

## CONFINED SPACE ENTRY PROGRAM

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### **1.0 Policy:**

It is the policy of Marquette University that entry into a confined space will be done in accordance with OSHA standards and other regulatory guidelines which may apply. No individual shall enter a confined space without following the Confined Space Entry Program.

### **2.0 Purpose/Scope:**

1. To establish a clear and consistent procedure for confined space entry on the Marquette campus.
2. The requirements of this document apply to all Marquette employees including employees.

### **3.0 Definitions:**

1. **Alternate Entry Procedure:**  
A procedure that may be used to enter a confined space if the only hazard present in the space is atmospheric in nature and: The atmospheric hazard can be controlled by mechanical ventilation alone; and The permit space will not become immediately dangerous to life and health (IDLH) if the mechanical ventilation should fail.
2. **Attendant:**  
An individual stationed outside one or more permit required confined spaces who monitors the authorized entrants and who performs all Attendant's duties as assigned in this program.
3. **Authorized Entrant:**  
A Marquette employee who is authorized by MU Environmental,

Health & Safety to enter a permit required confined space.

4. **Confined Space:**

A confined space means a space that:

- a. Is large enough and so configured that an employee can bodily enter and perform assigned work; and
- b. Has limited or restricted means for entry or exit (for example, manholes, vaults, and pits are spaces that may have limited means of entry or exit); and
- c. Is not designed for continuous employee occupancy.

5. **Entry Permit:**

The written document provided by MU Environmental, Health & Safety which allows and controls entry into a permit required confined space.

6. **Entry Supervisor:**

The person 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 program.

7. **Hazardous Atmosphere:**

An atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue, or acute illness resulting from the following:

- a. Flammable gas, vapor, or mist in excess of 10 percent of its lower flammable limit (LFL);
- b. Airborne combustible dust at a concentration that meets or exceeds its LFL; (note: this condition may be approximated as a condition in which the dust obscures vision at a distance of 5 feet or less)
- c. Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent;
- d. Atmospheric concentration of any substance which could result in an exposure greater than the Permissible Exposure Level (PEL).
- e. Any other atmospheric concentration that is immediately dangerous to life and health (IDLH).

8. **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 confined space.

9. **Lower Flammable Limit (LFL):**

The minimum vapor concentration of a flammable liquid in air, below which flame propagation does not occur on contact with an ignition

source.

10. **Non Permit Confined Space:**  
A 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.
11. **Oxygen Deficient Atmosphere:**  
An atmosphere containing less than 19.5 percent oxygen by volume.
12. **Oxygen Enriched Atmosphere:**  
An atmosphere containing more than 23.5 percent oxygen by volume.
13. **Permit Required Confined Space:**  
A confined space that has one or more of the following characteristics:
  - a. Contains or has a potential to contain a hazardous atmosphere;
  - b. Contains a material that has the potential for engulfing an entrant;
  - c. 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
  - d. Contains any other recognized serious safety or health hazard.
14. **Testing:**  
The process by which hazards that may confront entrants of a permit space are identified and evaluated.
15. **Ventilation:**  
A process used to control the atmospheric hazards of confined spaces by replacing unsafe air with clean, breathable air.

#### 4.0 References:

1. Code of Federal Regulations Title 29 Part 1910.146

#### 5.0 Responsibilities:

### **5.1 Department of Environmental Health & Safety**

1. Establish and update the written Confined Space Entry Program.
2. Provide training as necessary.
3. Review records of confined space entry operations.
4. Provide consultation to departments that enter confined spaces.

### **5.2 Facilities Management:**

1. Ensure that all employees who are involved with a confined space entry (including Authorized Entrant, Entry Attendant, and Entry Supervisor), have received training as specified in section 10.0.
2. Provide and maintain equipment that is needed for confined space entry including (but not limited to): atmospheric testing equipment, protective barriers, ventilation devices, and rescue equipment.
3. Ensure that all confined space entries involving PPM employees are conducted according to this procedure.
4. Maintain records of all confined space entries as specified in Section 7.0

### **5.3 Confined Space Entry Supervisor:**

1. Ensure that all persons involved in a confined space entry are properly trained (section 10.0) and follow the procedures outlined in section 7.0.
2. Evaluate and classify the confined space prior to entry (section 7.1).
3. Complete the Confined Space Entry Permit (section 7.1 - 7.3)
4. Ensure that canceled permits are properly filed.

**Note:**  The Entry Supervisor does not need to be present during the entire confined space entry operation.

#### **5.4 Confined Space Entrant(s):**

1. Must have completed the training outlined in section 10.0.
2. Must stay in constant contact with the Attendant (i.e. sight, voice, or radio) during a Permit Required Confined Space entry.
3. Use the appropriate safety equipment as specified on the Entry Permit.

