Permit-Required Confined Space Program

DARTMOUTH

EHS Approved By:	*Annette Chism, Sr. Director*	**Revision Date:**	03/01/25
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Section 1 - Scope

This program includes all aspects of a Permit-Required Confined Space (PRCS) Program as described in 29 CFR 1910.146, including: identification and classification of spaces, monitoring and evaluation, control of hazards, posting of spaces, training of employees, responsibilities and duties, emergency procedures, contractor requirements, and review of program.

Section 2 - Purpose

The PRCS Program is developed to protect Dartmouth College employees and to inform contractors who are required to enter PRCS during their work.

The purpose of the program is to identify and create awareness of the various PRCS at Dartmouth. A complete understanding of PRCS hazard identification, evaluation, and control measures is required for employees and contractors who may enter a PRCS.

The program is intended to fulfill the requirements of the Permit-Required Confined Space Standard set forth by the Occupational Safety and Health Administration (OSHA) in 29 CFR 1910.146.

The program shall be used in conjunction with other Dartmouth Safety Programs. Associated safe work practices include, but are not limited to, personal protective equipment, the handling of hazardous materials, the isolation of energy sources, and special work permits.

Section 3 - Definitions

Definitions are provided in **Appendix A**.

Section 4 - Roles and Responsibilities

The PRCS Program roles and responsibilities are identified and delineated in this section. The duties and responsibilities of entrants, attendants, supervisors, and other groups at Dartmouth play an important role in supporting the successful implementation and maintenance of this program. The success of the entire PRCS Program relies on and charges Dartmouth employees to adhere to, follow, and provide full support of this Program.

4.1 Environmental Health and Safety (EHS)

- Develop, implement, and maintain an OSHA-compliant PRCS Program.
- Review and audit the Program elements annually and revise as needed.
- Provide expert technical guidance to support safe entry into PRCS.
- Provide technical guidance on the selection of personal protective and entry equipment.
- Update and amend the Program and PRCS inventory as new spaces are identified and/or classified.

- Coordinate the PRCS training with entrants, attendants, supervisors, and others.
- Annually, coordinate with the Hanover Fire Department for emergency response training drills.
- Provide technical expertise and assistance in air monitoring, as needed.
- Maintain and review closed PRCS permits monthly.
- Maintain training records.
- Review the PRCS Program annually for hazards, injuries, "near misses," changes in use or configuration of a PRCS, and employee complaints about the effectiveness of the Program and amend the Program when necessary.

4.2 Facility Managers, Department Heads, and/or Supervisors

- Provide management commitment and operations support for the successful implementation and maintenance of the PRCS Program.
- Implement the PRCS Program and provide needed tools for adherence to the Program.
- Ensure employee participation in PRCS training.
- Ensure employees (PRCS entrants, supervisors, and attendants) participate in Lock Out/Tag Out training.
    - If the employee(s) have not received Lock Out/Tag Out training in the past year, training is required prior to the employee entering a PRCS.

4.3 Dartmouth Departments, Professional Schools, or Others Performing PRCS Entry

- Provide a list of potential entrants, supervisors, and attendants to EHS so training may be scheduled and provided.
- Maintain all required entry equipment and calibration equipment in working order.
- Maintain equipment calibration records.
- Engage with EHS to identify and assess suspected confined spaces, and/or PRCS.
- Inform employees when changes in the configuration of a particular space occur.
- If Dartmouth employees shall enter the space with contracted employees, the Dartmouth supervisor or project manager shall ensure entry operations are coordinated with the contractor or designee to ensure that:
    - All entrants of both employers can be accounted for during the entry.
    - The work of one employer does not endanger the employees of the second employer.
    - There is a properly trained attendant in place whenever employees of either employer have entered the PRCS.
    - Temporary hazards are eliminated, and the supervisor is apprised of new permanent hazards.

4.4 Project Managers/Personnel Who Hire External Contractors

- Shall attend PRCS Awareness training.
- Ensure contractors have their own PRCS Program and equipment while working on Dartmouth-owned properties, and they comply with the requirements of CFR 1910.146 and 1926.1201, as applicable.

- Inform the contract personnel of the work area(s) that contain PRCS on the construction site and the known hazards within or around the PRCS.
- Coordinate entry operations with contract personnel when both Dartmouth and contract personnel will work in a PRCS simultaneously.
- Verify contractors have been properly trained, briefed, and have met all requirements for compliance with PRCS OSHA regulations.
- Receive a copy of the contractor's closed entry permits and provide the permits to EHS monthly.

4.5 Entry Supervisor

- Shall attend PRCS training prior to assuming entry supervisor duties.
- Know the hazards authorized entrants may face during entry, including information on the mode, signs or symptoms, and consequences of exposure.
- Verify rescue services (Hanover Fire Department) are available and the means for summoning them are operable.
- Inform authorized entrants and attendants of the potential hazards associated with entering each space.
- Ensure air monitoring equipment is in proper working order, is calibrated (if required), and is maintained and functioning according to the manufacturer's specifications.
- Verify all tests have been conducted and all procedures and equipment are in place before endorsing the entry permit and allowing entry to begin.
- Determine and provide all necessary safety equipment.
- Ensure the PRCS entry permit is properly completed, and all other requirements are met.
- Ensure the PRCS entry permit is posted at the PRCS and made available to all people involved in the PRCS entry.
- Terminate entry and cancel permits when entry operations are completed or when a condition that is not allowed under the entry permit arises in or near the PRCS.
- Request unauthorized individuals who enter or attempt to enter the PRCS during entry operations that the area is 'off limits' and they must move on. If a conflict arises, contact the Department of Safety and Security at 603-646-4000.
- Check that the entry operations are consistent with those outlined in the PRCS entry plan.
- Submit to EHS Hot Work Permits, if applicable, monthly.
- Submit to EHS the PRCS entry permits monthly.

4.6 Attendant(s)

- **NEVER ENTER THE PRCS!**
- Shall attend PRCS training prior to assuming attendant duties.
- **Remain outside the PRCS** during operation until relieved by another attendant.
- Know the hazards authorized entrants may face during entry, including information on the mode, signs or symptoms, and consequences of exposure.
- Prior to authorized entrant entry into the PRCS, test the atmosphere and ensure the required conditions are met.
- Be aware of possible behavioral effects of hazard exposure in authorized entrants.

- Maintain a continuous count of authorized entrants.
- Track and always communicate with authorized entrants.
- Keep unauthorized people from entering the PRCS.
- Conduct intermittent atmospheric testing and record the results on the entry permit.
- Monitor activities inside and outside the PRCS to determine if it is safe for entrants to remain in the space.
- **NOT** perform other duties that may interfere with attendant duties to monitor and protect the safety of authorized entrants.
- Order exit from PRCS. Examples of instances requiring exit include:
    - Prohibited condition in PRCS.
    - Behavioral effects of hazard exposure in an authorized entrant.
    - A situation outside the space that could endanger the authorized entrants.
    - The attendant cannot effectively and safely perform all attendant duties.
    - Summon rescuers if necessary.
    - Only perform **non-entry rescue**. **NEVER ENTER THE PRCS!**
    - Determine if the entrant requires assistance to escape the PRCS and, if necessary, summon rescue services, the Hanover Fire Department, **911**.

