CONFINED SPACE ENTRY PROGRAM

PURPOSE
In accordance with the OSHA Permit-Required Confined Space Standard 29 CFR 1910.146, it is the intent of the University of Southern Indiana to protect all employees from toxic, explosive or asphyxiating atmospheres and from engulfment by loose materials when working in and around confined spaces. This program details the policies, procedures and training that USI will utilize in complying with the standard.

SCOPE AND APPLICATION
This program contains requirements for practices and procedures to protect University of Southern Indiana employees and hired contractors from the hazards associated with confined spaces. It is Environmental Health and Safety's policy that University employees are prohibited from entering confined spaces unless they have been trained accordingly. Contractors may enter USI's confined spaces provided they follow the entry procedures specified in section 10 of this program. All departments are included in the USI Confined Space Program.

RESPONSIBILITIES

EMPLOYEES shall:
- Obtain the required training before entering a confined space.
- Follow the confined space entry procedures and any additional instructions given by their supervisor.
- Not enter a confined space that is suspected of having a hazardous atmosphere, even to rescue a fellow employee.

SUPERVISORS shall:
- Identify which personnel will enter confined spaces.
- Identify and report work areas that have the potential to be confined spaces. This list will be developed with the assistance of Environmental Health and Safety.
- Classify confined spaces as either "permit required" or "non-permit required."
- Inform employees who may enter the permit required confined space by posting danger signs or by arranging training with EHS.
- Prevent unauthorized entry into confined spaces.
- Evaluate respiratory hazards and train personnel on routine measurement or respiratory hazard I confined spaces.
- Conduct a pre-entry briefing to inform entrants of the possible hazards that may be encountered in a confined space.
- Issue and cancel entry permits.
- Maintain canceled permits on file for one year.

ENVIRONMENTAL HEALTH AND SAFETY will be responsible for:
- Develop the University's written permit-required confined spaces program and update it when necessary.
- Provide guidance in the selection of air monitoring equipment and training in its proper use.
- Develop and maintain a program that insures the proper maintenance and calibration of air monitoring equipment.
- Assist in the development of entry procedures, selection and use of respiratory protection and personal protective equipment.
- Assist supervisors in identifying and classifying confined spaces.
- Provide detailed instructions and training on confined space hazards and entry procedures to those who may enter confined spaces.
- Provide instruction to personnel on the proper use of equipment required for confined space entry.
- Conduct annual work area audits to determine compliance with confined space entry procedures.
- Maintain equipment that is used to enter confined spaces.
- Maintain records of equipment maintenance and employee training.

CONTRACTORS shall follow their own procedures: they must provide their procedures to Environmental Health and Safety along with documentation of training.

IDENTIFICATION/EVALUATION/CONTROL OF CONFINED SPACES

IDENTIFICATION – Environmental Health and Safety will identify permit-required confined spaces according to the decision flowchart in Appendix I.

EVALUATION – Environmental Health and Safety will assess each confined space for the following:

- Presence of explosive gases equal to or greater than 10% of lower explosive limit (LEL).
- Oxygen deficiency – A concentration of oxygen in the atmosphere equal to or less than 19.5% by volume.
- Oxygen enriched atmosphere – A concentration of oxygen in the atmosphere above 23.5% by volume.
- Concentrations of carbon monoxide.
- Concentrations of hydrogen sulfide.
- Electric shock by equipment in or taken in to the confined space. (Failure to use lockout procedures)
- Burns by equipment in or taken in to the confined space area.
- Walking/working surfaces.
- Heat stress caused by warm atmosphere inside confined space.
- Noise hazards. Any other recognized hazard.

CONTROL

- Mechanical – Use proper lockout/tagout procedures when needed to prevent hazards within the confined space.
- Ventilation – If exposed to harmful vapors or an oxygen deficient atmosphere exists; a ventilation fan shall be used for the duration of the job.
- Slips and Falls – Use caution if shoes and /or ladders are wet or oily. Inspect shoes prior to entry.
- Burns and Heat Stress – The use of a ventilation fan will provide cooler temperatures. Use caution around hot equipment and avoid overexertion within the space. Take frequent breaks if needed.
- To prevent an explosion, do not use equipment that may cause flame or sparks in an oxygen enriched atmosphere.
- Personal protective equipment (goggles, gloves, dust mask, respirator) shall be worn when a potential hazard exists.
- Any other serious safety or water hazard.

CONFINED SPACE LOCATIONS

The majority of the Utility Tunnels have full sized doors and ample space (28 inches wide) for an employee to traverse them safely. The tunnels are commonly used by maintenance personnel to travel between buildings and house hot and cool water lines, electrical lines and switchgear, fiber optic cable and telephone lines. Also these tunnels do not have limited or restricted means of egress as defined in the standard. An employee would not have to crawl over or under or squeeze around, obstructions to exit the tunnels (see OSHA instruction CPL 2.100-in Appendix II in pertinent part) and thus do not meet the definition of a confined space. These tunnels do not pose a serious safety or health hazard to employees; the equipment and piping runs along one wall and does not interfere with employee egress.

The tunnel to the Physical Activity Center (PAC Tunnel) is an exception. This tunnel meets the definition of a confined space and poses a hazard of entrapment because it is approximately three feet in height. An employee must crawl through it and thus has limited and restricted means of egress. The safest approach is to consider this space a PRCS.

The Science Center Tunnel unlike the others is approximately five and one half feet high and 2 feet wide. These dimensions require an employee to stoop while traversing the tunnel; therefore it meets the definition of a confined space. This tunnel leads to the pipe chase in the Science Center and at this entry point an employee would have to step over pipes on the floor, thereby further restricting egress. No serious hazard was observed in this tunnel which would trigger the PRCS requirements; however if conditions change and hazards exist in this space it would be a PRCS.

The Transformer Vaults throughout the University do not meet the definition of confined spaces because they do not have a limited means of egress. They are rooms with full sized doors and an employee would

not have to go over or under or squeeze around to escape. The hazard in the transformer vaults is the electricity-12,500 Volts. This hazard can be eliminated by locking out the power, which can be done from outside of the room.

The Sump Pump Pits in the University Center, Health Professions Building, Orr Center and Technology Center, meet the definition of PRCS's because of the potential of hydrogen sulfide or methane production from bacterial decomposition, oxygen depletion from iron oxidation and/or microbial metabolism and engulfment by water.

