

WELLESLEY COLLEGE
CONFINED SPACE ENTRY PROGRAM

I. POLICY STATEMENT

Pursuant to the requirements of 29 CFR 1910.146, the OSHA standard for Permit Required Confined Space entry, this written program is established for Wellesley College to ensure that safe entry procedures are used prior to and during all work activities taking place in areas identified as confined spaces. This program sets forth minimum guidelines and procedures intended to protect Wellesley College personnel who may be required to enter or work in such spaces. All employees are expected to be familiar with and comply with the provisions of this policy whenever it is necessary to enter or work within confined spaces or otherwise work in conjunction with those workers who enter such spaces. Additionally, whenever outside contractors are hired to perform work at the College involving confined space entry the provisions contained in Section XIV of this program will apply. Any questions concerning this policy should be directed to the EH & S Department.

II. DEFINITION OF CONFINED SPACES

A Confined Space is one that has limited or restricted means of entry or exit, is large enough or so configured that an employee can bodily enter and perform assigned work and is not designed or intended for continuous occupancy. For an enclosure to be considered a confined space it must meet all of the above criteria.

A Permit- Required Confined Space (PRCS) is one that meets the definition of a confined space as noted above and has one or more of the following characteristics:

1. Contains or has the potential to contain a hazardous atmosphere.
2. Contains a material that has the potential for engulfing an entrant, such as liquids or finely divided solids like sand or grain.
3. Has an internal configuration that might cause an entrant to be trapped or asphyxiated by inwardly conveying walls or by a floor that slopes downward and tapers to a small cross section. For example, coned shaped or round bottom silos, bins or tanks.
4. Presents other serious safety or health hazards such as unguarded mechanical equipment, energized conductors, temperature extremes, excessive noise, hazardous radiation, or any other condition which could disable or injure a person.

III CONFINED SPACE HAZARDS

(A) Hazardous Atmosphere

Because of inadequate ventilation there is a potential for hazardous atmospheres to develop within confined spaces. Hazardous atmospheres include those, which are flammable, toxic, irritating, and asphyxiating. Deadly amounts of toxic vapors and gases can form and accumulate within such spaces. Some are capable of causing respiratory failure or death from even brief exposures.

An extremely dangerous condition often encountered in confined spaces is oxygen deficiency. This occurs when the normal level of oxygen in air is reduced by consumption or displacement, creating an asphyxiation hazard.

Fires and explosions are other potential dangers encountered in confined spaces. Flammable atmospheres from the use or presence of chemicals, paints, petroleum products, solvents, reactants, combustible dusts, etc. may accumulate and be trapped within confined spaces. Such flammable materials when mixed with oxygen present severe explosion risks if ignition from sparks, static electricity, unapproved electrical equipment, or any other heat source is possible.

(B) Physical Hazards

In addition to the above atmospheric type hazards, general physical hazards such as from temperature extremes, slipping or falling on slick/wet surfaces, moving parts, falling objects, high noise levels, and engulfment in loose, granular materials, etc. must also be recognized in confined spaces. Other hazards that may exist include electrocution from live wires, skin contact with contaminated or corrosive materials and bites from insects, snakes and rodents.

Good illumination and the ability to communicate without interference while in confined spaces are essential.

IV. HAZARDOUS GASES WHICH MAY BE FOUND IN CONFINED SPACES

Carbon Monoxide: A very toxic colorless, odorless, tasteless gas generated from incomplete combustion of organic materials, gasoline or diesel fueled engines.

Hydrogen Sulfide: A colorless, gas with a strong odor of rotten eggs at low concentrations. At high concentrations the sense of smell is impaired. This gas is extremely toxic at higher concentrations.

Carbon Dioxide: A colorless, odorless gas, which is a by-product of fermentation and combustion. While not toxic in itself, it will displace breathable air at high concentrations creating a very dangerous situation. ie, oxygen deficiency

V. TYPICAL SYMPTOMS OF OVEREXPOSURE

1. Symptoms associated with oxygen deficiency and other causes for asphyxiation include headache, dizziness, drowsiness, and nausea. Prolonged exposure could lead to convulsions, unconsciousness and death.
2. Symptoms from over-exposure to solvents, gases and vapors may include lightheadedness, eye and/or nose and throat irritation.
If you experience any of these symptoms while in a confined space, get out and/or call for help immediately.

