

# CONFINED SPACE ENTRY PROGRAM

## INTRODUCTION

Weber State University workers are, on occasion, required to enter confined spaces in order to maintain university operations. Personnel who are involved in confined space operations face dangers such as atmospheric, chemical, explosion, mechanical, electrical, and engulfment hazards. In addition, in the event of an accident, a rescue operation may be difficult, or dangerous. WSU's Environmental Health and Safety (EH&S) Office has written a Confined Space Entry Program to protect our employees, and to comply with standards set by the Occupational Safety and Health Administration. This program establishes guidelines to help ensure that employees follow proper working procedures whenever they enter confined spaces. A copy of this Confined Space Entry Program is available from the Environmental Health and Safety Office upon request and on the EH&S Web site at <http://safe.weber.edu/ehs>. Contact EH&S at 626-7823 for answers to questions.

## CONFINED SPACE ENTRY PROGRAM ELEMENTS

WSU's Confined Space Entry Program includes the following elements:

- SECTION 1: Evaluation and Classification of WSU's Confined Spaces
- SECTION 2: General Rules for Entering Confined Spaces
- SECTION 3: Instructions for Requesting a Confined Space Entry Permit
- SECTION 4: Operating Procedures for Employees Who Work in Permit Spaces
- SECTION 5: Alternate Entry Procedures for Confined Spaces with Hazardous Atmospheric Conditions Only
- SECTION 6: Instructions for Working with Construction Contractors
- SECTION 7: Duties and Training Requirements for Entry Personnel
- SECTION 8: Rescue and Emergency Procedures

## SECTION 1: Evaluation And Classification of WSU's Confined Spaces

A. Identified *permit required* confined spaces (See APPENDIX C for definitions.) which fall within WSU's working parameter include, but are not limited to the following areas:

1. All sanitary and storm sewer manholes.
2. All meter vaults, valve boxes, etc., which meet the definition of confined spaces and are accessible to employees.
3. All steam generators, boilers and fireboxes with openings accessible to employees at the Heat Plant and other locations.
4. All storage tanks or enclosed storage bins with openings accessible to employees.
5. Any confined space with electricity, machinery or other moving parts that could harm workers if suddenly energized.
6. Manholes that have electrical components, water pipes, etc.
7. Dust collecting bins with openings accessible to employees.

8. Any other areas as designated by the WSU confined space entry program manager.
- B. Identified *Non-Permit Required* Confined Spaces (see appendix A for definition), that fall within the WSU working parameter include, but are not limited to, the following areas:
1. Properly ventilated maintenance tunnels.
  2. HVAC, acid storage/chiller containment open to the atmosphere.
  3. Stewart bell tower.
  4. WSU hazardous materials storage facility.
  5. Crawl spaces under the buildings.
  6. Housing areas which include pipe chases, crawl spaces between floors, maintenance tunnels.
  7. Telecommunications manholes.
  8. Any other areas as designated by the WSU confined space entry program manager.
- C. Confined spaces classified as Non-Permit Required may only be entered if one of the following conditions are met.
1. The two man rule is used.
  2. A written log in and log out procedure with the respective supervisor is used.
  3. Communication through telephones or two way radios is maintained.
- D. As confined spaces in various locations through out campus are identified, a confined space inventory will be kept and updated as necessary. It will include the location, description, classification, actual or potential hazards and any monitoring results that have been obtained. This inventory will be located in the Environmental Health and Safety Office.

## **SECTION 2: General Rules For Entering Confined Spaces**

- A. All permit required confined spaces, except manholes, will be labeled with a danger sign that has the following information:
1. Permit required confined space.
  2. Do not enter.
  3. For entry approval call the Environmental Health and Safety Office at extension 7823.
- B. The configuration of some confined spaces do not readily allow for a sign. Employees must not solely rely on a warning sign. If a space is encountered that does not have a sign posted and is suspected to be a permit required confined space, contact the confined space program manager or environmental safety manager. Employees must not enter these spaces until a determination is made. An example of this would be manholes within WSU working parameter. They are considered to be permit required confined spaces. However, because of the large number of manholes, they may not be labeled as such. Training will be provided to alert employees that permits are required before entry into manholes is permitted.