The Detention and Dilution Pits in the Science Center are PRCS's and additionally have the potential for development of an unknown toxic or flammable atmosphere if a spill occurs in the Science Center.

The Main Air Handler in the University Center - old section, would be a confined space because of the 66 inch roof height, which would cause an employee to crouch when occupying the space, thus limiting and restricting egress from the space. An employee could enter the space and walk into the fan blades as they are not guarded and this is a serious hazard. Consequently this is a PRCS.

The remainder of the Air Handlers and air intake rooms are not PRCS because no hazard exists in these spaces and no potential for an atmospheric hazard exists in these spaces.

Physical Plant Boilers #1, 2 and 4. These are PRCS's because of the potential for a hazardous atmosphere from the presence of the natural gas lines. Another hazard that exists in the boilers is that of congestion or entrapment from the configuration of the boiler tubes.

Physical Plant Cooling Tower did not meet the definition of PRCS's. The open surfaced tanks at the bottom were of insufficient depth (18 inches) and (36 inches) to consider the tanks themselves as PRCS'S and the fans were at the top of the tower and would not pose a hazard to employees entering the cooling tower unit.

The 400 Ton Chiller Water Storage Tank in the Physical Plant is a horizontal tank approximately 12 feet high with a manhole type entryway at the top. Employees enter the tank to clean it out and wipe it down. The tank contains water which has a rust inhibitor added to it and is drained before entry. This tank is a PRCS because of the fall hazard that exists when employees enter it on a ladder.

800,000 Gallon Chill Water Storage Tank is a large vertical cylinder with two entryways at the bottom and one at the top. This tank was under construction at the time of observation. This tank is a confined space and when filled with water is a PRCS. After draining the tank and opening all entryways, this tank could be reclassified to non-permit required as long as a hazardous atmosphere does not exist and employees were entering from the bottom. If employees entering the tank were going to create a hazardous atmosphere, for example, by welding, cutting or using chemicals while inside the tank, then the tank would be a PRCS while that work was ongoing. The reclassification of the space should be supported with atmospheric monitoring data to ensure that a hazardous atmosphere would not develop while all entryways are open. Records of this data should be kept to support the reclassification of the space.

PROCEDURES FOR SPECIFIC ENTRIES

Telecommunication manhole entry (See APPENDIX VI - A)
Steam manholes (See APPENDIX VI -B)
Water-meter manholes (See APPENDIX VI - C)
HVAC systems (See APPENDIX VI - D)
Crawl spaces (See APPENDIX VI - E)
Injector pits (See APPENDIX VI - G)

COMPLETION OF WORK

When work in a confined space has been completed or cancelled, the entrant shall verify the following:

- Personnel, equipment and materials have been removed from the space.
- Slip blanks, locks and tags have been properly removed from all valves and disconnected piping lines have been secured.
- Electrical equipment and locks and tags have been properly removed.

- Openings have been secured for normal operations.
- Any contaminated PPE has been properly discarded and/or cleaned, prepared for reuse and stored.
- Monitoring and other equipment has been cleaned and returned to its proper storage area and that any damage to the equipment has been reported to the department supervisor.

RESCUE OPERATIONS

In the event of an emergency requiring entry rescue services, the attendant shall immediately call 7777. A trained rescue team supplied by the Marrs Township Volunteer Fire Department will perform emergency rescues. University employees shall not be permitted to attempt an entry rescue. In the event of an emergency that requires non-entry rescue services, the attendant shall immediately call Security at **812 464-1845**.

TRAINING

Training Overview

Environmental Health and Safety will provide training to all employees whose work is regulated by this program. Through this training, employees shall acquire the understanding, knowledge and skills necessary to safely perform their assigned duties. The training will establish employee proficiency in the duties required by 29 CFR 1910.146 and will introduce the entry requirements for each confined space on campus. Employees will be provided training as follows:

- Before any employee is assigned duties involving confined space entry.
- Before there is a change in assigned duties.
- Whenever there is a change in permit space operations that presents a hazard for which an employee has not been previously trained.
- Whenever Environmental Health and Safety has a reason to believe that either deviation from the permit space procedures is taking place or that there are inadequacies in the employee's knowledge.

Training Outline (See APPENDIX III)
Training will be provided to all personnel who are required to enter permit-required confined spaces. All other personnel will be provided with awareness training.

Written Training Verification
All employees who receive the required permit-required confined space entry training must, upon completion, have a signed and dated verification on file with Environmental Health and Safety. (Appendix IV)

