POLICY: IV: 07 Permit-required Confined Space Entry — DATED: October 1998
Procedure review: Annually — UPDATED: July 2024

APPROVED: Executive Director of Facilities and Construction: _____

I. PURPOSE

The purpose of this procedure is to establish a uniform procedure for the safe entry into confined spaces and to protect employees and contractors while working in confined spaces such as manholes, pipe tunnels, steam tunnels, boilers, tanks, high voltage electrical enclosures, etc.

II. SCOPE AND APPLICATION

A. This procedure describes mandatory practices and procedures for employee entry into and work within confined spaces. Ref. OSHA 1910.146.

B. This procedure applies to employees and contractors of JMU as referenced by the Virginia Occupational Safety and Health Standards for General Industry with the exception of employees or contractors covered by the telecommunications standards in OSHA 1910.268.

III. RESPONSIBILITIES

A. Executive Director of Facilities and Construction - Shall ensure the campus community is kept informed of confined space issues, and appropriate emphasis is placed upon construction projects.

B. Associate Director of Facilities Management Operations - Shall ensure adequate training (with written records documenting the latest training) and equipment are provided to support Facilities Management (FM) employees.

C. Director of Engineering and Construction - Shall ensure engineering staff are familiar with the requirements of this procedure.

D. Risk Management Safety Training Coordinator - Shall conduct and/or coordinate training as related to this procedure and maintain documented training records. Risk Management staff shall provide access to "Confined Space Awareness" training via SafetySkills. Additional hands-on training shall be provided to employees whose job duties include confined space entry.

E. Entry Supervisor- Responsible for the following:

1. Knowing the hazards(s) and potential hazard(s) that may be encountered during entry. Information shall include:
   a. The mode (equipment or utilities on or off)
   b. Signs or symptoms
   c. Consequences of the exposure

2. Notify Risk Management staff of Confined Space Entry/Hot Work. Notification shall be via Work Notifications link on the Risk Management webpage https://www.jmu.edu/riskmgmt/work-notification.shtml.

3. Determine the availability of the rescue team and ensure the means to summon the rescue team is operable.

4. List of the names of all entrants and attendants for each entry on the entry permit. If the entry supervisor enters the confined space they must be listed as an entrant. Use the entry rooster form and attach it to the entry permit.

5. Ensure all entrants have been trained in confined space entry procedures including self-rescue techniques to exit from the confined space.

6. Ensure all tests specified by the permit have been conducted and recorded.

7. Ensure the appropriate entries have been made on the permit.

8. Ensure the permit space is isolated to the extent possible. If isolation of the permit space is not feasible because the space is large or part of a continuous system, entry conditions shall be continuously monitored in areas where authorized entrants are working.

9. Ensure procedures and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin.

10. Sign the entry permit. Permits are not valid unless signed by the entry supervisor.

11. Remove unauthorized individuals who enter or attempt to enter the permit space during entry operations.

12. Determine entry operations remain consistent with the terms of the entry permit and that acceptable entry conditions are maintained.

13. Document on the entry permit or on a separate sheet, any incidents or circumstances requiring review of the confined space entry program. Sign the written documentation and, if a separate sheet is used, ensure the permit number is written on the sheet and the sheet is attached to the entry permit. Such incidents include but are not limited to the following:

    a. Unauthorized entry or entry attempt.
    b. The detection of a condition/hazard not authorized by the permit.
    c. The occurrence of an injury or near miss during entry.

d. A change in use, configuration of the space or reclassification from a permit required confined space to a non-permit required confined space.
e. Entrant concerns about the entry (procedure, tools, etc.)
f. Coordination of entry when personnel from multiple employers will work simultaneously.

14. Close the entry permit when work is completed.

15. If the permit space must be evacuated for any unacceptable condition, the entry supervisor shall:

a. Order the entrants to exit the confine space.
b. Note the unacceptable condition on the entry permit.
c. Cancel the entry permit.
d. Retain the canceled entry permit with attachments for annual review.
e. Correct the unacceptable condition if re-entry is planned. Document the corrective action.
f. Verify the conditions in the confined space are acceptable if re-entry is planned.
g. Issue a new entry permit before allowing re-entry.

F. The Attendant is responsible for the following:

1. Prior to worker entry into the confined space, the attendant shall have determined the location of the nearest functional phone, and verified the working condition of the two-way radio or other means of communication in case of an employee incident.

2. Knowledge of the hazards(s) that may be encountered during entry. Information shall include:
a. The mode (equipment or utilities on or off)
b. Signs or symptoms.
c. Consequences of the exposure.

3. Knowledge of possible behavioral effects of hazard exposure in authorized entrants.

4. Maintaining an accurate count of authorized entrants in the permit space and accurately identifies who is in the permit space. Recording the names of any additional entrants on the entrant roster. Recording times of entry and exit of each entrant on the entrant roster.