#### **5.5 Entry Attendant:**

1. Must have completed the training outlined in section 10.0
2. Obtain and install the required safety equipment for Permit Required Confined Space entries
3. Monitor pedestrian barriers to protect entrant(s) from external hazards.
4. Monitor the atmosphere within the confined space during the entire entry operation.
5. Must remain in position until relieved by another trained Attendant
6. Ensure that all Lockout/Tagout measures (if implemented) remain in place.
7. Responsible for ordering an evacuation if a situation develops that could endanger the Entrant (see section 7.3)

### **6.0 Confined Spaces on Campus:**

**6.1** Environmental Health & Safety and Facilities Management will jointly determine which types of spaces or specific spaces are defined as "Confined Spaces". A list of these spaces can be found in Appendix A. Spaces that will always be considered "Permit Entry Confined Spaces" will be posted and designated on the list as well.

**6.2** All confined spaces on campus will be considered "Permit Required" until pre-entry procedures determine otherwise (see section 7.1). The only individuals authorized to downgrade the entry requirements for a particular space (i.e. from "permit required to "Alternate Entry Procedure") is a

member of Environmental Health & Safety.

## **7.0 Confined Space Entry Procedures:**

### **7.1 Space Evaluation:**

**Note:** Refer to Appendix B for Confined Space Entry Decision Flow Chart

1. All confined spaces are to be evaluated by an Entry Supervisor and a member of Environmental Health & Safety prior to authorizing an entry (refer to Appendix A for a list of Confined Spaces on campus).
2. The primary purpose of the evaluation will be to determine if the entry will be via "Alternate Entry Procedures" (section 7.2) or by "Permit Required Entry Procedures" (section 7.3).
3. To be reclassified as an "Alternate Entry" space, the following conditions must exist:
  - a. the only hazard in the space is the potential for a hazardous atmosphere; and
  - b. The potential hazard can be eliminated through the use of continuous forced ventilation; and
  - c. Previous and current atmospheric monitoring data (gas tests) must demonstrate that (a) and (b) are true (i.e. there has never been a record of an atmospheric hazard during an entry).
  - d. If the above conditions are true (a, b, and c), and the gas test(s) indicate that the atmosphere is non-hazardous, is then the space may be entered using "Alternate entry Procedures" - Go to Section 7.2.
  - e. If the potential for atmospheric hazard cannot be eliminated with ventilation, the space must be entered using the "permit Required Entry Procedures" - Go to section 7.3.

### **7.2 Alternate Entry Procedures:**

1. Entry Supervisor and a member of Environmental, Health & Safety shall ensure that space has been classified as specified in section 7.1.
2. If an entrance cover must be removed, the opening shall be promptly guarded by railing, temporary cover, or other temporary barrier that will prevent an accidental fall through the opening, and will protect each employee working in the space from foreign

objects entering the space.

3. All hazardous sources of energy shall be locked and/or tagged out.
4. Ensure that the air has been tested for hazardous air contaminants and that the tests were negative. Note: this should have been completed prior to reclassifying space as "Alternate Entry"). Log the test results on the "Confined Space Entry Permit and Record Sheet" (only pre-entry readings need to be entered). The gas detector should be used during the entire entry procedure. Test for the following contaminants, in the order listed:
  - a. Oxygen content;
  - b. Flammable gases and vapors; and
  - c. Potential toxic air contaminants.
5. Entry Supervisor shall fill out the "Confined Space Entry Permit and Record Sheet" (Appendix C).
6. Set up adequate ventilation for the space that will be entered. Ensure that the supply air is taken from a clean source and that the ventilation is allowed to operate for at least 5 minutes prior to entering the space. If the ventilation ceases to operate, all Entrants must leave the space immediately.
7. The Entrant shall immediately evacuate the confined space if he/she becomes aware of a previously unrecognized hazard. If this occurs, the Entrance Permit shall be canceled, and the space must be reevaluated by an Entry Supervisor prior to re-entry.

**Note:**

- a. The Entry Supervisor may act as an entrant during "Alternate Entry Procedure" entries.
  - b. An attendant or Standby person is necessary for "Alternate Entry Procedure" entries.
8. When the confined space entry has concluded, the completed Record Sheet shall be filed and kept on file for a minimum of one (1) year.

**7.3 Permit Required Entry Procedures:**

1. As a minimum, an Entry Supervisor, a member of Environmental, Health & Safety, Entry Attendant and Entrant shall be designated to participate in each Permit Required Confined Space Entry. Note: the Entry Supervisor may act as the Entry Attendant as well.
2. Acquire, inspect and setup and safety equipment required by the

permit including blowers, full body harness, rescue tripod, and traffic control systems.