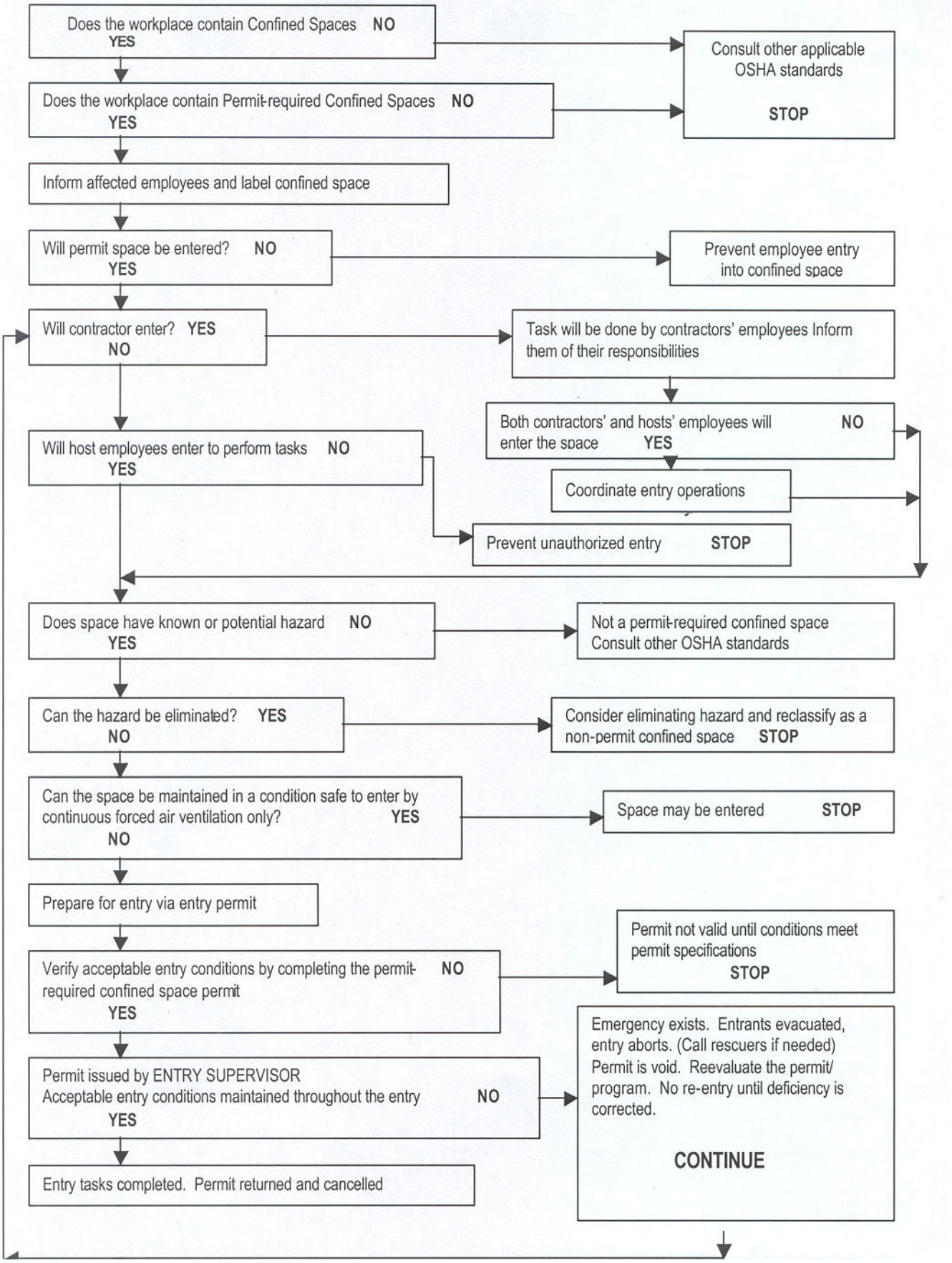
CONTRACTORS
When University of Southern Indiana arranges to have employees of another employer (contractor) perform work that involves permit space entry; the project coordinator will do the following:

- Inform the contractor that the work place contains permit spaces and that entry is only conducted through compliance with a permit space program.
- Supply Environmental Health and Safety with a copy of the contractor's entry procedures and documentation that employees are trained.
- Inform the contractor of the hazards that have been identified.
- Inform the contractor of any precautions or procedures that need to be observed in or near the permit space.
- Coordinate entry operations with the contractor when University employees are working in or near a permit space.
- Coordinate entry operations when there is more than one contractor.
- Debrief the contractor at the conclusion of the entry operations, regarding the program followed, hazard(s) confronted and/or hazard(s) created.

The **contractor** is responsible for the following:

- Obtaining any available information about permit space hazards and entry operations from Environmental Health and Safety.
- Coordinate entry operations when University employees are working in or near the area.
- Inform the project coordinator of entry procedures that will be followed and of any hazards confronted or created.
- Provide formal documentation of their company's entry procedures to Environmental Health and Safety.

APPENDIX I - PERMIT-REQUIRED CONFINED SPACE DECISION FLOW CHART



UNIVERSITY OF SOUTHERN INDIANA

Confined Space Entry Permit

Permit #_____

Department/Shop:_____ **Location:**_____

Description of work to be done:_____

ATMOSPHERIC AND ENGULFMENT HAZARDS

Check all expected hazards:

[ ] Oxygen deficiency (< 19.5%)
[ ] Fire hazard (more than 23.5% oxygen or more than 10% of the LEL)
[ ] Toxic gases, vapors, or dust (greater than PEL or TLV)
[ ] Heat stress/Engulfment
[ ] Other_____
[ ] Hot Work Permit (to be attached – obtained from FES)

ENTRY TEAM DUTIES

Check and identify all that apply:

ENTRY SUPERVISOR	ENTRANT	ATTENDANT	NAME
[ ]	[x]	[ ]	_____
[ ]	[ ]	[x]	_____
[ ]	[ ]	[ ]	_____

SAFETY CONTROLS AND COMMUNICATION PROCEDURES

EQUIPMENT REQUIRED FOR ENTRY:

[ ] Fall protection equipment
[ ] Air mover/ventilator
[ ] GFCI
[ ] Hearing Protection
[ ] Eye Protection
[ ] Hard Hat
[ ] Other Personal Protective Equipment:

_____
_____

ISOLATION:

[ ] Electrical equipment locked out and tagged
[ ] Mechanical equipment locked out and tagged
[ ] Entry ways are blocked open
[ ] Isolation valves closed and locked
[ ] Proper ventilation or purging completed
[ ] Operations notified and understands clearly

COMMUNICATIONS:

[ ] Access to phone
[ ] Radio

TESTING RECORD

Atmospheric Testing: **[X] Continuous** **[ ] Periodic** **Complete information below**

Date/Time					
Oxygen (19.5%-22%)					
Flam. (<10% LEL)					
H_2S (<10 ppm)					
CO (<200 ppm)					
Other:					

Instrument Used: Man:_____ **Model:** _____ **SN:**_____ **Last Cal. Date:**_____ **Initials:**_____

AUTHORIZATION/TERMINATION BY ENTRY SUPERVISOR

Authorization: I certify that all required precautions have been taken and the necessary entry equipment has been provided to safely work in this confined space

Print Name:_____ Signature:_____

Mechanic Signature:_____ **Mechanic Signature:**_____

(Entrant) (Attendant)

[ ] Permit Initiated:_____ **Duration:**_____

Date: _____ **Time:**_____

APPENDIX II – Confined Space Entry Permit *(page 2)*

CONFINED SPACE ENTRY PERMIT

9. Acceptable Entry Conditions

10. Test(s) To Be Taken	Permissible Entry Levels	Test 1	Test 2	Test 3	Test 4
A. Percent of Oxygen	19.5% to 23.5%				
B.					
C.					
D.					
E.					
F.					
G.					
H.					
I.					
Name or Initials of Tester					
Test Times					