5. Remaining outside of the permit space during operations until relieved by another attendant.

6. Communicating with entrants continuously to monitor status and to alert entrants of the need to evacuate the space.

7. Monitoring activities inside and outside the space and orders entrants to evacuate the space immediately under any of the following conditions:
a. If the attendant detects a prohibited condition.

b. If the attendant detects the behavioral effects of hazard exposure in an unauthorized entrant.
c. If the attendant detects a situation outside the space that could endanger the authorized entrants.
d. If the attendant cannot effectively and safely perform his duties.
e. If an evacuation alarm is sounded.

8. Notifying the entry supervisor immediately after taking the emergency action required.

9. Summoning rescue and other emergency services as soon as the attendant determines authorized entrants may need assistance to escape from permit space hazards.

10. Taking the following actions when unauthorized persons approach or enter a permit space while authorized entry is under way:
a. Warn the unauthorized person(s) to stay away from the permit space.
b. Advise the unauthorized person(s) to exit immediately if permit space has been entered.
c. Inform the authorized entrants and the entry supervisor if unauthorized persons have entered the permit space.

11. Performing non-entry rescues.

G. Entrants are responsible for the following:

1. Knowledge of the hazards(s) that may be encountered during entry. Information shall include:
a. The mode. (equipment or utilities on or off)
b. Signs and symptoms of exposure.
c. Consequences of the exposure.

2. Communicating with the attendant continuously to enable the attendant to monitor entrant status and to enable the attendant to alert entrants of the need to evacuate the space.

3. Alerting the attendant when:
a. The entrant recognizes any warning sign or symptom of exposure to a dangerous situation.
b. The entrant detects a prohibited condition.

4. Exiting from the permit space when:
a. An order to evacuate is given by the attendant or the entry supervisor.
b. The entrant recognizes any warning sign or symptom of exposure to a dangerous situation.
c. The entrant detects a prohibited condition.
d. An evacuation alarm is activated.

5. After the entry is completed, ensuring the confined space is clear and free of hazards. This includes but is not limited to the following:

a. Removal of tools, equipment and debris from the confined space at the completion of the job.
b. Confirm blinds are removed, valves are properly opened or closed, lines are properly reconnected, all locks and/or tags are removed and the space is ready to be returned to service.
c. Cleaning the surrounding area.

IV. DEFINITIONS

A. Attendant - An individual assigned to remain immediately outside the entrance to the confined space to monitor authorized entrants, as well as perform all the attendant's duties assigned by the procedure and who may render assistance as needed to entrants inside the space without entering the space.

B. Blind, Blinding or Blanking - Absolute closure of a pipe, line or duct, to prevent passage of any material by fastening a solid plate or "cap" across the bore and which can withstand the maximum potential upstream pressure and temperature.

C. Calibration or Recalibration- A laboratory or bench top resetting of alarm points, spans and zeros, if applicable, according to manufacturer specifications. Calibration or recalibration shall be conducted by a factory authorized service center, a factory trained technician, or a trained university technician.

D. Confined space - Any space:

1. That is large enough and so configured that an employee can bodily enter and perform assigned work.

2. Not intended for continuous employee occupancy.

3. Having a limited means for worker entry or exit due to the number, size or location of openings.

4. That has doors and other portals through which a person could walk are not considered limited means for entry and exit. However, a space containing such a door or portal may still be deemed a confined space if an entrant's ability to escape in an emergency would be hindered.

E. Double Block and Bleed- Closure of a line, duct or pipe by locking and tagging a drain or vent to open to the atmosphere in the line between two locked closed valves.

F. Engulfment- Surrounding and effective capture of a person by finely divided particulate matter of liquid. There is potential for engulfment when such particulate matter or liquid exists in a sufficient quantity or at a sufficient pressure to surround a person before normal exit can be affected.

G. Entrant - Any associate who enters a confined space. A qualified entrant is a person who:
1. Has a valid need to enter a confined space.
2. Has been trained as required in this procedure.

3. Has been briefed on the hazards of the confined space and is properly protected from such hazards by use of appropriate engineering controls or personal protective equipment.

H. Entry- means:
   1. Any action resulting in any part of the associate's body breaking the plane of any opening of the confined space,
   2. Includes any ensuing work activities inside the confined space.
   3. All periods of time the confined space is occupied.

I. Entry permit- The written or printed document provided by FM staff to allow and control entry into a permit space for a stated purpose during a specified time. The confined space entry permit must be properly completed prior to any confined space and must be posted at the portal of the confined space in use.

J. Entry permit log- Document used to assign numbers to entry permits.

K. Entry Supervisor (qualified person)-means:
   1. A person who is trained on all aspects of this procedure and how to recognize the hazards of the confined space, how to evaluate those anticipated hazards, and shall be capable of specifying necessary control measures to ensure worker safety.
   2. The person responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry, overseeing entry operations and for terminating entry.
   3. The entry supervisor may or may not actually participate throughout the entry, but shall be on the scene during the issuance of any confined space entry permit and be readily available for consultation.