- C. If a fixed ladder is not present in a confined space that is over 4 feet deep, a proper ladder must be used.
- D. If a fall hazard exists in a permit required confined space, or if the space is over 5 feet deep, or if there is an engulfment hazard, the entrant must wear a full recovery harness with a "D" ring located on the upper back between the shoulder blades and be attached to a safety line and to a mechanical drop/retrieval system.
- E. In permit spaces that exhibit multiple hazards (i.e., atmospheric and physical hazards), regular operating procedures listed in Section 4 of this program must be followed.
- F. In a permit required confined space that only has an atmospheric hazard that can be controlled by ventilation, alternate permit required confined space entry procedures may be followed. (See Section 5 of this program.)
- G. Except for SCBA respirators, no cylinders containing any type of compressed gas shall be taken into a confined space.
- H. Where a known atmospheric hazard exists, an MSDS shall be posted by the entrance of the permit required confined space.
- I. Each department head or supervisor is responsible for contacting the Environmental Health and Safety Office if they need help determining whether spaces in their areas should be identified and labeled as confined spaces.
- J. Department heads or supervisors may not enter, or allow their employees to enter permit required confined spaces which are not labeled. If they are aware that unlabeled permit required confined spaces exist in their areas, they must report them to the Environmental Health and Safety Office so they can be properly labeled.
- K. If welding, cutting, burning, or other type of hot work is to be done in a confined space, a hot work permit must be obtained from the WSU fire marshal.

### **SECTION 3: Instructions For Requesting a Confined Space Entry Permit**

- A. Anyone planning to enter a permit required confined space must, *before entering the space*, obtain an entry permit from the confined space program manager at extension 7823.
- B. If a situation occurs that requires a permit "after hours" contact the central dispatch office at extension 6460. They will contact a member of the Environmental Health and Safety Office, who will then assist in providing a permit for the entry.

- C. A qualified person (See appendix A for definition.) from the Environmental Health and Safety Office shall survey the permit required confined space and administer the testing and pre-entry procedures to insure that safe entry conditions exist.
- D. Once the pre-entry testing has been done, a qualified person will issue a permit. (See sample permit Appendix F.) The permit must identify the following:
1. Location of the confined space.
  2. Purpose of entry.
  3. Date, time and duration of entry.
  4. List of authorized attendants and entrants.
  5. Identified space hazards and the methods of control.
  6. Equipment necessary for working in the space.
  7. Initial and subsequent testing results.
  8. Rescue information.
  9. Additional required permits, if needed.
  10. Necessary authorization signatures.
- E. The confined space entry permit must be conspicuously posted at the entrance of the space so that the entrants can confirm the pre-entry preparations have been completed.
- F. Each person involved with the confined space must, for his own safety, be required to observe the instructions on the permit.
- G. The permit is valid only for the time required to complete the assigned task or job identified on the permit. If an additional task arises that needs to be addressed a new permit must be issued.
- H. All WSU employees must be properly trained on the information contained on the permit prior to working in confined space areas.

#### **SECTION 4: Operating Procedures for Employees Who Work in Permit Spaces**

- A. Preparing to enter a permit required confined space:
1. When preparing to enter a permit confined space, *entrants or attendants must*:
    - a. Obtain an entry permit from the Environmental Health and Safety Office extension 7823.
    - b. Contact the Environmental Health and Safety Office to test the atmosphere of the confined space to ensure that:
      - 1) Oxygen content is greater than 19.5% and less than 21.5%.
      - 2) Flammable gas is less than 10% of the Lower Explosive Limit.
      - 3) Toxic gases and vapors do not exceed the Permissible Exposure Limit .
    - c. Isolate all mechanical or electrical hazards in the space by following the written Lockout/Tagout procedures.