11. Rescue and Emergency Services Available:

Name_____ Name_____

Telephone_____ Telephone_____

12. Communication procedures to be used by authorized entrants and attendants.

13. Equipment supplied to the employee.

Yes	No	N/A	Equipment			Description
			(i) Gas Test and Monitoring	Name Serial/Unit No.		
			(ii Ventilating			
			(i) Communications			
			(iv) Personal Protective Equipment	☐ Safety Harness With Life Lines ☐ Respiratory	☐ Hard Hats ☐ Eye ☐ Ear ☐ Face	☐ Hand ☐ Foot ☐ Clothing
			(v) Lighting			
			(vi) Barriers/Shields	☐ Pedestrian	☐ Vehicle	☐ Other
			(vii) Safe Ingress/Egress	☐ Ladders		
			(viii) Rescue and Emergency	☐ Lifelines	☐ Hoists	☐ Resuscitators- Inflatable
			(ix) Other Safety Equipment			

15. Additional Permits Required. ☐ Hot Work ☐ Other

THIS CONFINED SPACE ENTRY PERMIT HAS BEEN CANCELLED:

BY_____ _____ : AM PM _____

Entry Permit Supervisor Time Date

Appendix III – Confined Space Training Outline

Confined Spaces

Hazards of Confined Spaces

Trainer Outline
Goals: This safety session should teach employees to:

- Know the characteristics and hazards of confined spaces.
- Understand how to follow confined space rules and regulations to protect themselves.

Applicable Regulations: 29 CFR 1910.146

1. **OSHA Defines Confined Spaces as Work Areas with Certain Features**
   - Large enough to enter and work in
   - Limited entry and exit areas
   - Not designed to be occupied for extended periods
   - Examples include: tanks, silos, storage bins, hoppers, vaults, pits, furnaces, tunnels, sewers, pipelines, crawl spaces, process vessels or underground areas
   - Confined space tasks include: cleaning, painting, welding, scraping or performing repairs or maintenance.
   - It becomes a permit-required confined space if, in addition, it presents or has the potential for any recognized serious hazard.

2. **Employers Must Test Confined Spaces to Determine if They're Hazardous**
Failing to identify hazards and take precautions causes thousands of serious injuries and sometimes deaths, in confined spaces. Certain hazards create permit-required confined spaces. OSHA allows work only with written permits, entry limits and specific employee roles and practices in spaces with one or more of the following:
   - Hazardous atmosphere or potential for one
   - Material that could potentially engulf a person in the space
   - Slanting walls or sloped and tapering floor that could trap or asphyxiate an entrant
   - Any other recognized serious safety or health hazard

3. **A Confined Space's Atmosphere May Make It Hazardous**
Employees could risk death or serious illness, become incapacitated or have trouble escaping if the confined space's atmosphere contains:
   - Levels of flammable gas, vapor or mist in excess of 10 percent of their lower flammable limits
   - Airborne dust levels at or above their flammable limits or permissible exposure limits (PELs) or that prevent visibility of fewer than five feet
   - Oxygen concentration above 23.5 percent or below 19.5 percent
   - Any condition immediately dangerous to life or health that could threaten life, cause irreversible health problems or make it difficult to escape the space without help.

4. **A Confined Space's Atmosphere May Pose Fire, Explosion and Toxicity Risks**
Anything that could burn or explode (e.g., gasoline, methane, dust) is more likely to do so in a confined space.
   - These substances can be ignited by smoking, grinding or welding sparks, unapproved electrical equipment or metal friction (even from nails in shoes).
   - Inhaling toxic substances above their PELs can cause illness, suffocation or even death (e.g., from carbon monoxide, hydrogen sulfide or sulfur dioxide).

5. **Too Much or Too Little Oxygen Is a Major Confined Space Hazard**
   - Oxygen levels over 23.5 percent create a serious fire or explosion risk.
   - Oxygen levels below 19.5 percent are a dangerous health risk:
     —Sixteen percent can cause drowsiness and nausea; 12 percent, unconsciousness; 6 percent, death.
     —Methane, carbon dioxide, nitrogen, corrosion or rust can displace oxygen.

6. **A Confined Space May Be Hazardous Because of Engulfment Potential**
A person could be covered, buried or smothered in a space that contains a liquid or a flowing solid such as sand or grain.

7. A Confined Space May Be Hazardous Because of an Entrapping Design
If a space's walls curve in or its floors slope and taper down, an entrant could:

- Get pushed into machinery in the space
- Slip or fall into a space that is too tight from which to escape

8. **Confined Spaces May Have Physical Hazards**

- Heat can build up and create the danger of exhaustion or heat stroke.
- Falls can be fatal if entrant is trapped with a serious injury, are in a toxic or low oxygen area or can't get a foothold on floors or a grip on handholds to get out.
- Noise bounces off walls in a space, making it hard to hear directions or warnings and creating a risk of hearing damage.
- Power equipment creates injury, electrocution, fire and explosion risks:
  —That is why power is turned off, equipment locked out and pipes and valves turned off, blocked and bled before spaces are entered.

Discussion Points:
—Ask participants to name hazards of particular confined spaces in your workplace.
Conclusion: Take confined space permits and precautions seriously. A hazardous confined space can be deadly unless the testing, entry limits and safety precautions spelled out on the permit are followed.

Confined Space Permit Requirements
Goals: This safety session should teach employees to:

- Understand confined space permit program requirements.
- Follow permit-required confined space precautions.

Applicable Regulations: 29 CFR 1910.146

1. **OSHA Requires Employers to Test Confined Spaces for Hazards**
Confined spaces are tanks, vessels and similar spaces large enough to work in, but difficult to get in and out of and not designed for continuous occupancy.

- Before a space can be entered, special instruments test for levels of:
  —Oxygen
  —Flammable gases and vapors
  —Toxic air contaminants
- Before employees can enter the space, breathing or fire hazards must be removed or controlled with ventilation, fresh air, flushing or other methods.