L. Field checked - The checking of the accuracy of an instrument's response to a known concentration of a gas: a method of checking an instrument for a proper response in the field. It is a check of the instrument's functionality and is a pass/fail or go/no-go check. When an adequate response is not obtained, the equipment shall be removed from service and adjusted or repaired by a factory authorized service center, a factory trained technician, or a trained university technician.

M. Ground fault circuit interrupter (GFCI) – A device whose function is to interrupt the electric circuit to the load when a fault current to ground exceeds a predetermined value that is less than that required to operate the over current protective device of the supply circuit.

N. Hazardous atmosphere - An atmosphere presenting a potential for death, disablement, injury, acute illness, or the inability to escape unaided from a permit space, from one or more of the following causes:

   1. A flammable gas, vapor, or mist in excess of 10% of its lower flammable limit (LFL).

   2. An oxygen deficient atmosphere containing less than 19.5% oxygen by volume or an oxygen enriched atmosphere containing more than 23.0% oxygen by volume.

3. An atmospheric concentration of any substance listed in 1910 subpart z standards above the listed numerical value of the permissible exposure limit (PEL). In the case of substances for which no PEL has been established, an industry professional must be contacted to establish a safe atmospheric concentration prior to entry.

4. An airborne combustible dust at a concentration that obscures vision at 5 feet or less.

5. A concentration of an air contaminant that is considered immediately dangerous to life or health (IDLH) by any published source, including the manufacturer's material safety data sheet (SDS).

6. A condition immediately dangerous to life or health (IDLH) as defined in this procedure.

O. Hot Work - Work that produces arcs, sparks, flames, heat, or other sources of ignition. This includes but is not limited to burning, welding, grinding, riveting and space heating.

P. Hot work permit log- Document that is used to assign numbers to hot work permits.

Q. Intrinsically safe- Equipment that is explosion proof and will not produce sparks or other ignition sources.

R. Immediately dangerous to life and health (IDLH) –Any condition that poses an immediate or delayed threat to life, or which is likely to result in acute or immediately severe health effects or that would interfere with an individual's ability to escape unaided from a confined space. Only qualified personnel with proper protective equipment may be permitted to enter IDHL confined space.

S. Immediate severe health effects - An acute clinical sign of serious, exposure-related reaction is manifested within 72 hours of exposure.

T. Inerting - Displacement of the atmosphere by a nonreactive gas (such as nitrogen) to such an extent that the resulting atmosphere is noncombustible.

Note: This procedure (inerting) produces an IDHL oxygen deficient atmosphere.

U. LFL- (lower flammable limit) - Minimum concentration of a flammable gas or vapor in air (usually expressed in percent by volume at sea level), that will ignite if an ignition source is present.

V. Line breaking- Intentional opening of a pipe, line or duct that is/or has been carrying flammable, corrosive or toxic material, an inert gas and/or fluid at a volume, pressure, or temperature capable of causing injury.

W. Lockout/Tagout- Placing locks and/or tags on the energy isolating device(s) in accordance with FM policy III: 03, Lockout/Tagout. The key for any lock used for lockout shall remain with the person working within the confined space.

X. Oxygen deficient atmosphere - Atmosphere containing less than 19.5% oxygen by volume.

Y. Oxygen enriched atmosphere - Atmosphere containing more than 23.0% oxygen by volume.

Z. PEL- Permissible exposure limit.

AA. Permit required confined space or permit space- Those spaces which meet the requirement of confined space and which also pose health or safety hazards such as:
1. A current or potentially hazardous atmosphere.
2. Potential worker entrapment (from inwardly converging walls or downward sloping floor.)
3. A potential for engulfment.
4. Contains any other serious safety or health hazard.

AB. PPE- Personal protective equipment.

AC. Purging- Method by which gases, vapors or other airborne contaminants are displaced.

AD. Retrieval line- A line or rope secured at one end to a worker's safety belt, chest or body harness, or wristlets with the other end secured to an anchor point or lifting device located outside the entry portal. The anchor point shall not be a motor vehicle. Retrieval lines shall be of sufficient strength to remove an entrant when necessary.

AE. SCBA- Self-contained breathing apparatus.

AF. Zero mechanical state- The mechanical potential energy of all portions of the machine or equipment is at its lowers practical value, set so that the opening of the pipe(s), tube(s), hose(s), or actuation of any value, lever or button will not produce a movement which could cause injury.

V. CONFINED SPACE IDENTIFICATION AND CLASSIFICATION

A. Entry supervisors are responsible for:
1. Identifying and classifying confined spaces into which associates, contractors or subcontractors will enter. Entry is considered to have taken place as soon as any part of the entrant's body breaks the plane of an opening into the space.
2. Identifying and providing written information as to the contents of the space, atmospheric conditions and rescue procedures.