- d. Assist in identifying protective measures to take if any atmospheric or physical conditions exist that make the space unsafe to enter.
- e. Obtain any equipment necessary to complete the job. See appendix E for a suggested list of equipment that may be needed. If certain equipment is not available through your department, contact the Environmental Health and Safety Office.
- f. Each authorized entrant who enters a permit required space shall wear a retrieval system to facilitate a non-entry rescue. (See section 8 B for retrieval system requirements). Retrieval equipment is made available through the Environmental Health and Safety Office (7823). If the retrieval system would increase the overall risk of entry, or would not contribute to the rescue of the entrant, other methods may be considered.
- g. Obtain a hot work permit, if necessary, by contacting the WSU fire marshal at extension 7220.
- h. Place any necessary signs or barriers around the space to prevent unauthorized entry and to control hazards created by opening up the space.
- i. After a qualified staff member has completed and signed the entry permit, review it to insure that all the requirements are met, and that you understand the contents of the permit.
- j. Brief all assigned workers on their roles, the work to be done, communication requirements, potential hazards and emergency procedures. This must be accomplished before anyone is allowed to enter the space.

B. Working within a confined space:

1. Entrant duties:
  - a. Perform only the work specified on the entry permit. If conditions arise that require additional work to be performed, contact the Environmental Health and Safety Office to do additional testing.
  - b. Maintain contact with the attendant through visual, radio, or other means.
  - c. Remain alert to any hazardous changes in the atmospheric conditions of the space.
  - d. Remain aware of their physical senses, headache, fatigue, etc.
2. Attendant duties:
  - a. Maintain constant contact with the entrant.
  - b. Stop the work and have all the entrants evacuate the space if a change in the atmosphere is noticed. Then call the Environmental Health and Safety Office for assistance.
  - c. Monitor the entrants behavior and watch for signs of fatigue, dizziness, etc.
  - d. Stop the work and have all entrants evacuate the space if an emergency occurs, and call 911 for assistance.

- e. Attempt a non-entry rescue if an entrant is injured or unconscious. If a non-entry rescue is not possible, wait for emergency help to arrive. *The attendant shall not enter the space to attempt a personal rescue.*
- C. Finishing work in a confined space:
1. The permit must be canceled when any one of the following conditions are met:
    - a. The work is completed.
    - b. A condition arises that creates a hazardous condition in the space.
    - c. The space is left unattended for a long period of time, creating the potential for a change in entry conditions.
  2. All entrants must exit the space and the space must be closed. All covers, barricades, signs, etc., must be replaced.
  3. Any problems encountered during an entry operation must be noted on the permit so that appropriate revisions to the permit space program can be made to prevent reoccurrence of the problem.
  4. The canceled permit must be sent to the Environmental Health and Safety Office to be maintained for one year and used for database tracking and annual evaluation of WSU's Confined Space Entry Program.

## **SECTION 5: Alternate Entry Procedures for Hazardous Atmospheric Conditions Only Spaces**

- A. Under certain conditions, confined space entry procedures may be altered. To alter entry procedures, the person authorizing the permit must show that:
1. The *only* hazard in the space is a potential or actual atmospheric hazard.
  2. A safe atmosphere can be maintained by continuous forced air ventilation.
- B. To use the alternate entry procedures, all physical hazards, such as mechanical equipment, must be safely locked out from outside the space prior to entry.
- C. If it is necessary to enter the space to isolate it, regular permit required confined space entry procedures must be followed.
- D. The following procedures may only be followed in a space in which *only* hazardous atmospheric conditions exist, **and** only after all mechanical hazards have been locked out:
1. Contact the Environmental Health and Safety Office of your intent to enter the space, and notify them that you suspect the only hazard within the space is a hazardous atmosphere. Request a confined space entry permit from the Environmental Health and Safety Office.
  2. A qualified staff member will conduct the necessary tests to confirm that the space is a hazardous atmosphere only space. If it is, it will be noted on the entry permit for the records.

