to the bottom of a space, (hydrogen sulfide),
- Lighter than air, and concentrate at the top of the space, (methane), or
- The same as air, and accumulate in the center, (carbon monoxide).

When monitoring for entries involving a descent into atmospheres that may be stratified, the space should be tested every four feet (**4 ft.**) in the direction of travel and to each side. The entrant's rate of progress should be slowed to allow for sampling and detector response.

5. **Order of testing**

When using an atmospheric testing instrument that requires the manual selection of test parameters, the order of testing **MUST** be:

- **Oxygen** – most combustible gas meters require a specific amount of oxygen, (min 20.8%), to be present in order to give a correct reading for flammable/explosive gases.
- **Flammable/Explosive gases** – are tested next because they represent more of an immediate and life threatening hazard, in most cases, than toxic gases or vapors.
- **Toxic gases or vapors**

Testing Procedure

1. Appoint a person to act as air monitor that has completed confined space training as well as training in the proper use of the monitoring equipment.
2. Check out a Multi-Gas Monitor that has been **calibrated** within the past **month**. A copy of the manufacturer's operating instructions shall accompany the equipment. (May be in abbreviated form.)
3. In a clean atmosphere, perform equipment check-out procedure or operational check as stated in the operating instructions.
4. If possible, draw an air sample through a hole leading to the space before opening the entry port. Otherwise, open the entry port and start sampling every **4 feet** in the direction of travel and from side to side. It is recommended that the sampling time be twice (**2 x**) the **response time** of the equipment.
5. Test atmosphere parameters in the following order:
 1. Oxygen
 2. Flammability
 3. Toxic
6. Compare sampling results to the following **acceptable entry conditions**:

Oxygen (O ₂)	Greater than 19.5% and less than 23.5%
Flammability	Less than 10% of Lower Flammable Limit (LFL)
Carbon Monoxide (CO)	Less than 35 ppm
Hydrogen Sulfide (H ₂ S)	Less than 10 ppm
Other substances	Less than Permissible Exposure Limit (PEL)

Note: The Industrial Scientific monitors will sound an alarm if these levels are exceeded. **Exit the space immediately if the monitor sounds an alarm.**

7. Record sampling results on the entry form.
8. It is recommended that the following readings be taken.
 1. Before ventilation,
 2. After ventilation,
 3. Initial entry survey, and
 4. Monitored continuously thereafter.
(Record readings every 30 minutes.)
9. Contact the Environmental Health and Safety Department at 910-962-3057 if atmospheric hazards cannot be corrected with continuous forced ventilation.



Confined Space Program Appendices

Appendix F

Duties of PRCS Entry Team Members

Entering Permit Required Confines Spaces, (PRCS) takes team work. Everyone on a PRCS entry team shall be assigned to one of the specific roles listed below. Anyone not fulfilling one of these roles shall not be allowed in the work area.

Entrants (Must be authorized on entry permit or roster.)

1. Know the hazards that may be encountered during entry.
2. Are able to recognize the signs and symptoms of exposure to possible atmospheric hazards.
3. Understand the consequences of exposure to contaminates.
4. Use equipment properly.
5. Stay in contact with the attendant.
6. Alert the attendant of hazards.
7. Exit the space quickly if when required.

Attendant

1. Knows possible hazards.
2. Is able to recognize the signs and symptoms of exposure to possible atmospheric hazards.
3. Maintains an accountability of entrants in the space.
4. Remains outside the permit space during entry.
5. Stays in contact with entrants.
6. Monitors activities inside and outside the space for safety.
7. Orders immediate evacuation of the space in case of any of the following:
 - Detection of a prohibited condition;
 - Detection of behavioral changes in entrants;
 - Detection of a hazards outside of the space;
 - If the attendant cannot effectively and safely perform all of his duties.
8. Summons rescue and other emergency services as soon as the need is detected;
9. Prevents unauthorized entry into the space as well as the work area outside;
10. Performs non-entry rescue if needed;
11. Performs no other duties that might interfere with his ability to monitor and protect the entrants.

Entry Supervisor (May also serve as an entrant or attendant)

1. Knows the hazards that may be encountered during entry;
2. Verifies that all tests have been conducted and that all procedures and equipment needed are in place before endorsing the permit and allowing entry to begin.
3. Verifies that the means of summoning rescue services are known by everyone;
4. Removes unauthorized individuals who enter the space or work area.

5. Determines that entry operations remain consistent with the entry permit and that acceptable entry conditions are maintained.
6. Terminates the entry and cancels the permit when the job is finished or otherwise required.