B. A permit required confined space is:
1. A confined space that meets the stated definition.
2. Contains or could contain a hazardous atmosphere.
3. Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross section.
4. Contains any other recognized serious safety or health hazard.

C. If a space is not considered permit required but meets the criteria in this procedure, it must be considered permit required for entry.

VI. RECLASSIFICATION

A. Although all confined spaces are initially considered permit required confined spaces, certain spaces can be reclassified as a non-permit confined space provided the following apply:
   1. Site specific approval of a qualified professional. (i.e., campus safety engineer, entry supervisor, etc.)
   2. Contaminants, vessels containing contaminants, and contaminated material have been removed.
   3. Actual or potential atmospheric hazards have been eliminated and verified by testing.
   4. Ventilation is not required to maintain control of atmospheric hazards.
   5. Recognized hazards have been eliminated.

B. The entry supervisor shall document in writing on a separate sheet, the basis for reclassifying a permit required confined space to a non-permit required confined space, sign and date the statement, reference the entry permits number, and attaches the sheet to the entry permit.

C. The space shall be reevaluated when the use or configuration of the space changes in any way that might increase the hazard to entrant. If necessary, the space shall be reclassified to permit required confined space.

D. All entrants shall exit the space immediately when hazards are noted.

E. The entry permit and all attachments shall be posted at the portal to the confined space.

VII. ENTRY PROCEDURE

A. Entering permit spaces is potentially one of the most dangerous jobs in industry. Entry into a confined space shall be conducted only if necessary for assigned work. When possible, assigned work shall be done from outside the space.

B. This confined space entry permit procedure shall be followed for entry into any defined confined space.

C. This procedure is to be used only by trained entry supervisors, entrants and attendants.

D. Hazards of entering confined spaces can be managed safely if the following principles and procedures are followed:
   1. Identify the confined space and develop a written work plan for isolating, clearing and entering the space.
   2. Isolate the space from all hazardous energy sources, production streams and/or energized equipment and stored pressure.
   3. Empty, flush purge, ventilate and clear the confined space (from the outside if possible.)
   4. Identify known and potential hazards or contaminants that may be found in the space.
   5. Prohibit entry into the space until atmospheric testing is conducted and the applicable entry permit is completed, signed and posted at the portal to the space.

6. After the space has been removed from service and prior to entry, initial testing of the atmosphere shall be conducted.
7. When removing the space from service, the space shall be opened up as much as possible to allow for good ventilation.
8. After the applicable entry procedures have been conducted, an entrant, attendant or other trained person shall inspect the space to verify that all actions and conditions necessary for safe entry have been performed.
9. Any deficient areas shall be corrected before entry proceeds.
10. Once the inspection is completed, the entry supervisor who performed the inspection shall sign the entry permit.
11. Entry is prohibited until the permit has been completed satisfactorily and signed.
12. Ventilate the space to remove hazardous gases, vapors, dusts and fumes and test the atmosphere with the ventilation system turned off.
13. Prepare the space, specifying the hazards that may be found, acceptable entry conditions, and required level of PPE to be used.
14. Prepare the hot work permit as applicable if hot work is to be conducted in a confined space.
15. Review the work plans, hazards, safety requirements and PPE requirements with entry personnel during the pre-entry meeting and with others working near the space (university and contractor) before entering the space.

VIII. GENERAL REQUIREMENTS

A. Each confined space being entered shall have a minimum of one dedicated attendant.

B. Entry supervisors must be thoroughly familiar with the confined space entry procedures and shall be responsible for ensuring that entries are conducted according to this procedure.

C. The use of space, internal configuration, size of the openings, contents, constructions materials, internal mechanical devices, unique characteristics and hazards are all factors that should be known by all entrants before entering.

D. No confined space entry is permitted without a properly executed confined space entry permit.

E. No confined space will be entered until it has been thoroughly tested for hazardous conditions and all those conditions have been properly eliminated or overcome.

F. Unauthorized entry shall be prevented through measures such as training, posting of signs and barriers.

G. PPE must be sanitary and in proper working condition prior to use.

H. All members of the entry team must be properly trained, including the entry supervisor, entrants, attendants and rescue personnel.

I. Contingencies/emergencies specific to each entry must be anticipated and planned for such as:
   1. Worker asphyxiation, engulfment or injury.
   2. Fire and explosion.
   3. Fluid or gas leaks.

J. All support equipment such as breathing apparatus, fire extinguishers, rescue ropes and harnesses, atmospheric monitors and required electrical devices (ground fault circuit interrupters [GFCI], explosion proof or intrinsically safe equipment, etc.) shall be utilized during entry and readily available as needed.

K. Rescue procedures and related equipment must be anticipated beforehand and be readily available during entry.

L. Any deviation from this procedure must be approved in writing and attached to the entry permit by the supervisor responsible for confined space entry.