3. After conditions in the space are determined to be safe, neither a permit or an attendant is required.
4. The internal atmosphere of the space must be tested continually while entrants are in the space to confirm that the atmospheric hazards remain eliminated and that the forced air ventilation, if required, is functioning properly. *All air monitoring results must be documented by a qualified staff member, or a designated employee.*
5. If a hazardous atmosphere is detected during entry, all entrants must exit the space and a regular confined space entry permit must be obtained before work is resumed.

## **SECTION 6: Instructions for Working with Construction Contractors**

- A. Facilities Management responsibilities:
  1. Inform the contractor if the area they are going to work in contains a permit required confined space.
  2. Inform the contractor that entry must be done in compliance with WSU's written Confined Space Entry Program.
  3. Inform the contractor that it is their responsibility to contact the Environmental Health and Safety Office, at extension 7823, to obtain a copy of WSU's written confined space entry program.
- B. Environmental Health and Safety Office responsibilities:
  1. Inform the contractor of the known hazards associated with the space.
  2. Inform the contractor of any precautions or procedures that the university has implemented for employee protection if such historical information is available.
  3. Maintain the canceled permit for one year.
- C. Contractor responsibilities:
  1. Refrain from entering permit required confined spaces on WSU property without prior approval from the Environmental Health and Safety Office.
  2. Coordinate entry operations with the University if University employees are working in or near the space.
  3. Inform WSU's Environmental Health and Safety Office of the confined space program the contractor will follow.
  4. Ensure that all work is done in compliance with all state and federal regulations.
  5. Return the completed permit to the Environmental Health and Safety Office upon closure of the space.
  6. Inform WSU's Environmental Health and Safety Office of any hazards the contractor confronts or creates in the permit space during the contractor's entry.

**SECTION 7: Duties and Training of Confined Space Entry Personnel**

- A. The WSU Environmental Health and Safety Office will provide training for all personnel assigned to perform work in confined spaces. These personnel must receive appropriate training *before* being allowed to perform any tasks in confined spaces.
- B. Employees may work as entry supervisors, entrants and attendants. It may be necessary for individuals to fulfill multiple roles. The policy of the WSU program is to train all personnel for all positions to provide depth of resources and to give each employee a full understanding of the WSU Confined Space Entry Program.
- C. All employees who will be required to work in confined spaces will receive training on the following:
1. Regulations for permit confined space operations.
  2. Basic definitions and purpose of the permit system.
  3. Evaluation of potential hazards involved with confined space work, including self assessment and recognition of exposure signs.
  4. Control of potential or existing hazards through ventilation, personal protective equipment (PPE), control of hazardous energy.
  5. Selection and use of proper PPE.
  6. Selection and use of proper equipment specific to the needs of the confined space environment, including communication, personal protection, ventilation, lighting, barriers, shields, ladders, rescue, emergency and any other equipment necessary for safe entry into and rescue from permit spaces.
  7. Recognition of conditions and signs which require evacuation of a space.
  8. Emergency response and rescue.
  9. Duties of the entry supervisor, authorized entrant and attendant.
  10. Review of WSU's written Confined Space Entry Program.
- D. There are three basic roles in a permit required confined space entry operation: entrant, attendant and entry supervisor. WSU's Environmental Health and Safety Office will ensure that all affected employees understand each role.
1. Entrant responsibilities:
    - a. Know the hazards and consequences of exposure.
    - b. Know the proper equipment and how to use it.
    - c. Ensure communications requirements are met.
    - f. Know the general duties of attendants and entry supervisors.
    - g. Alert the attendant when hazards, warning signs or symptoms appear.
    - h. Know the proper exit methods from the space.
  2. Attendant responsibilities:
    - a. Know the hazards faced during entry and the consequences of exposure.
    - b. Maintain a count of workers in the space and insure only authorized persons enter the space.