VI. ENTRY PRECAUTIONS AND PROCEDURES

The Maintenance Services managers or their designees will be responsible for evaluating the workplace to determine if it is a permit-required space and accordingly, may serve as the Entry Supervisor for the specific job. See Section XV for assessments of those spaces on campus that have initially been identified as confined spaces. In general when dealing with a PRCS, the following matters should be addressed in developing an overall entry plan.

1. Determine necessity to enter space. Can task be accomplished without entering?
2. Try to determine what substance(s) were previously contained in the space. Also, it is important to know what conditions such as excessive rusting of metal may have occurred. This information will help determine need for special testing requirements.
3. Test air for oxygen content and for toxic, flammable and oxygen-displacing gases/vapors. See section below on air testing.
4. Assure that all instruments used in air testing are properly calibrated and in good working order.
5. Determine need for special clothing and protective equipment or supplies, i.e., boots, gloves, chemical suits, hard hat eye and ear protection. Assure that all such equipment is readily available, in good condition and worn as required.
6. Determine the need for respiratory protection, lifelines, escape harness and special communication devices, i.e., radio. Each entry will require different equipment depending on the expected hazard. Some situations may require the use of safety lines/harnesses, air supplied breathing apparatus, continuous or frequent atmospheric monitoring, continuous ventilation and that a trained standby "buddy" person be on the outside ready for any emergency.
7. Respirators when required, must be of the right type, i.e., air supplied, air purifying, SCBA, etc. and be NIOSH approved. Personnel must be properly trained in their use.
8. Ventilate space as necessary, assuring that intake air is free of harmful contaminants. Determine need for continued ventilation.

9. Use only intrinsically safe, grounded, explosion proof equipment. If lighting is necessary, use battery powered devices such as hand's free" headlamps or flashlights.
10. As necessary, arrange for any steam, water, heat, gas or power lines effecting the confined space to be shut off by authorized personnel. (lockout/tagout)
11. Assure that lockout/tagout methods are used to prevent the startup of electrical or other energy sources that could jeopardize anyone in the space.
12. Where there is risk for persons or objects falling into confined space opening, a barricade or other means of warning should be used.

VII. TESTING THE ATMOSPHERE

A. GENERAL

Testing the air within confined space for oxygen content and for toxic and/or flammable gases or vapors is perhaps the most critical precautions to be taken. It is important to remember that many toxic gases and vapors are colorless and odorless and cannot therefore be detected by your senses. Nor can you determine the oxygen level that is present. Testing can only be accomplished by means of properly calibrated test equipment.

Detection monitors capable of measuring oxygen levels, carbon monoxide, hydrogen sulfide, and combustible gases/vapors are available for testing confined space atmospheres. The testing equipment used at Wellesley may change from time to time. Accordingly, it will be necessary to refer to separate Instructions for specific monitors being used.

It is important to understand that some gases/vapors are heavier or lighter than air and may settle to the bottom or accumulate at the top of the confined space. Therefore, it is necessary to test all area (top, middle, bottom) of a confined space to be sure of its safety.

If any readings indicate an oxygen deficiency or the presence of toxic or flammable substances, the space must be ventilated and retested before entry. Only trained personnel are authorized to conduct the air testing. Do not attempt to use test equipment until you are absolutely sure how to use it and that you have checked its accuracy (calibration) before and after each use in accordance with the manufacturer's instructions.

B. TESTING PROCEDURES

Testing shall be performed for oxygen, combustible gases or vapors, and toxic gases or vapors in that sequence before opening the space by probing with the test instruments near the entry. Placing the monitor probe through the hole in the manhole and drawing air into the instrument will do this. Once the space is opened, test the air 2 feet below the surface, 1 to 2 feet above the

bottom of the structure, and at mid height of the depth. Also, test all corners and spaces where gases/vapors might accumulate or pocket keeping in mind that some are heavier or lighter than air. Affected employees will be given the opportunity to observe all pre-entry testing.