IX. CONFINED SPACE ISOLATION PROCEDURE

Before persons are permitted to enter a confined space the following isolation procedure shall be conducted where applicable:

A. Depressurize the confined space if necessary.

B. The confined space must be isolated by lockout/tagout to preclude the entry of hazardous materials. Prevent the introduction into the confined space of hazardous materials from interconnecting equipment such as piping, ducts, vents, drains or other means. This will include not only inlet and outlet piping but all potential sources (electrical, thermal, hydraulic, mechanical, pneumatic, etc.)

C. Lockout/tagout and hazardous energy sources within or attached to the confined space to prevent accidental movement or energizing of such sources. Where applicable, one or more of the following methods shall be used:

1. Remove a valve, spool piece, or expansion joint in piping to, and as close as possible to, the confined space, and blank or blind a pipe or duct at the nearest accessible point to the confined space.

2. Employ the double block and bleed technique (a method used to isolate a confined space from line, duct or pipe by locking closed and tagging in-line valves on a piping system, and opening a valve between them that is vented to the atmosphere) at the nearest accessible point to the space.

3. In cases where lines have contained hazardous liquids or gases, inert gases or liquids at high temperature or pressure, all lines entering the space (process, steam, pneumatic or hydraulic lines, vents, drains, etc.) shall be physically disconnected as close to the tank or vessel as possible and practical.

4. Lines shall also be physically disconnected if they could introduce non-hazardous substances into the space in quantities that could engulf the entrants. If possible, the open ends of disconnected lines must be blanked or capped to prevent any liquids or gases from entering the space. All blind flanges must be of sufficient thickness and tensile strength to withstand maximum pressures and corrosion by chemicals to which they may be exposed.

5. Pressure in the lines must be bled down to atmospheric levels. Where lines cannot be physically disconnected due to space limitations, they may be blinded and tagged or a double block and bleed arrangement may be used.

D. To avoid the buildup of static electricity, all lines and other equipment used during the entry shall be electrically bonded and grounded to the space.

E. All sources of ignition within the space, and those nearby which are close enough to pose a hazardous, shall be turned off and locked out.

X. VENTILATION

A. Continuous ventilation of the space shall be performed under the following cases:
1. Initial air monitoring was not acceptable.
2. Natural ventilation is not adequate (example, space has only one entrance).
3. Chemicals are to be introduced into the space for cleaning or other purposes.
4. Welding or other hot work is to be conducted inside the space.

B. Only intrinsically safe air movers shall be used to ventilate confined spaces. Such air movers must be electrically bonded and grounded to prevent any buildup of static charge during operation.

C. Oxygen or power air-driven ventilators shall not be used to ventilate space.

D. Air movers used for ventilation shall be operated in the supply mode. The ventilation rate shall be high enough to achieve 20 air changes per hour.

E. Blowers shall be placed a minimum of five (5) feet from the entry to the space to prevent re-entry of contaminated air.

F. Whenever possible, air movers shall be used with ducting to increase the efficiency of ventilation in the space and to prevent re-entry of contaminated air. For maximum efficiency, the end of the ducting must be placed within 2 feet of the bottom of the space.

G. If the ventilation or exhaust stops, all entrants shall evacuate the space immediately.

H. The space must be thoroughly ventilated using atmospheric air only (never compressed air or oxygen). The equipment providing the ventilation outside the confined space must be situated to ensure that it does not introduce exhaust fumes or other toxic gases into the space.

I. Continuous ventilation shall be used while welding in a confined space or working in tank/vessel(s) that contain sludge, scale or other flammable materials.

J. Local exhaust must be used for any welding work. The hood of the exhaust system shall be placed as close to the welding work as possible to remove harmful vapors. The exhaust system shall be placed far enough away from the confined space entrance so that fumes cannot reenter the space.

XI. POTENTIAL HAZARDS OF CONFINED SPACE ENTRY

A. Asphyxiation may occur because:
   1. Certain chemicals can absorb or replace oxygen in the space (inert gases).
   2. Welding processes can deplete oxygen in the confined space and elevate carbon monoxide levels.
   3. Metal oxidation (rusting) inside a closed vessel may deplete oxygen from the atmosphere.
   4. Improper or inadequate ventilation can allow toxic or asphyxiation gases to accumulate within the space.

B. Gases or dusts present a fire and/or explosion hazard and:
   1. May come from residues in the confined space.
   2. May enter from upstream or downstream components.
   3. May be introduced by compressed welding gases (acetylene, oxygen, etc.)
   4. May be introduced by liquid or gaseous releases from outside the confined space.

C. Toxic substances or atmospheres:
   1. May be introduced from inside or outside the space.
   2. May cause damage through inhalation, ingestion or direct skin contact.
   3. Exposure effects may vary from mild to fatal.
   4. May be generated from procedures or materials used during the entry.

D. Electric shock can occur if electrical energy to the space is not properly disconnected and locked out or tagged out, or if equipment used in the space is improperly grounded or insulated.