- c. Maintain watch outside the space until all entrance have exited or until properly relieved of duty.
  - d. Maintain constant communication with the entrant, using visual, radio or other sufficient means.
  - e. Evacuate the entrants from the space if a problem or emergency occurs.
  - f. Know the proper use of the required equipment.
  - g. Perform a non-entry rescue, if necessary.
  - h. Summon rescue and emergency services, if necessary
3. Entry supervisor responsibilities:
- a. Know the potential hazards and signs of exposure during entry.
  - b. Ensure, before entry, that all information on the permit is correct and all conditions required on the permit are met.
  - c. Enforce permit requirements throughout the evolution of the work done in the space and ensure that all entrants and attendants know their responsibilities and entry procedures.
  - d. Remove any unauthorized personal from the work space.
  - e. Terminate the entry permit and notify the Environmental Health and Safety Office when the job is complete, or if hazardous conditions become apparent.

**SECTION 8: Rescue and Emergency Information Procedures**

A. Designated WSU employees will serve as a primary rescue team for Weber State University.

Current team members include:

- Nancy Fox, Environmental Health and Safety Office
- Jolene Clark, Environmental Health and Safety Office
- Richard Sandau, Environmental Health and Safety Office
- Patrick Clark, Environmental Health and Safety Office
- Mike Slyter, Refrigeration Shop
- Destry Labrum, Refrigeration Shop
- Ralph Frederiksen, Plumbing Shop
- Todd Lloyd, Plumbing Shop
- Mike Jones, Automation/Heat Plant
- Viron Lynch, Automation/Heat Plant

Each member shall trained in confined space rescues no less than once every 12 months by using simulated, or actual confined spaces, and shall be trained in the following rescue duties:

- 1. Proper use of personal protective equipment, and any other equipment necessary for making rescues from permit spaces.
- 2. Knowledge of the entrants and attendants duties and responsibilities.
- 3. Basic first-aid and CPR.

- B. The Ogden City Fire Department will be a secondary rescue team for Weber State University. WSU's primary rescue team will provide the Ogden City Fire Department with information concerning the known or potential hazards associated with identified confined spaces on campus. Ogden City Fire Department will also have access to WSU's confined spaces so they may perform practice rescue operations.
- C. General rules and equipment for emergency rescue:
1. When entering a permit required confined space with existing or potential hazards, authorized entrants must wear retrieval systems to facilitate non-entry rescues. A retrieval system shall consist of a 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.
  2. If the permit space is more than five feet deep, the retrieval line shall be attached to a mechanical device outside the permit space to aid in rescue.
- D. If an entrant becomes disabled or hurt while in a confined space the attendant must perform the following *non-entry* rescue procedures:
1. Notify the University Police Dispatch Center at extension 6460 by radio or telephone. The dispatcher will notify a member of the primary rescue team.
  2. Attempt a non-entry rescue if feasible, (if it does not create further hazard for the entrant), by using the retrieval line, body harness and tripod.
  3. If the attendant is able to remove the victim by non-entry rescue procedures, the attendant may administer first aid within the limits of his/her training until further help arrives.
  4. If the attendant is unable to remove the victim using non-entry means, the attendant must wait for emergency help to arrive.

**NOTE: The attendant is not to enter the confined space to attempt a personal rescue.**

## APPENDIX A: DEFINITIONS

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| <b>Acceptable entry conditions</b>        | The conditions that must exist in a permit space to allow entry and to ensure that employees involved with a permit-required confined space entry can safely enter into and work within the space.   |
| <b>Attendant:</b>                         | An individual stationed outside one or more permit spaces who monitors the authorized entrants and who performs all Attendant's duties assigned in the employer's permit space program.<br>Authorized entrant: An employee who is authorized by the employer to enter a permit space.  |
| <b>Blanking or blinding:</b>              | 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 is capable of withstanding the maximum pressure of the pipe, line or duct with no leakage beyond the plate.   |
| <b>Communication (which may be used):</b> | Visual, voice, telephone, two-way radio.   |
| <b>Confined space:</b>                    | A space that:<br>(1) Is large enough and so configured that an employee can bodily enter and perform assigned work; and<br>(2) 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.); and<br>(3) Is not designed for continuous employee occupancy.<br>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. |
| <b>Emergency:</b>                         | Any occurrence (including any failure of hazard control or monitoring equipment) or event internal or external to the permit space that could endanger entrants.   |
| <b>Engulfment:</b>                        | 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 permit-required confined space. 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 (permit):** The written or printed document that is provided by the employer to allow and control entry into a permit space.