3. The Entry supervisor shall establish appropriate rescue procedures specific to the space entry and shall list these procedures on the permit.
4. All hazardous sources of energy shall be locked and/or tagged out.
5. If an entrance cover must be removed, the opening shall be promptly guarded by railing, temporary cover, or other temporary barrier that will prevent an accidental fall through the opening, and will protect each employee working in the space from foreign objects entering the space.
6. Test the air for hazardous contaminants and enter the results on the Confined Space Entry Permit and Record Sheet. Continuously sample and record results throughout the entire entry procedure. Refer to section 8.1 for air monitoring guidelines.
7. The Entry Supervisor shall complete and sign the Confined Space Entry Permit (all sections) and Record prior to space entry. The permit conditions, entry precautions, and rescue procedures shall be reviewed with the Attendant and Entrant prior to entry.
8. Prior to entry, the Attendant shall verify that the entry conditions are acceptable.
9. The Entrant must wear retrieval equipment during the entire entry operation.
10. The Attendant will continuously monitor the portable gas detector and record the readings every hour (minimum).
11. An immediate evacuation of the space shall be ordered if the safety equipment fails or if the space becomes, or has the potential to become, immediately hazardous.
12. Upon completion of the job, the Entry Supervisor shall cancel the permit and ensure that the completed permit is placed in the proper department file.

## **8.0 Hazard Control:**

### **8.1 Monitoring Confined Space Air Quality:**

1. Prior to entering a Permit Required or Alternate Entry confined space, prepare the gas detector by ensuring the device has been recently calibrated (check manual for frequency) and is in good working order.

2. Conduct a "bump test". Breathe into the gas detector probe and look for a decrease in the oxygen concentration - the detector should alarm due to the lack of oxygen.
3. Sample the air quality of the space by slightly moving the lid, or by testing the space through the hole in the lid (if available) before completely opening the space.
4. Lower the probe slowly, allowing time for the instrument to detect atmospheric changes at different vertical heights within the space.
5. Measure in the following order:
  - a. Oxygen
  - b. LEL
  - c. H<sub>2</sub>S
  - d. CO

Record the results on the Confined Space Entry Permit Record Sheet.

6. The gas detector shall remain on during the entire entry operation shall be regularly inspected by the Attendant. The Attendant shall also record the gas readings on the Record Sheet at a minimum of one (1) hour intervals.
7. Cease entry operations and remove entry personnel if the following concentrations are exceeded at any time:
  - a. Oxygen reading less than 19.5% or greater than 22.5%
  - b. Combustible gas reading greater than 9% LEL
  - c. H<sub>2</sub>S reading greater than 9ppm
  - d. CO reading greater than 34 ppm

## **8.2 Ventilating a Confined Space:**

1. Set up one or more blowers to provide adequate ventilation for the space. Ventilation must be forced draft discharge of clean air into space (not exhaust of space).
2. Ensure that the ventilation air supply is from a clean source.
3. Allow enough time for blowers to clear the space before entering.
4. Ensure that the blowers remain on during the entire entry operation. If the blower fails, the Entrant must leave the space immediately Note: this applies to both Permit Required and Alternate Entry procedures.

## **9.0 Emergency Rescue from Permit Required Confined Spaces:**

Historically, more rescuers are killed while attempting a rescue than entrants. In light of this fact, emergency rescues within confined spaces should only be attempted by persons who are properly trained and have the proper rescue equipment.

1. All rescues attempted by Marquette personnel will be Non-Entry Rescues (i.e. rescuer will not enter the space at any time during rescue).
2. Retrieval equipment is required for all Permit Required vertical entries greater than 5 ft. Retrieval equipment shall include (but not be limited to) the following:
  - a. Rescue harness (chest or full body)
  - b. Rescue tripod
  - c. Rope or cable (inspected for damage)
3. Entry Supervisor must determine how emergency medical personnel (fire department) will be notified - i.e. radio call to work control.
4. All persons involved in the rescue must have received training and practiced a rescue within the last 12 months.
5. At least one member of the rescue team (i.e. Attendant) must have training in CPR and First Aid.

## **10.0 Training:**

1. All Marquette employees who participate in Permit Required or Alternate Entry Procedures including Entrance Supervisors, Attendants, and Entrants, must receive training in the requirements of this program.
2. All Marquette employees who are designated as rescue personnel must be trained in proper rescue techniques as well as CPR and First Aid.

## **11.0 Contractors:**

1. Contractors that enter confined spaces on the Marquette campus must comply with the Confined Space Standard. Regulations.

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## **Appendix A: Known Confined Spaces on Campus**

| <b><u>Space</u></b>  | <b><u>Location</u></b> | <b><u>Hazard(s)</u></b>                                       |
|----------------------|------------------------|---|
| Electrical vaults    | campus wide            | electrical hazards, low oxygen, asbestos                      |
| Sewer manholes       | campus wide            | carbon monoxide, low oxygen, toxic gases                      |
| Storm drain manholes | campus wide            | carbon monoxide, low oxygen, toxic gases                      |
| Communication Vaults | campus wide            | low oxygen, asbestos, electrical hazards                      |
| Pool Pit             | Rex Center/Rex Plex    | lack of oxygen, toxic gases, drowning                         |
| Sewer Tanks          | campus wide            | toxic gases, low oxygen, drowning, electrocution              |
| Boilers              | Central plant          | lack of oxygen, asbestos, steam, heat, hot water              |
| Steam vaults         | campus wide            | heat, lack of oxygen, asbestos, toxic gases, steam, hot water |