E. Physical injuries can occur because of:
   1. Slippery conditions within the space.
   2. Falling objects.
   3. Contact with hot metal or corrosive chemicals.
   4. Failure to disconnect and lock out all energy supplies to moving equipment inside the confined space.
   5. Poor lighting.
   6. Cave-in when working in a trench or excavation.

F. Note existing or potential hazards such as:
   1. Oxygen deficiency or enrichment.
   2. Flammability.
   3. Toxicity.
   4. Mechanical hazards.
   5. Heat hazards.
   6. Engulfment.

XII. CONFINED SPACE ATMOSPHERIC MONITORING PROCEDURES

A. A written record of the pre-entry atmospheric monitoring results shall be documented and kept at the work site for the duration of the entry. This record is part of the entry permit and is to be kept on file for one year.

B. The entry supervisor shall certify in writing, based upon the results of the pre-entry atmospheric monitoring, that all hazards have been eliminated.

C. All affected persons must be able to review the test results.

D. The most hazardous conditions will govern when work is being performed in two adjoining, connecting spaces.

E. Atmospheric testing shall be conducted using only properly calibrated air monitoring equipment. Properly calibrated equipment using the manufacturer's recommended specifications within the past 30 days. The most recent calibration date shall be marked on the equipment and in the logbook for testing and maintenance of such equipment.

E. After appropriate ventilation, a check of the atmosphere inside the confined space shall be conducted prior to entry, as determined by the potential hazards and immediately prior to any hot work. If IDLH conditions are suspected, work must stop until the hazardous atmosphere is eliminated. Record the readings.

1. Ventilating equipment shall be turned off at least 15 minutes prior to performing any atmospheric monitoring to ensure the values shown are representative of the raw atmosphere within the space.

2. Prior to entry tests shall be conducted with a properly calibrated detector(s) in the following order:
   a. Oxygen.
   b. Flammable vapors (%LEL)
   c. Suspected airborne contaminants.

3. The person conducting the atmospheric monitoring shall initial and list on the permit the date/time the testing was conducted and the results of the test.

F. Atmospheric monitoring shall be conducted at a minimum of three (3) locations within the space (i.e., bottom, middle, and top of space) for a minimum of one (1) minute in each location. Record the readings on the entry permit.
1. If entry is to be through a manhole, initial air monitoring shall be conducted through the manhole cover without removing the cover whenever possible. This is to prevent sparking in case of a flammable atmosphere in the space.
2. If entry is to be through the side of a space, testing immediately inside the space shall be conducted prior to entry. After entry, atmospheric monitoring of the space five (5) feet in front of the entrant shall be conducted using a three (3) foot probe.

G. All atmospheric monitoring results shall be legibly recorded on the entry permit documenting the range of results obtained from the different sampling locations within the space.

H. Entry into a confined space is prohibited when one or more of the following conditions are present:
1. Atmospheric oxygen concentration below 19.5 or above 23.0%.
2. Flammable atmosphere in excess of 10% of its LEL.
3. Airborne combustible dust at a concentration that obscures vision at five (5) feet or less, or combustible dust concentration is more than LEL.

4. Any air contaminant at a concentration more than its allowable concentration.
5. If the oxygen concentration is not within the range of 19.5 - 23.0%, the reason for the abnormal reading shall be investigated. Such a reading may indicate the presence of another toxin, such as carbon monoxide, that displaces oxygen. This toxin shall be monitored for.
6. If any more of the above conditions exist, the space shall be ventilated for a minimum of 10 minutes prior to retesting.
    a. With the ventilation still on, retest the space.
    b. If conditions are still not acceptable, contact a qualified professional.

I. Atmospheric monitoring shall be performed by a trained qualified person, such as an entry supervisor, health & safety professional, etc. and readings are to be recorded on the confined space entry permit.

J. Continuous atmospheric monitoring may be needed based upon the potential for changing atmospheric conditions. Readings are to be recorded every 15 minutes.

XIII. CONFINED SPACE ENTRY PERMIT

A. The entry permit serves several essential functions:
1. It restricts entry so only authorized personnel may enter a confined space.
2. It ensures communication takes place and hazards are controlled.
3. It minimizes safety precautions to be taken.
4. Serves as an official written record of existing conditions, requirements and safeguards.
5. Serves as a tool for reviewing this procedure.

B. Entry into a confined space shall be documented in writing using an entry permit.
1. The permit is a written authorization and approval that is specify to the job to be done and certify that all hazards have been evaluated and protected against.
2. It also serves as a record of all entrants.
3. All required signatures must be present and the permit must be filled out completely.

C. Entry permits are only valid for a specified time (e.g., one task or one shift).

D. Prior to entry, a copy of the entry permit shall be made available to all entrants by posting it at the portal. All entrants shall examine it to be determined if entry conditions have been met.