Confined Space Program Appendices

Appendix G

Identified Confined Spaces

Area of Concern	Permit Required?
Attics	No
Boilers	Yes
CMS AHU Exhaust	Yes
Crawlspace	No
Dobo AHU Exhaust	Yes
Ducts/ AHU - with hot work	Yes
Ducts/ AHU - with no hot work	No
Electrical Vaults	No
Elevator Sumps	No
Excavations	No
Lift Stations	Yes
Manholes - Sanitary Sewer	Yes
Manholes - Storm water	Yes
Natatorium Surge Tank	Yes
Seawater Tanks	Yes
Sports Med Whirlpool	No
Tanks	Yes

Telcom Vaults	No
Water Fountain Vaults	No
Water Tower (neck up)	No



Confined Space Program Appendices

Appendix H

Confined Space Permit *(continued next page)*

UNCW Confined Space Entry Permit

Entry Permit No. _____

Entry Permit action	Date / Times	<i>Follow company procedure for final disposition of this document</i>	Rescues and Emergencies	
Start			<input type="checkbox"/> Call 911 or 962-2222 (UPD) for emergencies	911 or 962-2222 (UPD)
Auto-Expiration			<input type="checkbox"/> Call 341-1024 to advise WFD of entry	
Cancellation with <i>Entry Supervisor initials</i>			<input type="checkbox"/> Call or page EH&S 962-3057 or 254-5830	

Confined Space Information	Space Name: _____	Entry Information:	Phone: _____
Building:		Purpose of entry:	
Room:	Type Space:	Attendant(s):	
Description:		Authorized Entrant(s):	

Hazards of Space & Entry Previous content: _____ Hot work: Type _____ Inside space

Potential Hazards	Contributor/Source	Potential Hazards (Cont.)	Contributor/Source
<input type="checkbox"/> Engulfment <input type="checkbox"/> Entrapment Atmospheric <input type="checkbox"/> O ₂ Deficiency/Enrichment <input type="checkbox"/> Flammable <input type="checkbox"/> Toxic <input type="checkbox"/> Dust/Fibers Materials <input type="checkbox"/> Flammable <input type="checkbox"/> Corrosive / Reactive <input type="checkbox"/> Radioactive / Biological <input type="checkbox"/> Sludge / Residue		Physical / Configuration <input type="checkbox"/> Poor Lighting / Communication <input type="checkbox"/> Weather <input type="checkbox"/> Noise <input type="checkbox"/> Hot / Cold; Surf / Environment <input type="checkbox"/> Slip / Trip <input type="checkbox"/> Protrusions / Sharp objects <input type="checkbox"/> Working at heights <input type="checkbox"/> Falling objects <input type="checkbox"/> Electricshock <input type="checkbox"/> Equip. start-up / Mechanical action <input type="checkbox"/> High pressure gas <input type="checkbox"/> Restricted movement	

Atmospheric Conditions	Time	Canc.	Canc.	Canc.	Test by:	Additional Atmospheric Monitoring Requirements	Details
Parameter	Limits						
Oxygen	19.5-23.5%					<input type="checkbox"/> Continuous <input type="checkbox"/> Periodic, _____ <input type="checkbox"/> If ventilation changes <input type="checkbox"/> Re-entry, each <input type="checkbox"/> If change suspected	
LFL	10%						
CO	+ 35 ppm						
H ₂ S	+ 1 ppm / * 5 ppm						
SO ₂	+ 2 ppm / * 5 ppm						
Ammonia	* 35 ppm						
* Short-term exposure limit: Employee can work in the area up to 15 minutes					+ 8 hr. TWTA: Employee can work in area 8 hrs. (longer with resp. protection)		Comments:

Hazard Controls / PPE

Ventilation <input type="checkbox"/> Mechanical temporary <input type="checkbox"/> Electric <input type="checkbox"/> Engine / Fuel <input type="checkbox"/> Natural <input type="checkbox"/> Fixed ventilation <input type="checkbox"/> _____	Respiratory Protection <input type="checkbox"/> Cartridge _____ <input type="checkbox"/> Half-face (NPR) <input type="checkbox"/> Full-face (NPR/PAPR) <input type="checkbox"/> SCBA <input type="checkbox"/> Airline (SAR) <input type="checkbox"/> Dust mask	Lighting <input type="checkbox"/> Portable light, area <input type="checkbox"/> Permanent light <input type="checkbox"/> Natural light <input type="checkbox"/> Flashlight <input type="checkbox"/> Lightstick, corded	Other PPE <input type="checkbox"/> Garment, _____ <input type="checkbox"/> Natural light
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Entry / Exit <input type="checkbox"/> Access ladder <input type="checkbox"/> Body harness / Entry tripod <input type="checkbox"/> Raised platform <input type="checkbox"/> Barriers <input type="checkbox"/> Pre-task briefing	Isolation / LOTO <input type="checkbox"/> Electrical <input type="checkbox"/> Pneumatic <input type="checkbox"/> Mechanical <input type="checkbox"/> Hydraulic	Other Entry Requirements:
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CS Classification	OSHA Standard	Entry Classification	
<input type="checkbox"/> Permit Space	1910.146	<input type="checkbox"/> PRCS entry	
<input type="checkbox"/> Non-Permit Space	1910.146	<input type="checkbox"/> NPS entry	
<input type="checkbox"/> Manhole	1910.268	<input type="checkbox"/> CSS entry	
<input type="checkbox"/> Construction Site Space	1926	<input type="checkbox"/> _____	
<input type="checkbox"/> Boiler	1910		
<input type="checkbox"/> _____			

Other OSHA Standards Applied to Entry:

29 CFR 1910.147 Lock-out/Tag-out 29 CFR 1910.134 Respiratory Protection 29 CFR 1910.252 Welding

Safety Signature (if applicable): _____

Name / Phone: _____ Entry Supervisor Name(s) / Phone: _____