2. **Hazardous Confined Spaces Require Detailed Precautions**
Employer must:

- Develop and use a written permit program
- Create a written permit detailing conditions for working in the space
- Train workers to work safely in and around the space
- Use warnings and barriers to keep unauthorized workers away from the space:
  DANGER: PERMIT-REQUIRED CONFINED SPACE—DO NOT ENTER

3. **Only Trained, Authorized Workers Can Perform Confined Space Duties**
Employee training covers confined space hazards, signs of danger, safe work practices, communication methods and rescue procedures.

- Authorized entrants are assigned and trained to work in a permit space.
- Attendants are stationed outside the space to maintain contact with and monitor authorized entrants.
- Entry supervisors determine if work conditions and confined space permits allow entry; and they authorize, oversee and, when appropriate, stop work in the space.

4. **Written Confined Space Permits Detail Hazards and Safety Precautions**
Before beginning work, authorized entrants and attendants have to read the signed entry permit that must be posted at or near the space entrance. This permit covers:

- Reason for entering the space (e.g., repair work)
- Hazards of the space (e.g., design or shape of space, flammable atmosphere)
- Results of tests performed in the space
- Actions taken to remove or control hazards (e.g., ventilation)
- Acceptable conditions for entering the space
- Permit date and length of time the permit is applicable

- Names of authorized entrants, attendants and entry supervisors
- Equipment employees must use in or around the space (e.g., communications, rescue and personal protective equipment)
- Communication methods to be used by workers in and outside the space
- Available rescue procedures and equipment
- Any specific safety precautions and instructions
- Additional permits related to the job (e.g., hot work)

5. **Testing and Other Precautions Continue While Space Is Occupied**
- An employee cannot enter a space with a hazardous atmosphere.
- Forced air ventilation removes hazards before entry and during work in the space.
- Atmosphere testing continues while the space is occupied.
- Employees must leave the space immediately if tests reveal atmospheric hazards.

6. **Rescue and Emergency Services Must Be Available When Employees Enter Permit Spaces**
Rescue team members must:
- Be trained in permit space hazards, rescue techniques, basic first aid and CPR
- Have necessary personal protective equipment and rescue retrieval systems
- Practice confined space rescues at least yearly

Discussion Points:
—Use a confined space entry permit and warning sign to illustrate this training session.
—Ask participants why they think OSHA requires such caution and detail for work in confined spaces.
Conclusion: Read and follow confined space permit requirements
Perform work in and around a permit-required space only if trained, authorized and fully informed. Otherwise, obey warning signs and stay away.

Employee Roles in Confined Spaces

Goals: This safety session should teach employees to:
- Understand the different roles and responsibilities associated with work in and around permit-required confined spaces.

Applicable Regulations: 29 CFR 1910.146

1. **OSHA Requires Detailed Safety Precautions for Work in Confined Spaces**
When employees must enter confined spaces to paint, scrape, perform maintenance, etc., employers must:
- Identify space hazards and remove or control them with ventilation, etc.
- Develop and post a detailed entry permit
- Use barriers and warnings to keep unauthorized employees out of permit spaces
- Determine and maintain safe conditions for entering and working in the space
- Train employees to perform jobs in and around permit spaces

2. **Only Trained Employees Can Work in Permit-Required Spaces**
Confined Space Tasks Employees are trained to understand and safely perform the jobs of:
- Authorized entrants
- Attendants
- Entry supervisors

3. **Authorized Entrants Enter and Work in Permit-Required Spaces**
Must be able to:

- Identify the space's hazards and potential consequences, as well as signs and symptoms of exposure \
- Properly use any necessary equipment to:
  —Test, monitor and ventilate the atmosphere in the space
  —Communicate with others working in and outside the space
  —Protect themselves from exposure to dangerous levels of toxins, power, equipment, etc.
- Wear chest or full body harnesses or, when appropriate, wristlets to permit rescue
- Stay in constant contact with the attendant to assure fast attention to problems
- Alert the attendant to signs of personal exposure or danger in the space
- Leave the space quickly after identifying a problem or getting a signal or order from the attendant or entry supervisor

4. **Attendants Stand outside the Space to Monitor and Protect Authorized Entrants**
Must be able to:

- Remain outside the space during entry operations
- Maintain accurate count of authorized entrants in the space
- Identify the space's hazards, exposure consequences and signs that authorized entrants have been exposed to hazards
- Stay in constant contact with workers in the space
- Monitor activities in and outside the space that could affect entrant safety
- Order entrants to evacuate the space immediately if:
  —Conditions in or outside the space endanger authorized entrants
  —Workers in the space show signs of dangerous exposure
  —The attendant can't safely and effectively perform all his/her duties
- Summon rescue or emergency services or perform permitted non-entry rescues
- Keep unauthorized persons away from the space and alert authorized entrants and entry supervisor if such persons enter the permit space

5**. Entry Supervisors Take Responsibility for Permits and Safety Procedures**
Entry Supervisors:

- Identify the space's hazards, consequences and signs of exposure
- Make sure the entry permit is complete and that:

—Listed tests and hazard removal/controls have been completed
—Listed procedures are followed
—Listed safety, communications and rescue equipment is in place
—Rescue services are available

- Sign the permit and allow entry into the space
- Cancel the entry and permit when operations are completed or the permit expires or a dangerous condition arises
- Remove unauthorized individuals from the permit area

Discussion Points:
—Ask participants to describe how authorized entrants, attendants and entry supervisors would work together in the event of a confined space emergency. Conclusion: All three roles are essential to safety authorized entrants, attendants and entry supervisors must know how to perform work safely in permit-required confined spaces.

APPENDIX IV – Training Verification and Quiz

The University of Southern Indiana
OSHA Permit-Required Confined Space Training Quiz and Employee Acknowledgment of Training

I have received training and information on the OSHA Permit-Required Confined Space Standard 29 CFR 1910.146. I agree to observe and follow the safe work practices and standard operating procedures presented to me in this training session.