4.7 Authorized Entrant(s)

- Shall attend PRCS training prior to assuming authorized entrant duties.
- Understand all the hazards associated with working in the identified space, including information on the mode, signs or symptoms, and consequences of exposure.
- Be trained in the proper use of personal protective equipment and equipment necessary for testing of and safe entry into the PRCS.
- Wear and utilize the proper safety equipment, including PPE, as required by the task.
- Inspect the winch, tripod, and any other entry equipment for defects or damage prior to entry. If defects or damage are found, **DO NOT USE**.
- Utilize appropriate methods of hazard control, including lockout/tagout, hot work permits, and ventilating a hazardous atmosphere.
- Maintain constant communication with the attendant.
- Alert attendants when a warning symptom or other hazardous condition exists.
- Exit the PRCS whenever:
    - An order to evacuate is given by the attendant or the entry supervisor.
    - The entrant recognizes any warning signs or symptoms of exposure to a dangerous situation.
    - The entrant detects a prohibited condition.
    - An evacuation alarm is activated.

4.8 Contractors

Contractors shall always comply with OSHA 29 CFR 1910.146 requirements.

- When contractors are to perform work that involves PRCS entry at Dartmouth, the following duties must be performed:
    - Obtain, from Dartmouth personnel (project manager, facilities operations and

management, or professional school facility manager), any available information regarding the PRCS hazards and entry operations.
    - Coordinate entry operations with Dartmouth when both Dartmouth and the contractor are working in or near a PRCS.
- The contractor or its designee shall notify the Dartmouth supervisor/project manager responsible prior to entry.
    - The Dartmouth supervisor or project manager shall notify any employees near or affected by the entry.
- The contractor or designee shall meet with the responsible Dartmouth supervisor or project manager after completion of the entry to provide notification of:
    - Any new permanent hazards created by the work, and/or
    - Any unidentified hazards encountered during the entry.
- The contractor will provide the closed PRCS entry permit to the Dartmouth project manager, facilities operations and management, or professional school facility manager.
- Contractors must use their own equipment, including safety apparatus and air monitors.

4.9 Rescue Operations Provider

If an emergency arises that requires a rescue team, the **Hanover Fire Department** is to be contacted by calling **911**. The caller should state that an incident has occurred in a PRCS to ensure the rescue team is dispatched immediately. The caller should also provide:

- The address of the incident.
- Number of people trapped or injured.
- Types of injuries.
- Their contact number.
- Hazardous conditions that could result in injury or death to anyone entering the space for rescue.

Section 5 - Employee Training

All employees involved with PRCS work must be trained to ensure their knowledge, understanding, and skills are necessary for the safe performance of their duties. Training describes the necessary measures and precautions that must be taken when working around confined spaces and PRCS. Employee training records showing the training date, employee attendance, and the name and signature of the instructor(s) will be maintained by EHS.

5.1 Training Includes

The PRCS training must include the following (but is not limited to):

- Definition of a confined space.
- Definition of a PRCS.
- Dartmouth's PRCS Program.
- Hazard recognition and control.
- Procedures for atmospheric monitoring.
- Safe work practices.

- Duties of an entrant, attendant, and supervisor.
- The PRCS entry permit.
- Emergency and rescue procedures.
- Maintenance, calibration, and use of air monitors.
- Depending on the PRCS, additional training may be required. Additional training may include hazard communication, hot work, fire extinguisher, and CPR.

5.2 Training Frequency Initial/Re-training

Initial training is required for each employee involved in PRCS operations before they are assigned to any PRCS duties. Annual refresher training is required for employees who enter a PRCS.

Supervisors are responsible for ensuring employees attend PRCS re-training whenever one of the following situations occurs:

- Whenever there is a modification to the PRCS, entry procedures, or employee duties.
- If a review finds inadequacies in the PRCS Program, all affected employees will be informed of any changes.
- There is a change in PRCS operations that presents a hazard for which an employee has not been previously trained.
- If the employer has reason to believe that proper PRCS entry procedures are not being followed.
- A supervisor has reason to believe an employee's knowledge or use of these procedures and plans is inadequate.
- If changes in the OSHA Standard occur.
- Specific training on monitoring equipment will be conducted, as necessary.

Section 6 - Identification and Evaluation of Confined Space and PRCS

EHS has identified many confined spaces and PRCS on the Dartmouth campus. These spaces have an identification number assigned to each space. Employees who encounter a space that is not currently identified as a confined space or PRCS, but the employee believes it meets the definition of one, must notify EHS immediately for assessment. EHS will complete the Confined Space Assessment Form (**Appendix B**) and will make recommendations for the next steps depending on the outcome of the assessment.

A PRCS must meet the definition of a confined space before it can be classified as a PRCS.

6.1 Confined Spaces

Confined spaces are:

- Spaces that are large enough and so configured that an employee can bodily enter and perform assigned work.
- It has limited or restricted means for entry or exit.
- Not designated for continuous occupancy.

Spaces that are classified as confined spaces do not require the use of an entry permit. Examples of confined spaces that are not PRCS include, but are not limited to:

- Steam tunnels.
- Most crawl spaces.
- Interstitial spaces.
- Most attics.
- I.T. closets.

It is important to recognize a confined space that does not contain or have the potential to contain any hazard capable of causing death or serious physical harm. Confined spaces may become PRCS if the work process within the space creates a hazard or if conditions change within the space. All confined spaces on campus should be treated with care and caution for this reason.

6.2 Permit-Required Confined Spaces (PRCS)

PRCS meet the definition of a confined space but also have one or more of the following characteristics:

- Contains or has the potential to contain a hazardous atmosphere.
- Contains a material that has the potential to engulf an entrant.
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or
- Contains any other recognized serious safety or health hazard.

PRCS are labeled to alert employees of the hazards within the PRCS. Additional markings shall inform and direct the employee as to how the space may be entered, lock out/tag out requirements, as well as the danger present. Examples of PRCS include, but are not limited to:

- Steam manholes
- HVAC equipment
- Large tanks
- Some attics
- Some sumps

6.3 Identification of New Space and Re-Evaluation

Contact EHS whenever a confined space is changed, created, modified, or permanently changed to a PRCS. Temporary changes do not require contacting EHS unless there is a question or concern regarding the method for entry or permit changes.

6.4 PRCS Signage

PRCS are posted with **"DANGER – PERMIT-REQUIRED CONFINED SPACE – DO NOT ENTER"** signs displaying a unique identifier number. The identifier number is used to identify the hazards within the PRCS.