In some cases it may be necessary to test for gases or vapors other than those measured by the available detection/monitor. The potential for the presence of other toxic substances will be assessed prior to entry and will be based on such factors as products that may have been stored in the spaces, other work being performed in the space, or potential toxicants from nearby or adjacent areas.

Record all readings and their locations. If any of the tests indicate that hazards may exist in the confined space, the project supervisor and/or the Environmental Health and Safety Office shall be notified. **DO NOT ENTER THE CONFINED SPACE IF THERE IS ANY INDICATION OF DANGER.**

Reading outside the following limits indicate problems and entry shall not be made under any circumstances.

- a. Oxygen levels less than 19.5% or greater than 23.5%.
- b. Carbon monoxide level greater than 35 parts per million, (ppm).
- c. Hydrogen sulfide level greater than 10 ppm.
- d. The percentage of the lower explosion limit, (LEL), must be less than 10% to permit any type of hot work. This limit does not mean that atmosphere is toxic free.
- e. All other air contaminants are within their threshold limit values or permissible exposure levels.

VIII. ENTRY PERMIT

If at any time a confined space is determined to be a permit-required confined space (PRCS), the Maintenance Services Manager will be responsible for preparing and signing the written permit document. Each permit document will reflect only the specific proposed entry and terminate at the end of the shift or when the job is finished, whichever occurs first. Affected employees or their representation will be given the opportunity to participate in the preparation of the permit and have access to all related information. Each entry permit must include the following information as appropriate:

- test results;
- tester's initials or signature;
- name and signature of supervisor who authorizes entry;
- name of permit space to be entered authorized entrant(s), eligible attendants, and individuals (s) authorized to be entry supervisor(s);

- purpose of entry and known space hazards;
- measures to be taken to isolate permit spaces and to eliminate or control space hazards i.e., locking out or tagging of equipment and procedures for purging, making inert, ventilating, and flushing permit spaces;
- name and telephone numbers of rescue and emergency services
- date and authorized duration of entry
- acceptable entry conditions
- communication procedures and equipment to maintain contact during entry;
- additional permit(s), such as for hot work, that have been issued to authorize work in the permit space;
- special equipment and procedures, including personal protective equipment and alarm systems; and
- Any other information needed to ensure employees safety.

IX. ENTRY WITHOUT A PERMIT AND/OR ATTENDANT NEEDED

All confined spaces are to be considered to be PRCS until pre-entry procedures demonstrate otherwise. However, a confined space may be entered without the need of a written permit or attendant provided:

1. The space is determined not to be a PRCS or
2. The only hazard posed by the space is an actual or potential hazardous atmosphere, which can be maintained in a safe condition for entry by mechanical ventilation alone i.e., continuous forced air ventilation.
3. There is sufficient Monitoring data to support item # 2 above.

X. RESPIRATORS

Respirators are personal protective devices that can allow workers to breathe without inhaling toxic substance. Two basic types of respirators are air-purifiers, which remove the contaminant through filters and the air supplying type which deliver air to the wearer from a tank, i.e. SCBA, or from an outside air source. Only air-supplied respirators can be used in oxygen deficient atmospheres. All other type respirators can only be used if sufficient oxygen is present.

If respirators are required to work in the confined space make sure that you can get through the space opening with one on. The use of respirators shall be allowed only for persons who are properly trained in their use and limitations and are medically fit to wear them. Respirators shall be used in accordance with section 1910.134 of the OSHA standards.

XI. EMERGENCY RESPONSE SYSTEMS

Workers who enter a confined space as well as those associated with the task should be prepared to deal with any emergency situation that could arise. A well-organized emergency response procedure is essential for every confined space project. Since each job assignment may vary in many ways, emergency procedures need to be specified for every job.