E. The original permit and any subsequent permits shall be retained for a minimum of one (1) year.

F. Permit required confined space entries should have the following minimum equipment at the entry site prior to initiating the entry:
1. Communication equipment.
2. Full body harness.
3. Appropriate PPE.
4. For top entry, rescue line & tripod retrieval winch.
5. For bottom entry, rescue line, wristlets.

G. A separate hot work permit shall be obtained for any welding, burning, drilling or other hot work that will take place within the space and attached to the entry permit.

H. The entry permit shall outline the elements of a rescue plan for the rescue of entrants in case of an emergency. It will outline at least the following elements:
   1. Designated rescuers.
   2. Equipment.
   3. Methods of summoning the rescue team.

I. Prior to any confined space entry, a pre-entry safety meeting shall be held that involves all participants (including contractors) and covers at least the following points:
   1. Review all existing or potential hazards that may exist in the space.
   2. Review the required levels of PPE. The entry supervisor shall ensure that each participant has the proper PPE and knows how to use it.
   3. Discuss the work to be performed, who will do it and how it will be done safely.
   4. Review the rescue plan that will be activated in case of emergency.
   5. Anyone not attending the pre-entry safety meeting will not be allowed to enter the permit space until they have been briefed on all the information presented at that meeting.

J. Preparation of the entry permit

Entry into a permit required confined space shall not be made unless an entry supervisor has assured that he following procedures have first been completed:

1. An entry permit is initiated by signing the confined space entry log, obtain a blank entry permit and fill it out. The permit will indicate:
   a. The specific confined space to be entered.
   b. What work is to be performed.
   c. The length of time estimated to complete the work. Permits are only valid for 12 hours. A permit may be extended for another 12 hours provided that acceptable conditions are re-certified and test results entered on the permit.
   d. What date and time the work will be started.
   e. What personnel, names and titles, will perform the work.
   f. Name and title of authorizing authority.
   g. Name and title of entry supervisor.
   h. Name and title of person acting as the attendant.
   i. All pumps or lines which may convey flammable, injurious, or incapacitating substances into the confined space shall be disconnected, blinded, (double blocked or bled), or effectively isolated by other means to prevent the development of dangerous levels of air contamination or oxygen deficiency within the space. The closing of values alone, or the closing of valves and locking or tagging them, is not considered effective protection. The disconnection or blind shall be so located or done in such a manner that inadvertent reconnection of the line or removal of the blind are effectively prevented.

   Note: This does not require the blocking of all laterals to sewers or storm drains unless experience or knowledge of industrial use indicates materials resulting in dangerous air contamination may be dumped into an occupied sewer.

j. The atmospheric testing equipment must be field checked prior to testing the atmosphere in the confined space.

k. Atmospheric testing must be conducted for oxygen levels between 19.5 % and 23.0% by volume and the percentage found is to be entered on the permit. The last calibration date of the oxygen detector must be entered on the permit.

l. Atmospheric testing must be conducted for flammable gas, vapors or mists in excess of 10% of its LEL and results noted on the permit. The last calibration date of the combustible gas indicator must be entered on the permit.

m. The confined space must be flushed or emptied of all dangerous substances and then tested for known toxin substances for the permissible exposure limit (PEL).
   i. Enter the value of the PEL on the permit.
   ii. If a hazardous atmosphere is present ventilation and respirators must be provided.

n. Electrical and mechanical hazards must be removed or prevented from causing a hazardous situation.

o. Associates entering a permit required confined space with a hazardous atmosphere must be provided with an appropriate retrieval device, retrieval line and an appropriate respirator. The associate must have received and have documented training on the use of a respirator.

2. Testing shall be conducted every hour that the confined space is occupied and results noted on the permit.

3. If there is a problem, necessary action shall be taken to ensure the safety of those involved. The attendant is to contact the applicable rescue team and inform them of the conditions when they arrive on the scene.

Note: Under no circumstances is the attendant to enter the confined space.

4. When work has been completed, the entry supervisor shall sign the permit as being completed and all conditions in the confined space have been returned to normal, the space is closed and properly marked.

XIV. CONFINED SPACE ILLUMINATION

A. Confined spaces shall be properly illuminated.

B. When temporary lighting is used in confined spaces containing combustible or flammable dusts, residues or contaminants, the following requirements shall be met:
   1. Temporary lighting and powered equipment shall be protected using a ground fault circuit interrupter (GFCI) or be the low voltage type (12 volts).

2. Lighting shall be factory mutual (FM) or underwriters' laboratories (UL) approved. Equipment used in hazardous areas shall match the classification of the area (i.e., Class 1 or 2, Division 1 or 2, etc.)
3. Extension cords used for temporary lighting shall be equipped with connectors or switches approved for hazardous locations.