Section 7 - Procedures

7.1 PRCS Entry Permit

- The PRCS entry permit is the written or printed document provided by Dartmouth to allow and control entry into a PRCS.
- The completed PRCS entry permit shall be made available at the time of entry to all authorized entrants.
- Methods to meet the intent of the OSHA standard for entry, the PRCS entry permit must adhere to the Dartmouth PRCS Program and 29 CFR 1910.146.
- Additional information will be posted at the PRCS to provide warnings and instructions for the use of the PRCS entry permit.
- EHS retains PRCS entry permits for one year and air monitoring results for 30 years.

7.2 Entry/Operating Procedures

7.2.1 Permit-Required Confined Spaces

- Identify the need to enter the PRCS (**Appendix C**).
- Identify appropriately trained entry attendants and personnel to enter the PRCS.
- Complete PRCS entry permit (**Appendix E**).
- Provide appropriate equipment.
- Establish communication systems.
- **The attendant shall always remain outside the PRCS.**
- Post the completed PRCS entry permit or tag at the site.
- Identify hazards on the PRCS entry permit and methods that are to be used to control the hazards.
- Communicate this information to entry personnel and contractors.

7.2.2 PRCS Entry Permit

- Identification of the PRCS.
- Purpose of the PRCS entry.
- The date.
- Length of the permit.
- Names and signatures of the attendant and the authorized entrants.
- Name and signature of the supervisor who authorized the entry.
- Results of atmospheric monitoring.
- Acceptable entry conditions.
- Document of hazard elimination and control.
- Rescue procedures.
- Communication procedures.
- PPE to be used during the PRCS entry.

7.2.3 New Hazard Identified in PRCS

- If a new hazard is introduced during work in the PRCS, the PRCS entry permit must be modified, revalidated, and a new PRCS entry permit completed for entry.
- The PRCS entry permit must be kept at the work site over the course of the entire operation.
- If the job runs longer than was previously listed on the PRCS entry permit or beyond that shift, a new PRCS entry permit is required.
- When the PRCS entry is complete, the PRCS entry permit must be returned to the supervisor.
- The entry supervisor keeps the original permit and forwards a copy to EHS monthly.

7.2 Atmospheric Testing/Monitoring

- Air monitoring must be performed by a trained employee prior to entering any PRCS to evaluate potential atmospheric hazards and determine if acceptable entry conditions exist. The atmosphere shall be tested to determine if a hazardous condition, oxygen deficiency, or oxygen enrichment exists.
- **At a minimum,** oxygen, combustible gases, carbon monoxide, and hydrogen sulfide must be monitored.
- **Appendix D** contains a PRCS entry air monitoring flow chart.

The atmospheric monitoring will be performed using, **at a minimum**, a multi-gas meter that offers real-time sampling results as well as audible and visible alarms to warn the user of dangerous situations. The low and high limits are preset to the levels set forth by OSHA Standards:

Hazard	Regulatory Limits
Carbon Monoxide (CO)	50 ppm (parts per million)
Hydrogen Sulfide (H2S)	<10 ppm
Lower Explosive Limit (LEL)	<10%
Oxygen (O2)	19.5 – 23.5%

Note - If sampling is needed for another type of toxic atmosphere, contact EHS (603-646-1762) prior to entry.

- Air testing must be done prior to entry:
  - **Note** - All conditions must be simultaneously met.
  - If any atmospheric test is outside the regulatory limit, entry is not permitted until such time as the regulatory limit is achieved.
  - Oxygen content - results must be greater than 19.5% but less than 23.5%.
  - Flammable/combustible gas content - results must indicate less than 10% of the LEL (lower explosive limit).

    - Toxic gases - such as carbon monoxide and hydrogen sulfide levels. Results must indicate Hydrogen Sulfide concentrations less than 10 ppm (parts per million), and carbon monoxide concentrations must be less than 50 ppm.
- If the pre-entry testing shows there is no hazardous atmosphere or oxygen deficiency/enrichment within the PRCS, and there is no reason to believe there is a chance for one to develop, and other potentially hazardous conditions have been removed or controlled, the space may be entered, and work can begin.
- EHS is available to provide technical expertise and assistance in air monitoring if hazardous air conditions may be generated in the space.

7.3.1 Monitoring a Stratified Atmosphere

- Atmospheric measurements shall be taken <u>every four feet</u> from the top, middle, and bottom, in the direction of travel, and to each side, following the procedures set forth in OSHA 1910.146, (**Appendix D**).
- Different gases accumulate at different levels in each space. For example, methane is lighter than air and will usually be found higher, at the top of the PRCS.
- Likewise, hydrogen sulfide is heavier than air and will tend to collect on the bottom portion of the PRCS.

7.3.2 Continuous Air Monitoring

- Air quality inside the PRCS must be **<u>continuously monitored</u>** due to the potential for changing atmospheric conditions. These results are to be recorded on the entry permit. To meet this requirement, a four-gas meter is used to continuously monitor the atmosphere inside the PRCS. The preceding shall be done by using one of the following methods:
    - Place the monitor inside with the worker.
    - Place the monitor inside and set up a remote alarm outside with the attendant.
    - Set up the remote sampling tube with the worker and set up the monitor outside with the attendant. If unacceptable levels are measured, the space must be vacated immediately.
    - The PRCS must be re-tested and determined that it is safe to re-enter the space.

7.3 Calibrating and Maintaining Air Monitoring Equipment

- All monitoring equipment must be properly calibrated and maintained in good working condition by the Dartmouth department or shop that has purchased an air monitoring unit for their use.
- A monitor calibrated according to the manufacturer's instructions must be zeroed and checked for calibration prior to use. Calibration checks and zeroing should be performed at or as near as possible to the temperature of the space to be entered.
    - <u>If the monitor is out of calibration or fails a check, it cannot be used to test the PRCS atmosphere until properly calibrated</u>.
- Calibration check results must be noted in the calibration log provided with each instrument. See the manufacturer's operations manual for more information.
- An air monitor calibration log sheet is included in **Appendix F**.

- Calibration logs and information can be printed on request.
- Calibration of atmospheric testing equipment must be performed by the **Heating Plant Supervisor.** The calibrators must be trained in the proper method of calibration for the specific instrument.
- Testing must be done immediately before entry and throughout the entry, and results must be recorded on the permit. The meter should be lowered into the PRCS to determine the atmospheric conditions prior to entry.

7.4 Hazard Elimination and Control

The entry supervisor will identify all potential hazards concerning the PRCS. Each hazard will be eliminated or controlled. Hazards may exist in any of the following categories:

7.5.1 Atmospheric Hazards

- Forced fresh air ventilation is the first option for correcting an atmospheric hazard.
    - If forced air ventilation is used for anything other than the control of heat, EHS must be consulted.
- Ventilation of the space for the removal of heat will be done using the following procedure:
    - Place the ventilator outside the PRCS with the ventilator inlet six to ten feet from the entrance to the PRCS.
    - Extend the flexible duct from the ventilator outlet into the area to be ventilated.
    - Position the duct so that the end of the duct is suspended approximately two feet above the bottom of the space.
    - Ventilate the space for a period of **not less than ten minutes** before entry.
    - Continue the ventilation process until the atmosphere is acceptable.
    - Maintain the ventilation process during the entire space entry operation.