**Entry supervisor:** The person (such as the employer, foreman or crew chief) responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations and for terminating entry as required by this section.

**NOTE:** An entry supervisor also may serve as an Attendant or as an authorized entrant, as long as that person is trained and equipped as required by this section for each role he or she fills. Also, the duties of entry supervisor may be passed from one individual to another during the course of 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:

- (1) Flammable gas, vapor or mist in excess of 10 percent of its lower flammable limit (LFL);
- (2) Airborne combustible dust at a concentration that meets or exceeds its LFL. This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 feet or less.
- (3) Atmosphere is oxygen deficient; the oxygen concentration is below 19.5 percent.
- (4) Atmosphere is oxygen enriched; the oxygen concentration is above 23.5.
- (5) Atmospheric concentration of any substance for which a dose or a permissible exposure limit is published 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 covered by this provision.

(6) 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 Communication Standard, section 1910.1200 of this Part, published information and internal documents can provide guidance in establishing acceptable atmospheric conditions.

**Hot work permit:**

The employer's written authorization to perform operations (for example, riveting, welding, cutting, burning and heating) capable of providing a source of ignition.

**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 permit space.

**NOTE:** Some materials such as hydrogen fluoride gas and cadmium vapor, may produce immediate transient effects that, even if severe, may pass without medical attention, but are followed by sudden, possibly fatal collapse 12-72 hours after exposure. The victim "feels normal" from recovery from transient effects until collapse. Such materials in hazardous quantities are considered to be "immediately" dangerous to life or health.

**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; miss aligning 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.

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| <b>Line breaking:</b>   | The intentional opening of a pipe, line or duct that is or has been carrying flammable, corrosive or toxic material, an inert gas or any fluid at a volume, pressure or temperature capable of causing injury.   |
| <b>Non-permit confined space:</b>                                     | 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.  |
| <b>Permit-required confined space (permit space):</b>                 | A confined space that has one or more of the following characteristics:<br>(1) Contains or has a potential to contain a hazardous atmosphere;<br>(2) Contains a material that has the potential for engulfing an entrant;<br>(3) 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<br>(4) Contains any other recognized serious safety or health hazard. |
| <b>Permit-required confined space program (permit space program):</b> | The employer's overall program for controlling and, where appropriate, for protecting employees from, permit space hazards and for regulating employee entry into permit spaces.   |
| <b>Permit system:</b>   | The employer's written procedure for preparing and issuing permits for entry and for returning the permit space to service following termination of entry.   |
| <b>Prohibited condition:</b>  | Any condition in a permit space that is not allowed by the permit during the period when entry is authorized.  |
| <b>Rescue service:</b>  | The personnel designated to rescue employees from permit spaces.   |
| <b>Retrieval system:</b>  | The 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 spaces.  |
| <b>Testing:</b>   | The process by which the hazards that may confront entrants of   |

a permit space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit space.