Employee Signature	Department
Employee Name (Please Print)	Date
Trainer	Date

1. Which of the following is not listed by OSHA as a feature of a confined space?
- a. Limited entry and exit areas
- b. More than 100 feet from a first aid station
- c. Not designed for extended occupancy periods

2. A confined space atmosphere may be hazardous if flammable gas, vapor or mist levels top their flammable limits by more than 10 percent.
- a. True b. False

3. An ignition source like grinding or welding sparks could cause a fire in a confined space.
- a. True b. False

4. The worst that can happen if you inhale toxic substances in a confined space is:
- a. Skin irritation
- b. Suffocation or death
- c. Dizziness

5. A confined space is hazardous if oxygen levels are below:
- a. 19.5 percent
- b. 24.5 percent
- c. 5 percent

6. You could be smothered or buried in a confined space if it contains liquid or:
- a. High levels of oxygen
- b. A damp atmosphere
- c. Sand, grain or any flowing solid

7. Entrapping design means a space that's very deep or dark.
- a. True b. False

8. Heat stroke or heat-related exhaustion is hazardous because it limits your ability to get out of a confined space.
- a. True b. False

9. Noise is a hazard in confined spaces because you may not be able to:
a. Wear earmuffs or other hearing protection
b. Hear warnings or directions
c. Get out of the space quickly

10. Confined space conditions that could pose a threat to life, cause irreversible health problems or hinder ability to escape without help are called:
a. Immediately dangerous to life or health
b. Atmospheric hazards
c. Physical hazards

11. Confined spaces are tested for hazards before anyone can enter them:
a. True b. False

12. There's no way for unauthorized workers to know which confined spaces may be hazardous.
a. True b. False

13. Employees trained and authorized to work in and around permit spaces are called:
a. Authorized entrants, attendants and entry supervisors
b. Authorized entrants, communications specialists and permit supervisors
c. Authorized entrants, guards and supervisors

14. A confined space entry permit is posted:
a. At or near the entrance to the building
b. At or near areas containing personal protective equipment
c. At or near the entrance to the space

15. A confined space entry permit contains information that includes:
a. Training schedules for authorized entrants
b. Reason for entering the space
c. Where to file copies of the permit

16. Confined space entry permits are undated and good for an indefinite period of time.
a. True b. False

17. Authorized entrants learn about necessary personal protective equipment from the confined space entry permit.
a. True b. False

18. Employees can enter a space with a hazardous atmosphere as long as a permit is posted.
a. True b. False

19. While employees are working in a space:
a. Instruments continue to test the atmosphere for hazards
b. Atmospheric testing equipment is turned off
c. Attendants make notes of any hazards identified by testing

20. Before employees can work in permit-required confined spaces, employers must test the atmosphere and remove or control hazards.
a. True b. False

21. The employees who enter and work in permit-required confined spaces are:
a. Entry supervisors
b. Authorized entrants
c. Entry level employees

22. All employees involved with confined space entry must know about the spaces:
a. Hazards, hazard consequences and signs and symptoms of exposure
b. Previous uses and history
c. Temperature

23. One responsibility of authorized entrants is to:

a. Fill out confined space permits
b. Stay in constant contact with attendants
c. Practice rescuing other entrants from confined spaces

24. Attendants decide if and when entrants need to evacuate quickly from a confined space.

a. True b. False

25. Attendants can enter the space only to check on or rescue authorized entrants.

a. True b. False

26. All three roles are essential to safe operations in permit-required confined spaces.

a. True b. False

Confined Space Answers to Quiz

Answers

1 b. More than 100 feet from a first aid station.
2 a. True.
3 a. True.
4 b. Suffocation or death.
5 a. 19.5 percent
6 c. Sand, grain or any flowing solid.
7 b. False. Entrapping design means a space whose walls curve in or whose floors slope and taper down
8 a. True.
9 b. Hear warnings or directions.
10 a. Immediately dangerous to life or health.
11 a. True.
12 b. False. The spaces are barricaded and posted with warning signs.
13 a. Authorized entrants, attendants and entry supervisors.
14 c. At or near the entrance to the space.
15 b. Reason for entering the space.
16 b. False. They're dated and include length of time the permit applies.
17 a. True.
18 b. False. Employees can enter the space only when tests find the atmosphere is not hazardous.
19 a. Instruments continue to test the atmosphere for hazards.
20 a. True.
21 b. Authorized entrants
22 a. Hazards, hazard consequences and signs and symptoms of exposure
23 b. Stay in constant contact with attendants
24 a. True.
25 b. False. They never enter the space; if entry rescue is needed, they alert the rescue team.
26 a. True.

APPENDIX V – DEFINITIONS

ATTENDANT – 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.

AUTHORIZED ENTRANT - a person authorized by the supervisor to enter a confined space. Entrant must be able to recognize signs and symptoms of exposure and know how to use any needed equipment and how to communicate with the attendant as needed and alert them when some warning symptom or hazardous condition becomes evident.

CONFINED SPACE – a space that: (1) is large enough and so configured that an employee can bodily enter and perform assigned work; and (2) has limited or restricted means of entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, manholes and pits); and (3) is not designed for continuous employee occupancy.

EMERGENCY – any occurrence or event internal or external to the space that could endanger entrants.

ENTRAPMENT – to get caught, wedged or trapped in a space which is too tight for a person to escape from.

ENGULFMENT – the covering, burying, smothering or combination, of a person in a space that contains a liquid or a flowing solid such as sand.

ENTRY – the action by which a person passes through an opening into a 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 the opening into the space.

ENTRY PERMIT (**RECLASSIFYING FORM**) – the written or printed document provided by Environmental Health and Safety to allow and control entry into a permit space that has been reclassified as a non-permit space.

ENTRY SUPERVISOR – a person (such as the employer, foreman or crew chief) who authorizes entry and prepares and signs the written entry permits after having made sure that all necessary tests have been conducted and that Security can be readily contacted.

HAZARDOUS ATMOSPHERE – an atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self rescue, injury or acute illness from one or more of the following causes:

(1) flammable gas, vapor or mist in excess of 10% LEL
(2) airborne combustible dust at a concentration that meets or exceeds its LFL
(3) atmospheric oxygen concentrations below 19.5% or above 23.5%
(4) atmospheric concentrations of substances above their recommended permissible exposure limit (PEL)
(5) any other atmospheric condition that is immediately dangerous to life or health.

HOT WORK – work within a confined space that produces arcs, sparks, flames, heat or other sources 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.

ISOLATION – a process of physically interrupting or disconnecting or both, pipes, lines and energy sources from the confined spaces.