      NOTE - A PRCS that is oxygen deficient or contains a flammable or toxic atmosphere **"SHALL NOT"** be entered by any personnel.
      EHS (603- 646-1762) shall be contacted for assistance and evaluation of the space.

7.5.2 Ventilation

- Force fresh air into PRCS.
- Make sure the source of air is fresh, and combustion byproducts are not being introduced into the PRCS.
- Ensure air flows reach the bottom of PRCS.
- Use continuously.

7.5.3 Contents and Residues

- Contents should be removed from the space when possible. Entrants must assume that residues may be present and protect themselves from contact with harmful materials.
    - Remove contents.
    - Clean space.
    - Isolate space.
    - Protect personnel from contact with materials.

7.5.4 Environment in the PRCS

- Entrants will need to address any safety issues. Examples include:
    - Slippery surfaces.
    - Extreme temperatures.
    - Extreme surface temperatures.

7.5.5 Configuration of the PRCS

- The configuration of the PRCS can make safe operations more difficult. Use particular care when any of the following are present:
    - There is an unusual shape or slope.
    - There is low overhead clearance.
    - There are drop-offs on/in the floors.
    - There is a complex layout.

7.5.6 Lockout/Tagout

- If there is a need for lockout/tagout, the employee(s) must be trained in the Control of Hazardous Energies Program prior to locking and tagging equipment.
- Potential energy sources must be secured. Potential energy sources include:
    - Electrical equipment and circuits.
    - Hydraulic equipment and systems.
    - Pneumatic equipment and systems.
    - Mechanical equipment and systems.
    - Gravity-operated equipment and systems.
    - Thermal Energy equipment, systems, or appurtenances.
    - The control of hazardous energy and employee exposure to these types of stored energy shall be controlled in accordance with OSHA 1910.147.
    - All Dartmouth employees shall adhere to Dartmouth's Control of Hazardous Energies Program.

- Sources of hazardous energy must be isolated and de-energized, and equipment physically immobilized according to Dartmouth's Control of Hazardous Energies Program. Both kinetic (or "movement") energy and potential (or "stored" energy, such as in a coiled spring or raised weight) energy sources must be considered. For example:
    - All pumps and lines that may convey hazardous materials into a PRCS must be disconnected, blinded, double-blocked, bled, or effectively isolated by other means to comply with zero energy procedures.
    - All fixed mechanical devices and equipment capable of causing injury within the PRCS must be disconnected to prevent the release of energy during the entry.
    - Radioactive sources must be removed or isolated, and a survey of the space shall be completed and documented – the employee **must contact EHS** for assistance.
    - PRCS containing hazardous materials (i.e., tanks) must be emptied, flushed, purged, and tested for residual material in the atmosphere before entry is permitted.
    - The area surrounding the PRCS must be surveyed to avoid hazards such as drifting vapors from tanks, piping, sewers, or idling vehicles.

- Any condition(s) making it unsafe to remove an entrance cover must be eliminated before the cover is removed.
    - When entrance covers are removed, the opening must promptly be guarded by a railing, temporary cover, or other temporary barrier that will prevent an accidental fall through/into the opening and protect each employee working in the PRCS from foreign objects entering the space.
- Electrical work: When an employee works in a PRCS that contains exposed energized parts, protective shields, protective barriers, or insulating materials must be used as necessary to avoid inadvertent contact with these parts. Additionally, doors, hinged panels, etc., must be secured to prevent their swinging into people and causing contact with exposed energized parts.

7.5.7 External Hazards

- External hazards such as vehicle traffic, machinery, equipment, and processes may increase the hazards of the PRCS entry.
- External hazards must be secured prior to entering the PRCS.

7.5 PRCS Entry Equipment

- The entry equipment that is needed to enter a PRCS is based on the hazards in the PRCS at the time of entry and the hazards that are created by the work being performed. Maintenance of the entry equipment is the responsibility of the supervisor or their designee.

7.6.1 Required PRCS Equipment

- The following items must be available at the PRCS site and in good working condition before entry is allowed:
    - Atmospheric monitoring instruments and calibration supplies/equipment.
    - Ventilating equipment, if needed, to obtain acceptable entry conditions.
    - Communications equipment if unassisted verbal communication is insufficient for the PRCS.
    - Personal protective equipment.
    - Intrinsically safe lighting equipment (if there is a gas or spark concern) to enable employees to see well enough to work safely and to exit the space quickly in an emergency.
    - Barriers and shields as needed to protect PRCS entrants from hazards outside the space and to prevent unauthorized entry.
    - Rescue-rated tripod with mechanical lifting device.
    - Full body harnesses for entrant(s).
    - Any other equipment necessary for safe entry into and rescue from the PRCS.
    - Safety Data Sheets (SDS) are required at the worksite (to be made available to medical facilities in case of injury or exposure), for chemicals or materials used during work activities.

7.6 Termination of PRCS Entry

- The entry supervisor must terminate entry and cancel the PRCS entry permit when:
  - The entry operations covered by the PRCS entry permit have been completed.
  - A condition that is not allowed under the PRCS entry permit arises in or near the permit space.

7.7 Post-Entry Operations

- Upon completion of the work, authorized entrants must leave the PRCS, and the entry supervisor must cancel and sign the PRCS entry permit.
- The PRCS must be sealed and/or locked to prevent unauthorized entry.
- Barriers/shields outside of the space erected prior to entry must be removed.
- Equipment that had been locked or tagged out prior to entry must be reenergized according to Dartmouth's Control of Hazardous Energies Program.
- Canceled PRCS entry permits must be delivered to EHS monthly, where they will be reviewed and retained.

Section 8 - Rescue and Emergency Services

If a condition that is unsafe under the entry permit arises in or near the permitted space, or there is a need for rescue, 911 must be immediately notified. Then, DoSS should be contacted, and they will notify EHS.

8.1 Rescue Services and Responsibilities

- Dartmouth College will utilize the services of the **Hanover Fire Department** to provide rescue services in the event of a PRCS emergency. Dartmouth has notified the Hanover Fire Department and has obtained their permission to rely upon their assistance in case of an emergency.
- Responsibilities of Dartmouth and the rescue service are outlined below:

8.1.1 Dartmouth

- Evaluate the rescue service annually, including:
  - The response time
  - The ability of the rescue service to be "equipped for and proficient in" performing rescue.
- Provide the rescue team with a copy of the PRCS Program, a list of spaces, and the potential hazards they may encounter.
- Provide rescue service with access to spaces for rescue plan development and drills.