**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.

**NOTE:** All Permit Required Spaces where possible will be identified with a warning sign which will contain as a minimum the following: **DANGER-PERMIT REQUIRED  
CONFINED SPACE, DO NOT ENTER. FOR ENTRY  
APPROVAL CALL THE ENVIRONMENTAL SAFETY  
OFFICE AT 7823.**

## APPENDIX B: Atmospheric Testing of Confined Spaces

- A. Atmospheric testing of confined spaces is required for two distinct purposes:
  - 1. To evaluate the hazards of the permit space.
  - 2. To verify that acceptable entry conditions exist.
- B. All permit required confined spaces must be tested before entry to ensure that the atmosphere meets all safety and health standards which are required for worker occupancy.
- C. Testing must be performed by authorized representatives of the Environmental Health and Safety Office and/or qualified designees, who are assigned in writing to perform such duties.
- D. WSU policy states that confined spaces must be 100% clear of any measurable contaminant and oxygen content must be between 19.5% and 23.5% prior to entry.
- E. Atmospheric testing must be done prior to any initial venting or purging of the space.
- F. An atmosphere which contains a measurable contaminant must, *prior to entry*:
  - 1. Be ventilated with forced air until the contaminant is completely purged.
  - 2. Have appropriate continuous ventilation and monitoring strategies put into effect and annotated on the entry permit.
- G. Air monitoring equipment used at WSU (Industrial Scientific Multi-gas monitor) shall be calibrated by the Environmental Health and Safety Office as instructed by the manufacturer. A calibration log will be maintained along with pertinent information and be kept on file for the life of the instrument, plus one year.
  - 1. Order of testing will be:
    - f. Oxygen content
    - b. Combustible gasses
    - c. Toxic gases or vapors
- H. The atmosphere must be tested at the bottom, top and middle of all confined spaces and continuously monitored while work is being conducted in the confined space. If the confined space is left for any reason, the atmosphere must be re-tested before anyone is allowed to re-enter the space.
- I. Lockout/Tagout procedures must be in effect as required prior to testing if practicable.
- J. If the space is filled with water, the water must be completely pumped out and the space uncovered for 30 minutes prior to testing.
- K. The following list gives personal exposure limits for some of the most common hazards found in confined spaces:

1. Oxygen deficiency ) oxygen less than 19.5% per volume of air.
2. Oxygen enriched ) oxygen level above 23.5 % per volume of air.
3. Carbon monoxide–35 parts per million (ppm), action level 17 ppm.
4. Hydrogen sulfide–10 ppm.
5. Carbon dioxide–5000 ppm or .5% of the enclosure, action level 2500 ppm.
6. Chlorine–1 ppm.

## APPENDIX C: Ventilation of Confined Spaces

- A. Employees shall not be allowed to enter a space with a hazardous atmosphere or continue to work in a space where the atmosphere becomes hazardous after entrants are inside.
- B. Some permit required confined spaces contain an actual or potential atmospheric hazard that could present a safety or health risk to an entrant. To maintain a safe atmosphere during entry, it may be necessary to purge or flush the space or to use continual forced air ventilation.

**NOTE: Control of atmospheric hazards through forced air ventilation does not constitute elimination of the hazards, it is only a control measure.**

- C. Continuous forced air ventilation shall be used as follows:
  - 1. Ventilation equipment used in confined space entry shall consist of the blower and duct work provided by the Environmental Health and Safety Office (ext. 7823).
  - 2. Prior to entry, the space shall be ventilated for the time required, according to the size of the space, using mechanical ventilation equipment.
  - 3. An employee may not enter a space until forced air ventilation has eliminated any hazardous atmosphere.
  - 4.. The forced air ventilation shall be directed to ventilate the immediate areas within the space where an entrant will work and shall continue until all entrants have left the space.
  - 5. The air supply for the forced air ventilation shall be from a clean source and may not increase the hazards in the space. (*Pure oxygen shall not be used to ventilate an area.*)
  - 6. Spaces shall be continuously ventilated when tasks producing fumes, vapors or mists are being performed, such as welding, cutting, removing sludge, and painting.
- D. Prior to and during entry, a qualified staff member shall test the atmosphere in the space as necessary to ensure that the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere.
- E. Before completing and signing the entry permit, the Environmental Health and Safety Office shall verify that mechanical ventilation has controlled the atmosphere.
- F. If a hazardous atmosphere is detected during entry:
  - 1. All entrants shall immediately leave the space.
  - 2. The entry supervisor shall evaluate the space to determine how the hazardous atmosphere developed.
  - 3. The entry supervisor shall implement procedures to protect employees from the hazardous atmosphere before any subsequent entry takes place.