However, every safety plan that is prepared for confined space projects which may be potentially hazardous must include the following common practice and precautions:

- a. Notify in advance the rescue service that would be called upon in an emergency to ensure that they can respond quickly if help is needed. They will need to know the exact location of the job, the nature of the space involved, what hazards to expect and any special equipment.
- b. Use a buddy system. Have another person “buddy” outside to help. Never enter the confined space without a buddy waiting outside to render assistance. This person should also have the same protection gear as you, with a lifeline or parachute harness attached to you which could be used to pull you out if necessary. The “buddy” should remain outside the confined space at all-time and a third person should be available via radio (if possible) in the event of an emergency. Maintain visual and verbal contact with your “buddy” at all times. If verbal contact is not possible, work out a signaling system with your “buddy”, so he knows you are okay.
- c. Keep ventilating the area with clean make-up air if possible.
- d. Keep testing for oxygen deficiency, combustibility, and toxicity.
- e. Wear respirator as necessary.
- f. Wear required safety equipment all the time.
- g. Take all the equipment you need for the job when you enter the area.
- h. Some confined spaces have constructive entries or work spaces. In such cases it is possible that safety equipment such as ropes, gas monitors, respirators, and protective clothing may actually create a separate hazard due to their bulk. In such cases, it may be necessary to lower the equipment in prior to entry, but any such deviations from normal procedures must be cleared with your supervisor.
- i. Never smoke or eat in the confined space area.

XII. EMERGENCY RESCUE PROCEDURE

If you are watching out for others who are working in a confined space and get a call for help, be prepared to act quickly and competently. First, try to remove the victim with the harness and ropes rather than going into the area yourself. **NEVER ENTER THE CONFINED SPACE UNPROTECTED TO RESCUE SOMEONE.** If the person is overcome from toxins or lack of oxygen, there is a good chance you will too. Call for help immediately and wait for them to arrive if you cannot get the victim out yourself with the lifeline. Once the victim is out, render emergency first aid if necessary and call for medical help.

Once the emergency response has completed and medical help has arrived, post a sign in the area signaling danger. Report the incident to the Job Supervisor.

XIII. TRAINING

It is essential that anyone connected with working in confined spaces understand the hazards and relevant safety aspects associated with such environments. Training for Wellesley College personnel assigned to work within or in conjunction with confined spaces will include but not be limited to the following issues:

- a. Contents of the OSHA confined space standard, 1910.146.
- b. Signs and symptoms of exposure to hazardous atmospheres.
- c. Air testing requirements, methods, and techniques.
- d. Interpretation of air testing results.
- e. Use of respirators and other personal protective equipment.
- f. Means of communication.
- g. How and when to summons rescue and other emergency services.
- h. Duties of the Attendants, Entry Supervisors, Authorized Entrants.

XIV. USE OF OUTSIDE CONTRACTORS

When outside contractors are hired to perform work in a PRCS, a responsible Wellesley College representative must coordinate with the contractor to ensure strict compliance with appropriate entry procedures. The contractor must be informed of any potential hazards in the space, of any special precautions needed and be informed of Wellesley College's past experiences associated with the space.

Contractors may implement their own entry procedures provided they comply with the OSHA requirements. Contractors must also show evidence that their employees who will be associated with the confined space task are fully trained and qualified. When employees of more than one employer are to work simultaneously in the PRCS, the College representative in charge of the job will develop and implement a plan in advance of the entry to ensure a coordinated effort so that one employer does not create a hazard to the others and to ensure that everyone follows the same rules.

XV. ASSESSMENT OF CONFINED SPACES AT WELLESLEY COLLEGE

Entries into confined spaces are generally made to conduct inspections, testing, repairs, maintenance, or cleaning tasks. Typical examples of confined spaces include, but are not limited to: manholes, sewers, tank cars, crawl spaces, silos bins, storage tanks, tunnels, pipelines, wells, vaults, or any underground areas.

As part of this program, spaces at Wellesley College known or assumed to be confined spaces have been identified and evaluated in terms of entry requirements. This assessment is as follows:

- Wastewater treatment vault (mixing tanks). There are two 500 gal tanks in this space that collect wastewater from the Science Center laboratory sinks. Chemicals are fed into the tanks to neutralize the waste prior to discharge. Entry into this space is thru a 4'x4' hatch from street level which is locked at all times. Workers must climb down a fixed steel rung ladder about 10 feet to perform basic maintenance and check the mixing motors and probes. This is done weekly. The space is equipped with a blower that brings in fresh air. The chemicals are fed in solution and thru an automated, closed system. There appear to be no known or potential atmospheric or physical hazards present to warrant total PRCS entry procedures. However, minimum precautions that should be taken before entry is made are as follows:
 1. test atmosphere for oxygen and other gases, see procedure in XII B, above.
 2. place barricade around opening to prevent accidental trip and fall.
 3. caution needs to be applied if the fixed ladder is slippery from icy or wet conditions. Use of fall protection equipment may be necessary in such cases.
 4. An observer should be stationed topside to assist in any emergency.