8.1.2 Hanover Fire Department (Rescue Service)

- Provide PPE and PPE training to rescuers.
- Trained rescuers will perform the rescue duties.
- Trained rescuers are authorized PRCS entrants.
- Rescuers are trained in basic first aid and CPR (at least one rescuer must be

certified).

- Practice rescue at least once every 12 months at Dartmouth PRCS.

Note: The Hanover Fire Department has staff members trained in rescue, use of PPE, and PRCS entry. Paramedics are assigned to each engine and are available at each emergency. Rescue drills have been performed on campus in the past and will be performed at least annually.

8.2 PRCS Evacuation/Emergency Procedures for Onsite Personnel

- In the event of an emergency, the following steps shall be performed:
  - Contact the Hanover Fire Department, **911**.
  - Notify the entry supervisor immediately if an evacuation is necessary due to hazardous conditions.
  - Provide the exact location of the emergency and a brief description of the situation.
  - Perform a non-entry rescue, if possible. **NEVER ENTER THE PRCS!**
  - Remain at the location.
  - Remain a safe distance away.
- Order entrants to evacuate the space immediately whenever a prohibited condition is determined, or;
  - If the signs and symptoms of exposure or uncontrolled hazards are identified.
  - A situation outside the space that could endanger those inside is observed.
  - If the attendant must leave the space to perform work duties, if it interferes with the attendant's responsibilities.

8.2.1 Non-Entry Rescue

- Used only if the rescue means does not create a greater hazard.
- Entrants shall use a full-body harness with a rescue line attached.
- The retrieval line must be attached to a mechanical lifting device or a fixed point in such a manner that rescue may begin as soon as the attendant becomes aware of a problem.
- A retrieval device must be used for vertical entries greater than five feet deep.

Note: Contractors must use their own equipment, including safety apparatus and air monitors.

Section 9 - Alternative Permit Space

Dartmouth no longer classifies spaces as alternative confined spaces. All confined spaces on campus will either be a non-permit confined space (also known as a confined space) or a permit-required confined space.

Section 10 - Reclassifying a PRCS as a Non-Permit Required Confined Space

Re-classification of a PRCS to a non-permit confined space is permitted in accordance with OSHA

1910.146(c) (7).

- To classify an area as a non-permit-confined space, the PRCS must meet the following requirements:
  - There is no actual or potentially hazardous atmosphere in the PRCS.
    - This is done by using a gas meter to test the air in the PRCS without entering the PRCS.
  - Any hazards capable of causing death or serious physical harm have been eliminated. This includes any recognized health or safety hazards, including engulfment in solid or liquid material, electrical shock, or moving parts. If testing and inspection demonstrate that all hazards have been eliminated, the space may be reclassified as a non-permit confined space only for the time the hazards remain eliminated.
  - The entry supervisor shall document that all hazards have been removed and complete the PRCS Reclassification Form (**Appendix G**).
  - The PRCS can be classified as a non-permit space only as long as all the hazards remain eliminated.
  - If someone must enter the space to remove hazards, the space must be treated as a PRCS until the hazards have been eliminated.

    Note - Control of atmospheric hazards through forced air ventilation **DOES NOT** constitute elimination of the hazards.

Appendix A - Definitions

Acceptable entry conditions – the conditions that must exist in a permit space to allow entry and to be certain that employees involved in PRCS entry can safely enter and work within the space.

Action level - the exposure level (concentration in air) at which OSHA regulations to protect employees take effect; generally, half the PEL.

Attendant – the individual stationed outside a PRCS who monitors the authorized entrant(s) and who performs all attendant duties assigned in the employer's PRCS Program.

Authorized entrant – an employee who is authorized by the employer to enter a PRCS and is familiar with the hazards associated with the space and methods for controlling and mitigating hazards.

Barrier – a physical obstruction that blocks an area, allowing for limited access.

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

Calibration - The action of standardizing a measuring instrument by determining the deviation from a standard and adjusting the instrument accordingly.

Calibration check - To determine the proper calibration of an instrument by running a known amount of a standard through an instrument and comparing the known amount to the instrument's result. Calibration checks are documented as proof that an instrument has been properly calibrated and has not fallen out of calibration between uses.

Combustible gas – an airborne concentration of gas or vapor that may present the risk of fire or explosion if an ignition source of enough energy is introduced. This term is synonymous with "flammable".

Competent person – a person who can identify hazards and working conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them.

Confined space – a space that meets **ALL** the following criteria:

- Large enough and so configured that an employee can bodily enter and perform assigned work.
- Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of

entry.)
- Not designated for continuous occupancy.

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

Emergency – any occurrence (including any failure of hazard control or monitoring equipment) or event internal or external to the permitted space that could endanger entrant(s).

EHS - Dartmouth's department of Environmental Health and Safety.

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

Entry permit – the document provided by the employer to allow and control entry into a PRCS and contains the information necessary for proper entry and documentation.

Entry supervisor – any employee may be the entry supervisor if they have completed PRCS training. The entry supervisor is responsible for determining if acceptable entry conditions are present at a PRCS where entry is planned, for authorizing entry and overseeing entry operations, and terminating entry if necessary. The duties of the entry supervisor may be passed from one qualified and trained individual to another during an entry operation.

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

- **Flammable gas, vapor, or mist** more than 10% of its lower explosive limit (LEL).
- **Airborne combustible dust** at a concentration that meets or exceeds its LEL.
    - **Note** – This concentration may be approximated as a condition in which the dust obscures vision at five feet or less.
- **Atmospheric oxygen concentration** is below 19.5% or above 23.5%.
    - **Note** – An atmospheric concentration of any substance that is not capable of causing death, incapacitation, and impairment or the ability to self-rescue, injury, or acute illness due to its health effects is not covered by this provision.
- **Any other atmospheric condition** that is immediately dangerous to life or health.

- **Note** - For air contaminants for which OSHA has not determined a dose or permissible exposure limit, other sources of information, such as Material Safety Data Sheets that comply with the Hazard Communications Standard 29 CFR 1910.1200, published information, and internal documents, can provide guidance in establishing acceptable atmospheric conditions.

Hot work – operations capable of providing a source of ignition (for example, riveting, welding, cutting, burning, and heating).

Hot work permit – the employer's written authorization to perform operations capable of providing a source of ignition. Refer to Dartmouth's Hot Work Program.

Immediately dangerous to life or health (IDLH) – 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 permitted space.

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

Limited or restricted means for entry or exit – a condition that has the potential to impede an entrant's ability to escape in an emergency. Such conditions may include trip hazards, poor lighting, pipes, ducts, equipment, slippery floors, inclined surfaces, and ladders.

Lockout – the placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

Lower explosive limit (LEL) or Lower flammable limit (LFL) - the minimum concentration of a substance in air needed for an ignition source to cause a flame or explosion.