## APPENDIX D: SEWER MANHOLES

- A. Sewer entry differs from other permit entries in the following ways:
- a. There is rarely any way to completely isolate the space (a section of a continuous system) being entered.
  - b. Because isolation is not complete, the atmosphere may suddenly and unpredictably become hazardous from causes beyond the control of the entrant or the entry supervisor.
- B. Because of these additional hazards, the following extra precautions shall be used for entry into sewer manholes:
1. Only WSU Plumbing Department employees shall be trained as entrants.
  2. Entrants shall be equipped with an atmospheric monitor (TMX 412) which sounds an audible alarm whenever one of the following conditions are encountered:
    - a. Oxygen concentration of less than 19.5 percent.
    - b. Flammable gas or vapor is 10 percent or more of the lower flammable limit (LFL).
    - c. Hydrogen sulfide is at or above 10 ppm.
    - d. Carbon monoxide is at or above 35 ppm.
  3. Where several entrants are working together in the same immediate location, one atmospheric monitor used by the lead entrant is acceptable.
  4. All pumps and lines which may cause contaminants to flow into the space shall be effectively isolated to prevent development of dangerous air contamination or engulfment. Not all laterals to sewers or storm drains require blocking. However, where experience or knowledge of industrial use indicates there is a reasonable potential for contamination of air or engulfment into an occupied sewer, then all affected laterals shall be blocked.
  5. If blocking and/or isolation requires entry into the space, the provisions for entry into a permit-required confined space must be implemented.
  6. All storm and sanitary sewers shall be considered permit-required confined spaces until the pre-entry procedures demonstrate otherwise.
  7. Mechanical ventilation systems, where applicable, shall be set at 100% outside air. Where possible, additional manholes shall be opened to increase air circulation. Portable blowers shall be used to augment natural circulation if needed. Entry shall not begin until testing has demonstrated that the hazardous atmosphere has been eliminated.

## APPENDIX E: EQUIPMENT

The following checklist may be used as a guide for pre-planning and pre-entry purposes. It is only a guide and may be added to and deleted from to meet operational requirements.

| ✓ | Personal Protective Equipment    |
|---|----------------------------------|
|   | Respiratory protection           |
|   | Hard hat                         |
|   | Eye protection                   |
|   | Hand protection                  |
|   | Hearing protection               |
|   | Clothing, coveralls, boots, etc. |

| ✓ | Lockout/Tagout Equipment                                     |
|---|--|
|   | Locks, tags, etc.  |
|   | Blanking & blinding gear, etc.                               |
|   | Notice to others who may be affected by a power outage, etc. |
|   |  |

| ✓ | Lighting Equipment |
|---|--------------------|
|   |                    |

| ✓ | Communications Equipment |
|---|--------------------------|
|   | Radio, cell phone, etc.  |
|   | Emergency phone numbers  |
|   |                          |

| ✓ | Retrieval and Egress Equipment          |
|---|---|
|   | Safety harness                          |
|   | Life line & Mechanical retrieval system |
|   | Ladder                                  |

| ✓ | Emergency Equipment |
|---|---------------------|
|   | First aid kit       |
|   | Fire extinguisher   |
|   | Drinking water      |

| ✓ | Ventilation Equipment |
|---|-----------------------|
|   | Portable Blower       |
|   | Ducting               |

| ✓ | Monitoring Equipment |
|---|----------------------|
|   | TMX 412 gas monitor  |

| ✓ | Barricade Equipment |
|---|---------------------|
|   | Safety cones        |
|   | Barricades          |
|   | Signs               |

If you do not have access to some of this equipment call the Environmental Health and Safety Office for assistance, 626-7823.



# CONFINED SPACE ENTRY PROGRAM

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