- Water Supply Chemical treatment Vault. This space is similar to the wastewater treatment vault. Access may be made from the steam tunnel or from topside thru a secured 4'x4' hatch opening. When access into this space is made from the street level, workers must climb down a fixed steel rung ladder approximately 9 to 10 feet. At this station, solutions of sodium hypochlorite and potassium hydroxide are fed into the water supply via an automated, closed system. The space is equipped with a blower to continually bring in fresh air. Workers periodically enter the space to check things out. There appears to be no known atmospheric or physical hazards to warrant PRCS procedures. The same minimum precautions as listed under the wastewater treatment vault above should be taken.

- Air handling Systems. These are large plenum areas for air supply. Workers must periodically enter to change filters and perform basic maintenance. Entrance is thru conventional sized doors, approx. 3'x8'. There appears to be no hazards in this space to require PRCS procedures. However, lockout/tagout provisions may apply.
- Cooling towers. These structures located on top (roof) of the Physical plant building. Workers performing maintenance are essentially in areas open to the outside atmosphere. Accordingly, this is not considered to be a permit required space. However, fall protection is needed and Lockout/tagout procedures may apply.
- Steam Tunnels. This is a network of sub level tunnels that connect various buildings throughout the campus. Approx. 2 miles in total length. Egress into and out of the tunnel may be made thru relatively large openings, 6'x6' and walking along the tunnel route is somewhat unrestricted except in vicinities of the tunnel where there are numerous overhead pipes and where the ceiling height becomes lower. The tunnels have access to the open atmosphere with no known airborne hazards present. However, workers entering or passing through the tunnels need to be mindful of the potential exposures to physical hazards such as ruptured steam lines, faulty wiring or low overhead ceilings, etc. Minimum precautions to be taken for workers assigned to enter and work in the tunnel should include the following:
 1. use of "Buddy" system.
 2. two way radio contact or some other means of ample communications between workers and dispatcher.
 3. carry or wear oxygen indicator
 4. apply lockout/tagout procedures when working on steam lines.
 5. flashlights
- Power Plant Boilers. Workers from time to time must enter the firebox of boilers to remove soot and other debris from the internal surfaces. Entry is made thru a hatch opening near floor level. Workers wear respiratory protection and the work is done under ventilated conditions, (forced ventilation). Minimum precautions to be taken should include:
 1. initial and periodical testing for oxygen and carbon monoxide.
 2. an observer stationed outside the boiler to maintain contact with the entrants and watch for any mishaps.
 3. apply lockout/tagout procedure as appropriate.
- Stormwater/Sewer Manholes. There are several of these spaces located throughout the campus. Access is generally via manhole covers at street level, approx. 20" dia. These spaces range in depth from approx. 4' to 10', the majority of them being at 8 to 10 feet down. Depending on the configuration of any given space and the potential for one or more atmospheric contaminants, this type of space should be

treated as a PRCS until determined otherwise. With each given situation, the job supervisor/manager should proceed as follows:

1. determine need to enter space and what work parameters will be involved.
 2. what is in the space? Any mechanical, electrical, or other potential physical hazards? Any chemicals, organic materials or other possible sources that could give rise to a hazardous atmosphere?
 3. if the answer for #2 is “yes” or “possibly” and the hazards cannot be eliminated, then PRCS conditions prevail and appropriate procedures outlined under Section VIII need to be followed.
 4. if the only hazard is determined to be atmospheric which can be controlled and maintained safely by forced ventilation, the written permit will not be required. See section IX.
 5. otherwise the minimum precautions listed under entry into the wastewater and water supply vault spaces should be applied.
- Underground Utility Vaults. Reserved
 - Elevator Pits. Reserved
 - Steam drum. Reserved