Non-entry rescue – occurs when a rescue service, usually the attendant, retrieves employees in a permit space without entering the permit space.

Non-Permit Required Confined Spaces – 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.

Other hazards - physical hazards such as moving parts, electrical shock, engulfment, entrapment, or steam vapor environments; use of welding equipment or other hot work may cause a hazardous environment and require a supplemental hot work permit.

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

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

Permissible exposure limit (PEL) - concentration of a chemical that an individual can "safely" be exposed to 8 hours per day, 5 days per week, as established by OSHA.

Permit-Required Confined Spaces (PRCS) – a confined space that has **one or more** of the following characteristics:

- Contains or has the potential to contain a hazardous atmosphere.
- Contains a material that has the potential to engulf an entrant.
- It has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross-section.
- Contains any other recognized serious safety or health hazard.

Prohibited condition – any condition in a permit space that is not allowed by the permit during the period when entry is authorized. A hazardous atmosphere is a prohibited condition unless the employer can demonstrate that PPE will provide effective protection for each employee in the permit space and provide the appropriate PPE to each employee.

Rescue – retrieving and providing medical assistance to one or more employees from the PRCS.

Rescue service – the personnel or department designated to rescue employees from PRCS. The Hanover Fire Department serves as the rescue service for Dartmouth College.

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

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

- **Note** - Testing enables employers both to devise and implement adequate control measures for the protection of authorized entrants and to determine if acceptable entry conditions are present immediately prior to, and during, entry.

Ventilate or ventilation – controlling a hazardous atmosphere using continuous forced-air mechanical systems that meet the requirements of 29 CFR 1926.57 (Ventilation).

Appendix B – Confined Space Assessment Form

Instructions: *All confined spaces must be assessed using this form. The purpose of this form is to identify the hazards and characteristics of a space to determine if it is a non-permit required space or a permit-required confined space. This assessment does not replace a Confined Space Entry Permit. This assessment must be reviewed by the entry team prior to any entry into a permit-required confined space.*

Section A: General Information				
1	Name:		Type of Space:	
2	Date of Assessment:		Assessment Conducted by:	
3	Location:			

Section B: Confined Space Determination		**Yes**	**No**
4	The space is large enough and is so configured that an employee can bodily enter and perform assigned work.		
5	The space has limited or restricted means of entry or exit.		
6	The space is not designed for continuous employee occupancy.		
7	If items 4-6 were all marked **Yes**, then the space is considered a confined space; proceed to the next section. If you answered **No** to 4, 5, or 6, the space is not a confined space; check the box below. The space does not qualify as a "confined space":		

Section C: Atmospheric Hazards										**Yes**	**No**
8	Does the space have or have the potential to contain a hazardous atmosphere? *If **Yes**, check the hazard(s) below.*										
9	Oxygen Deficient (O_2 below 19.5%):		Oxygen Enriched (O_2 above 23.5%):		Explosive Gas/Vapor:						
10	Hydrogen Sulfide (H_2S):		Carbon Monoxide (CO):		Chlorine (Cl_2):						
11	Other *(specify)*:										

Section D: Engulfment Hazards										**Yes**	**No**
12	Does the space have the potential to engulf or suffocate the entrant? *If **Yes**, check the hazard(s) below.*										
13	Sand:		Water:		Soil:		Gravel/ Rock:		Sewage:		Oil:
14	Other *(specify)*:										

Section E: Entrapment Hazards										**Yes**	**No**
15	Does the space have an internal configuration that an entrant could become trapped? *If **Yes**, check the hazard(s) below.*										
16	Converging Walls/ Downward Sloping:		Constriction/Taper to a Smaller Cross-Section:		Difficult Exit/ Inadequate Access:						
17	Other *(specify)*:										

Section F: Other Serious Hazards							Yes	No
18	Is there a potential for any other serious safety and health hazards? *If **Yes**, check the hazard(s) below.*							
19	Electrical:		Moving Parts:		Slips/Trips/Falls:			
20	Hot/Cold Extremes:		Noise/Vibration:		Chemicals:			
21	Skin/Eye Irritants:		Pressurized Steam/ Condensate:		Unguarded Machinery:			
22	Pneumatic Energy:		Hydraulic Energy:		Stored Energy:			
23	Other *(specify)*:							

Section G: Access												
24	Fixed Ladder:		Portable Ladder:		Stairs:		Door:		Hatch:		Manhole:		Lowering Winch:	
25	Other *(specify)*											

Section H: Ventilation								
26	None:		Unfavorable Natural:		Favorable Natural:		Mechanical:	
27	Mechanical ventilation is required in the space:							

Section I: Rescue		Yes	No
28	Does the space have an internal configuration where non-entry rescue equipment (e.g., tripod and winch) will be **effective** in rescuing the entrant?		
29	Does the space have an internal configuration where non-entry rescue equipment (e.g., tripod and winch) may be **ineffective** in rescuing the entrant, depending on where the work is being performed inside the space?		
30	Will a standby rescue service be required outside the space if non-entry rescue equipment is **ineffective** in rescuing the entrant?		