LOWER EXPLOSIVE LIMIT (LEL) – the lower limit of flammability of a gas or vapor at ordinary ambient temperatures expressed in percent of the gas or vapor in air by volume. This limit is assumed constant for temperatures up to 120 C (250F). Above this it should be decreased by a factor of 0.7 because explosability increases with higher temperatures.

LFL – acronym for Lower Flammable Limit.

LOCKOUT/TAGOUT – the placement of a lock/tag on the energy isolating device in accordance with an established procedure, indicating that the energy isolating device shall not be operated until removal of the lock/tag in accordance with procedure.

OXYGEN DEFICIENT ATMOSPHERE – an atmosphere containing less than 19.5 oxygen by volume.

OXYGEN ENRICHED ATMOSPHERE – an atmosphere containing more than 23.5 oxygen by volume.

PEL – Permissible Exposure Limit, which is the allowable air contaminant level established by OSHA.

PERMIT-REQUIRED CONFINED SPACE – means a confined space that has one or more of the following characteristics:

(1) contains or has a potential for engulfing an entrant
(2) contains or has a potential to contain a hazardous atmosphere
(3) has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls
(4) contains any other recognized serious safety or health hazard.

PROJECT COORDINATOR – Employee who arranges to have a contractor enter a confined space or permit-required confined space. Examples of project coordinators include Facilities Management, Facilities Operations, AEC, Information Systems and Services and Television.

QUALIFIED PERSON – Employees who have received the 8 hour OSHA permit-required confined space training and training on the air monitoring device.

TLV – acronym for Threshold Limit Value which is a time-weighted average concentration under which most people can work consistently for 8 hours a day, day after day, with no harmful effects.

UPPER EXPLOSIVE LIMIT – the highest concentration (expressed in percent vapor or gas in the air by volume) of a substance that will burn or explode when an ignition source is present.

VENTILATION – a system or means of providing fresh air inside the confined space.

Appendix VI-A – TELECOMMUNICATION MANHOLE ENTRY

Telecommunication manhole entry procedures for the following job tasks:

(In compliance with the telecommunication standard, OSHA 29 CFR 1910.268(o))

- **Inspecting TV cable**
- **Repairing TV cable**
- **Installing, Inspecting and/or Repairing fiber optic cable**

Notify your supervisor of the need to enter a telecommunication manhole. The supervisor will ensure the entrant is trained to work on telecommunication cables.

Bring all materials (ventilation fan, material safety data sheets, barriers, water pump, tools and lighting equipment) to the work site.

Place barrier around confined space and open the entrance to the confined space but do not enter.

Ventilate the confined space with the ventilation fan.

Pump water out of the manhole.

Remove the ventilation equipment.

Have the confined space atmosphere tested by Environmental Health and Safety or other qualified person.

- Tests should indicate that the oxygen is between 19.5 and 23.5 percent.
- Concentration of explosive gas must be less than ten percent of the lower explosive limit (LEL).
- Concentration of carbon monoxide is below 35 ppm.
- Concentration of hydrogen sulfide is below 10 ppm.

If the atmosphere is safe for entry then the space can be entered. These procedures must be repeated for each re-entry.

Entrant – Obtain the personal oxygen monitor and attach to belt. Keep monitor until job is completed. If the monitor alarms, the entrant will exit immediately.

Attendant – Maintain audio and visual communication with the entrant. Instruct the entrant to evacuate the space if a hazard is observed or if the entrant shows signs of exposure. In the event of an emergency, contact Security. Do not attempt an entry rescue.

Appendix VI-B – STEAM MANHOLES

Entry Procedures for Steam Manholes involving the following tasks:

- **Inspecting**

Repair or maintenance not involving hot work or the introduction of chemicals.

Notify Environmental Health and Safety or qualified person of the need to enter the confined space. This person will evaluate the confined space and fill out the permit.

Prior to entry, lockout/tagout all steam valves.

Allow steam line to cool. University employees are not permitted to enter manholes until the steam condenses into water.

Bring all materials (ventilation fan, material safety data sheets, barriers, tools, water pump and lighting equipment) to the work site.

Place barrier around confined space and open the entrance to the confined space but do not enter.

Ventilate the confined space with the ventilation fan.

Pump water out of the manhole.

Remove the ventilation equipment.

Have the confined space atmosphere tested by Environmental Health and Safety or other qualified person.

- Tests should indicate that the oxygen is between 19.5 and 23.5 percent.
- Concentration of explosive gas must be less than ten per cent of the lower explosive limit (LEL).
- Concentration of carbon monoxide is below 35 ppm.
- Concentration of hydrogen sulfide is below 10 ppm.

If the permit space poses no actual or potential atmospheric hazards and if all hazards within the space are eliminated without entry into the space, the permit space may be reclassified as a non-permit confined space for as long as the non-atmospheric hazards remain eliminated. **However, if the space is not reclassified as a non permit-required confined space then the employee is <u>not permitted</u> to enter the permit-required confined space.**

Entrant – Obtain the personal oxygen monitor and attach to belt. Keep monitor with you until job is completed. If the monitor alarms, the entrant will exit immediately.

Attendant – Maintain audio and visual communication with the entrant. Instruct the entrant to evacuate the space if a hazard is observed or if the entrant shows signs of exposure. In the event of an emergency, contact Security. Do not attempt an entry rescue.

Once the entrant exits the space, the space becomes a permit-required confined space. The entrant will follow the above procedures before re-entry.

Appendix VI-C – WATER-METER MANHOLES

Entry procedures for water-meter manholes performing the following job tasks:

- **Reading Water Meter**

Notify Environmental Health and Safety or qualified person of the need to enter the confined space. This person will evaluate the confined space and fill out the permit.

Bring all materials (ventilation fan, material safety data sheets, barriers, water pump, tools and lighting equipment) to the work site.

Place barrier around confined space and open the entrance to the confined space, but do not enter.

Ventilate the confined space with the ventilation fan.

Pump water out of the manhole.

Remove the ventilation equipment.

Have the confined space atmosphere tested by Environmental Health and Safety or other qualified person.

- Tests should indicate that the oxygen is between 19.5 and 23.5 percent.
- Concentration of explosive gas must be less than ten percent of the lower explosive limit (LEL).
- Concentration of carbon monoxide is below 35 ppm.
- Concentration of hydrogen sulfide is below 10 ppm.