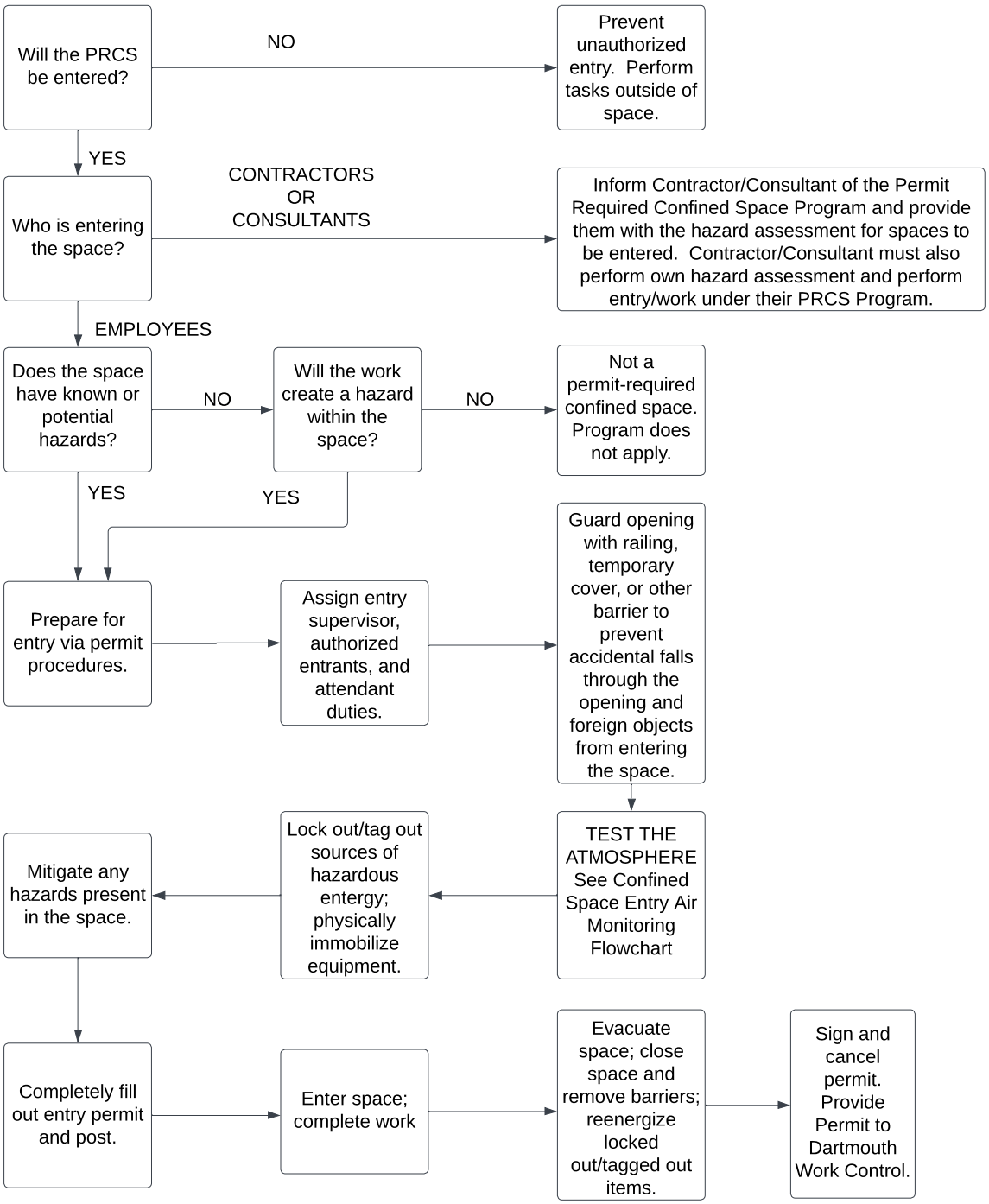
Section J: Determination		Yes	No
31	Is the space a Permit-Required Confined Space? *If items 8, 12, 15, or 18 were marked **Yes**, a permit is required to enter the space.*		

Section K: Notes	
32	

Section L: Hazardous Energy Isolation
Hazards indicated in sections C through F may require isolation or de-energization in accordance with Dartmouth's Control of Hazardous Energy (Lockout/Tagout) Program **prior to entry**.

Appendix C - Confined Space Entry Decision Flowchart

Permit Required Confined Space Entry Decision Flowchart



Notes:

A confined space has limited or restricted means of entry or exit, is large enough for a employee to enter and perform assigned work, and is not designed for continuous occupancy by the employee. These spaces may include, but are not limited to, underground vaults, tanks, storage bins, pits and diked areas, vessels, and silos.

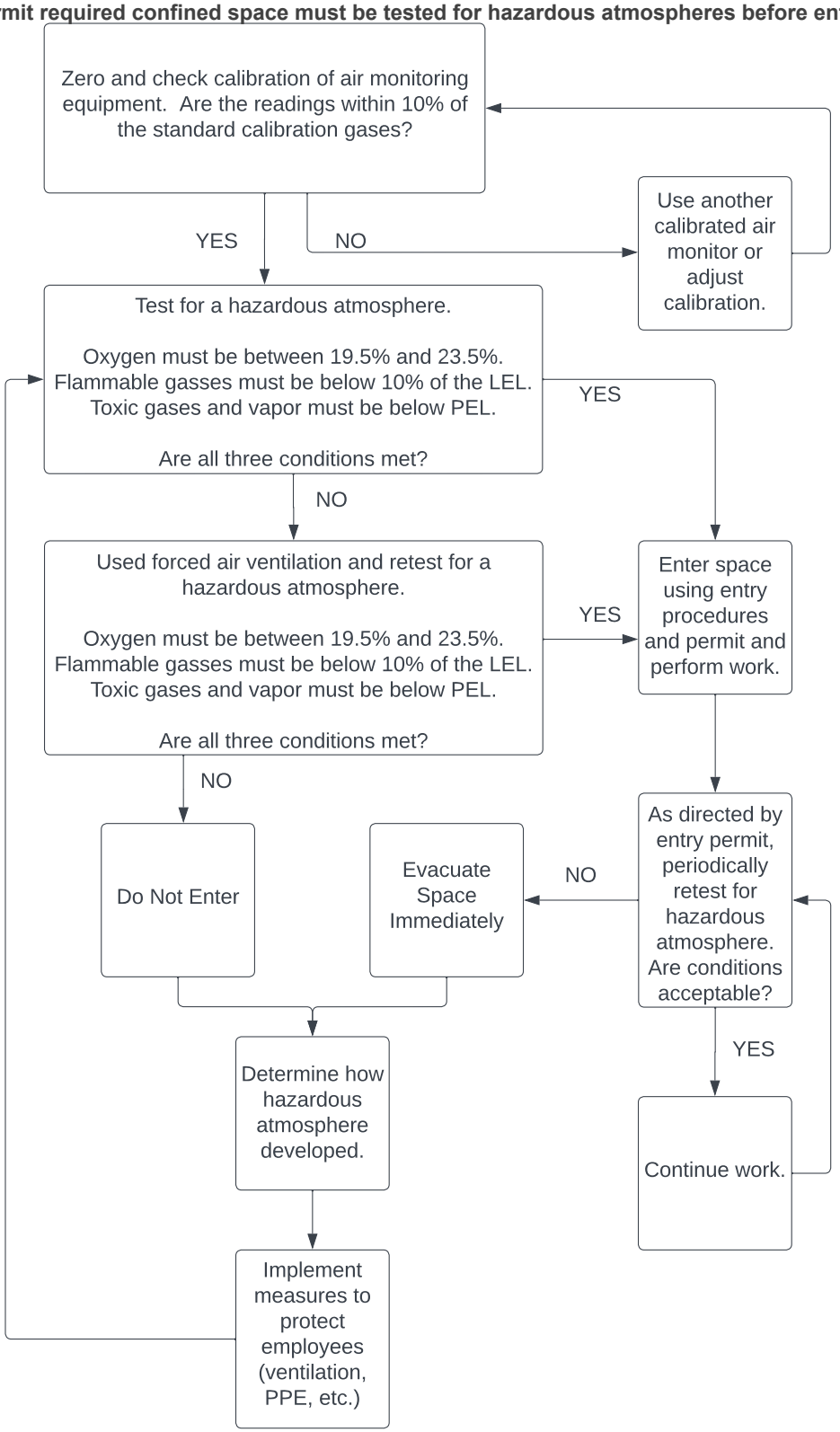
A permit-required confined space (PRCS) is one that meets the definition of a confined space and has one or more of these characteristics: (1) contains or has the potential to contain a hazardous atmosphere, (2) contains a material that has the potential for engulfing an entrant, (3) has an internal configuration that might cause an entrant to be trapped or asphyxiated by inwardly converging walls or by a floor that slopes do to a smaller cross section, and/or (4) contains any other recognized serious safety or health hazards.

EHS to receive permits from Work Control on a monthly basis.

Appendix D - Confined Space Entry Air Monitoring Flowchart

Permit Required Confined Space Entry Air Monitoring Flowchart

A permit required confined space must be tested for hazardous atmospheres before entry.



PEL: Permissible Exposure Limits

Carbon Monoxide (CO)
< 35 ppm (parts per million)

Hydrogen Sulfide (H2S)
< 10 ppm

Hazard Regulatory Limits

Oxygen (O2)
19.5 – 23.5%

Lower Explosive Limit (LEL)
< 10%

37 Dewey Field Rd, Suite 6216 Hanover, NH 03755 Tel: 603-646-1762 EHS@dartmouth.edu http://www.dartmouth.edu/ehs/

Appendix E - Confined Space Entry Permit

CONFINED SPACE PERMIT

PROMINENTLY DISPLAY AT JOB SITE

SIDE A

Complete Side A Prior to Work Commencing

Date & Time Issued: _____
Location Name: _____
Street Address: _____

Work to Be Performed: _____
_____

Entry Supervisor: _____
Trained Y N
Entrant (Print Name) _____
Trained: Y N
Attendant (Print Name): _____
Trained: Y N

Entry Equipment:	Y	N
Tripod	❒	❒
Harness	❒	❒
Lifeline	❒	❒
Ventilation/Blower	❒	❒
Two Way Radio	❒	❒
Direct Read Gas Meter	❒	❒
Barricades:	❒	❒
PPE Required:	❒	❒

Other: _____

Gas Monitor Calibration Completed by/date:
_____
Site Control Plan: _____
_____
_____
Communication Plan: _____
_____
_____
Rescue Plan: _____
_____
_____
_____

Manager/Supervisor Approval;

(Print Name

Signature
(Top Copy to dispatch after approval & before work)

SIDE B

Complete Side B at Work Site

Work Site Hazard Assessment:	Y	N
Electrical Hazard:	❒	❒
Fall Hazard:	❒	❒
Atmospheric Hazard	❒	❒
Mechanical Hazard	❒	❒
Engulfment/Flood Hazard.	❒	❒
PPE Available/Donned	❒	❒

If Yes above, describe:
_____
_____
_____

Fresh Air Calibration at Site (initial)_____

INITIAL TEST ACCEPTABLE:
(O_2: 19.5 -23.5%; EX: Less than 10%; CO: 35 ppm; H_2S 10ppm)

Opening/Top
O_2_____% Ex_____% CO_____ppm H_2S_____ppm
Time:_____Initial:_____

Four Feet
O_2_____% Ex_____% CO_____ppm H_2S_____ppm
Time:_____Initial:_____

Eight Feet
O_2_____% Ex_____% CO_____ppm H_2S_____ppm
Time:_____Initial:_____

Twelve Feet
O_2_____% Ex_____% CO_____ppm H_2S_____ppm
Time:_____Initial:_____

Bottom
O_2_____% Ex_____% CO_____ppm H_2S_____ppm
Time:_____Initial: _____

I have reviewed and agree with the above readings:
Entrant Initial:_____Attendant Initial: _____

Permit Prepared By (Entrant/Attendant) Sign

_____
Entry approved by: (Onsite entry supervisor) Sign

Entry Terminated (Date/Time):_____

_____
Entry Supervisor Signature

(Return bottom copy to dispatch after work completion)

Dartmouth Requires Continuous Monitoring

Recording of Atmospheric Readings in the Confined Space Taken During Entry.

Time (15 minute intervals)	Oxygen % (19.5%-23.5%)	Explosive % (Less than 10%)	Carbon Monoxide (less than 35 PPM)	Hydrogen Sulfide (Less than10 PPM)	Initial

CS Entry Review (Post entry permit audit only)

Reviewed by:___________________________________

Date:____

Appendix F - Air Monitor Calibration Log Sheet

Air Monitor Calibration Log Sheet

Equipment	location	Calibration Gas	serial #	Calibration	Calibration	Notes
				Date Done	Expire Date	

Appendix G - PRCS Reclassification Form

PERMIT-REQUIRED CONFINED SPACE RECLASSIFICATION FORM

Use this form to temporarily reclassify a permit-required confined space to a non-permit confined space, which is only valid for the duration of work being performed and for no more than 8 hours. The space cannot contain **any** actual or potential atmospheric hazards, and all hazards within the space must be eliminated without entry into the space. An attendant is required outside the space, and must maintain communication with the entrant(s) and have a means to summon rescue services (e.g., 911). Review the confined space assessment to evaluate the space, and review the work to be performed within the space.

General

Space to be Entered:		Date **&** Time Issued:	
Location of Space:		Date **&** Time of Expiration:	
Purpose of Entry:		Department **or** Contractor*:	
ENTRANT(S):		EHS Contractor Approval by:	
ATTENDANT(S):			

Requirements

Hazards	Yes	No	If **Yes**, describe how the hazard was eliminated without entry into the space.
Does the space contain or have the potential to contain a hazardous atmosphere?			If Yes, reclassification is not permitted. *Note:* Control of atmospheric hazards through forced-air ventilation does not constitute elimination of the hazards.
Does the space contain biological or chemical hazards?			
Does the space contain electrical hazards?			
Does the space contain engulfment hazards?			
Does the space contain mechanical hazards?			
Does the space contain entrapment hazards?			
Does the space contain extreme temperatures?			
Does the space contain any other *serious* hazards? (e.g., steam)			
Will the work being done inside or near the space introduce new hazards into the space? (e.g., welding, chemicals, painting fumes)			

Narrative/Other Relevant Information

Certification and Authorization

*By signing below, I certify that the space does not contain or have the potential to contain a hazardous atmosphere, all hazards within the space have been eliminated **without** entry, and no hazards will be introduced into or created within the space during the entry. I certify that all actions and conditions necessary for safe entry have been performed to temporarily reclassify the permit-required confined space to a non-permit confined space.*

Entry Supervisor:	(print):	(sign):	(title):

Cancellation

If hazards arise within a permit-required confined space that has been declassified to a non-permit confined space, the space must be evacuated immediately. The space must be reevaluated to determine whether it must be reclassified as a permit-required confined space. Entry will be terminated and this form will be canceled when the entry operations covered by this form have been completed, or when a condition that is not allowed under this form arises in or near the space.

Form canceled by the Entry Supervisor must be provided to Dartmouth EHS and kept on file for 3 years.

Form Canceled by:		Date **&** Time:	
Reason:	☐ Work Complete ☐ Conditions Violate Form ☐ New Hazards ☐ Other (Specify)		

* Contractors must have EHS approval to reclassify permit-required confined spaces on campus.

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