If the permit space poses no actual or potential atmospheric hazards and if all hazards within the space are eliminated without entry into the space, the permit space may be reclassified as a non-permit confined space for as long as the non-atmospheric hazards remain eliminated. **However, if the space is not reclassified as a non permit-required confined space then the employee is <u>not permitted</u> to enter the permit-required confined space.**

Entrant – Obtain the personal oxygen monitor and attach to belt. Keep monitor until job is completed. If the monitor alarms, the entrant will exit immediately.

Attendant – Maintain audio and visual communication with the entrant. Instruct the entrant to evacuate the space if a hazard is observed or if the entrant shows signs of exposure. In the event of an emergency, contact Security. Do not attempt an entry rescue.

These procedures must be repeated for each re-entry.

Appendix VI-D – HVAC SYSTEMS

Entry Procedures for HVAC systems involving the following tasks:

- Inspecting and cleaning boilers
- Inspecting and cleaning unfired pressure vessels
- Inspecting and cleaning boiler breaching
- Repair or maintenance not involving hot work or the introduction of chemicals

Notify Environmental Health and Safety or qualified person of the need to enter the confined space. This person will evaluate the confined space and fill out the permit.

Lockout/tagout steam and fuel valves prior to entering the space.

Bring all materials (ventilation fan, material safety data sheets, barriers, tools, signs) to the work site.

Place barrier around confined space and open the entrance to the confined space but do not enter.

Ventilate the confined space. If the use of the ventilation fan will cause dusty conditions, then ventilate the space naturally.

Remove the ventilation equipment (If applicable).

Have the confined space atmosphere tested by Environmental Health and Safety or other qualified person.

- Tests should indicate that the oxygen is between 19.5 and 23.5 percent.
- Concentration of explosive gas must be less than ten percent of the lower explosive limit (LEL).
- Concentration of carbon monoxide is below 35 ppm.
- Concentration of hydrogen sulfide is below 10 ppm

If the permit space poses no actual or potential atmospheric hazards and if all hazards within the space are eliminated without entry into the space, the permit space may be reclassified as a non-permit confined space for as long as the non-atmospheric hazards remain eliminated. **However, if the space is not reclassified as a non permit-required confined space then the employee is <u>not permitted</u> to enter the permit-required confined space.**

Entrant – Obtain the personal oxygen monitor and attach to belt. Keep monitor until job is completed. If the monitor alarms, the entrant will exit immediately.

Attendant – Maintain audio and visual communication with the entrant. Instruct the entrant to evacuate the space if a hazard is observed or if the entrant shows signs of exposure. In the event of an emergency, contact Security. Do not attempt an entry rescue.

Once the entrant exits the space, the space becomes a permit-required confined space. The entrant will then follow the above procedures before re-entry.

Appendix VI-E – CRAWL SPACES

Procedures for entering crawl spaces:

Notify Environmental Health and Safety or qualified person of the need to enter the confined space. This person will evaluate the confined space and fill out the permit.

Bring all materials (ventilation fan, material safety data sheets, tools and lighting equipment) to the work site.

Ventilate the confined space with the ventilation fan.

Remove the ventilation equipment.

Have the confined space atmosphere tested by Environmental Health and Safety or other qualified person.

- Tests should indicate that the oxygen is between 19.5 and 23.5 percent.
- Concentration of explosive gas must be less than ten percent of the lower explosive limit (LEL).
- Concentration of carbon monoxide is below 35 ppm.
- Concentration of hydrogen sulfide is below 10 ppm.

If the permit space poses no actual or potential atmospheric hazards and if all hazards within the space are eliminated without entry into the space, the permit space may be reclassified as a non-permit confined space for as long as the non-atmospheric hazards remain eliminated. **However, if the space is not reclassified as a non permit-required confined space then the employee is <u>not permitted</u> to enter the permit-required confined space.**

Entrant – Obtain the personal oxygen monitor and attach to belt. Keep monitor until job is completed. If the monitor alarms, the entrant will exit immediately.

Attendant – Maintain audio and visual communication with the entrant. Instruct the entrant to evacuate the space if a hazard is observed or if the entrant shows signs of exposure. In the event of an emergency, contact Security. Do not attempt an entry rescue.

These procedures must be repeated for each re-entry

Appendix VI-G – INJECTOR PITS

Entry Procedures for Sewage Injector Pits

Notify supervisor of necessity to enter a telecommunication manhole. The supervisor will ensure the entrant is trained to work on telecommunication cables.

Bring all materials (ventilation fan, material safety data sheets, barriers, water pump, tools and lighting equipment) to the work site.

Place barrier around confined space and open the entrance to the confined space but do not enter.

Ventilate the confined space with the ventilation fan.

Pump water out of the manhole.

Remove the ventilation equipment.

Have the confined space atmosphere tested by Environmental Health and Safety or other qualified person.

Tests should indicate that the oxygen is between 19.5 and 23.5 percent. Concentration of explosive gas must be less than ten percent of the lower explosive limit (LEL). Concentration of carbon monoxide is below 35 ppm. Concentration of hydrogen sulfide is below 10 ppm.

If the atmosphere is safe for entry then the space can be entered. These procedures must be repeated for each re-entry.

Entrant – Obtain the personal oxygen monitor and attach to belt. Keep monitor until job is completed. If the monitor alarms, the entrant will exit immediately.

Attendant – Maintain audio and visual communication with the entrant. Instruct the entrant to evacuate the space if a hazard is observed or if the entrant shows signs of exposure. In the event of an emergency, contact Security. Do not attempt an entry rescue.

APPENDIX VII

OSHA Instruction CPL 2. 1 00
May 5, 1995
Directorate of Compliance Programs
(Appendix E in pertinent part)

Does the fact that a space has a door mean that the space does not have limited or restricted means of entry or exit and, therefore, is not a "confined space"?

A space has limited or restricted means of entry or exit if an entrant's ability to escape in an emergency would be hindered. The dimensions of a door and its location are factors in determining whether an entrant can easily escape; however, the presence of a door does not in and of itself mean that the space is not a confined space. For example, a space such as a crawl space or a bag house that has a door leading into it, but also has pipes, conduits, ducts or equipment or materials that an employee would be required to crawl over or under or squeeze around in order to escape, has limited or restricted means of exit.