XV. PROTECTIVE EQUIPMENT

A. Appropriate protective equipment (selection based one exposure) shall be worn during entry. This may include but is not limited to the following:
1. Protective clothing.
2. Hard hat.
3. Gloves.
4. Safety-toed footwear.
5. Safety glasses with side shields, or face shields.
6. Respiratory protection

B. Respiratory protection should not be used unless associates have been properly trained and qualified in its use according to 1910.134. To wear a respirator, an associate must have a respiratory physical performed by a qualified medical professional approving them to wear the respirator and must have a fit test annually.

C. A rescue line shall be worn by all entrants unless it would increase the overall risk of entry.
1. The rescue line shall be attached to a mechanical device or fixed point outside the space. Under no circumstances is the line to be fastened to a vehicle.
2. A mechanical device must be available to retrieve personnel from vertical type spaces more than 4' deep.
3. A full body harness shall be worn for all top entry confined spaces.

D. Personnel protective equipment (PPE) is necessary for entry into a confined space if the space contains a corrosive hazard or if chemicals brought into the space require such clothing.
1. The proper type of PPE must be assigned for use in confined spaces based on the types and amounts of hazardous substances present in the confined space.
2. The entry supervisor is to contact Risk Management staff if there is any question about what is proper PPE for a particular entry.
3. Additional information may be obtained from the applicable MSDS.

E. Where required, PPE shall be used in accordance with 1910.134.
1. Respiratory protection is required in situations where hazardous dusts are present and when atmospheric monitoring results dictate.
2. Risk Management staff shall determine the proper type of respiratory equipment required.
3. Employees must be trained in the proper selection and use of PPE.

F. Retrieval equipment is required for permit required confined spaces such as entries that:
1. Present an engulfment hazard from the presence of a material inside the space during entry.
2. Involve hot work or the presence of chemicals inside the space.
3. Require the use of air supplying respirators.

G. Retrieval equipment shall include:
   1. A retrieval line that shall be attached to a mechanical device or fixed point outside the permit space in such a manner that rescue can begin as soon as the rescuer becomes aware that rescue is necessary. A mechanical device shall be available to retrieve associates from vertical type permit spaces more than 5' feet deep.
   2. A chest or full body harness, with a retrieval line attached at the center of the entrants back near shoulder level, or above the entrant's head. Wristlets may be used in place of the chest or full body harness if the entry supervisor can demonstrate that the use of a chest or full body harness is infeasible or creates a greater hazard and that the use of wristlets is the safest and most effective alternative.
   3. Fall protection for spaces greater than 10 feet in depth and requiring entry through the top.
   4. As a minimum, safety glasses and safety shoes or boots shall be worn while in a confined space.

XVI. MISCELLANEOUS TOOLS AND EQUIPMENT

Many types of tools and equipment may be utilized to conduct a confined space entry. The tools and equipment shall meet the following minimum criteria:

A. Electrical tools using normal 120-volt alternating current shall be grounded and connected only to GFCI circuit. (Low voltage systems (12 volts) are preferred.)
B. Within spaces where a flammable atmosphere may exist, all electrical equipment shall be explosion proof or intrinsically safe.
C. Electrical lighting systems shall be connected to a GFCI circuit or provided by a 12-volt electrical system.
D. Where ladder or scaffolding use is required, all equipment shall be non-slip/skid and shall be secured (tied off) as necessary to ensure against falling.
E. Arc welding equipment shall be properly grounded, taken into space only when needed and removed as soon as possible. A hot work permit is required.
F. Compresses gas cylinders (except breathing air and portable fire extinguishers) are not to be taken into any confined space. Oxyacetylene hoses and arc welding equipment may be taken into the space but must be checked for leaks and/or cracks prior to use. If leaks or cracks are found the hose or cable shall be replaced immediately.

XVII. MEDICAL CONSIDERATIONS

A. Individuals who are claustrophobic should be made aware of the conditions involved in a confined space and should notify their supervisor if they feel unable to function in such an environment. The supervisor should excuse such individuals.

B. Other precautions
   1. The number of confined space entrants should be kept to a minimum, especially during "hot work" (welding or burning.)
   2. Entry will not be permitted until entrants have a minimum visual distance of 5 feet within the confined space.

XVIII. ADDITIONAL PROCEDURES

A. Rescue service personnel
   1. Rescue teams shall be from the Harrisonburg Fire Department.
   2. Employees shall only perform external rescues and shall not enter a confined space to perform any rescue.

B. Emergency preparation and procedures
   1. Appropriate fire protection and/or water supply should be readily available and operable if needed.
   2. For emergencies, a rescue harness and line(s) must be available.

XIX. TRAINING

A. The FM Power Plant Manager shall inform new associates of the hazards of working in confined spaces and permit required confined spaces by providing specific training to associates before they may be authorized to enter a confined space.

B. New associates shall receive an online introduction to confined space entry procedures from the Risk Management Safety Coordinator. Supervisors must ensure that untrained associates do not participate in confined space entries.

C. Entry supervisors, entrants and attendants shall attend an annual hands-on training course to keep aware of changing requirements and to maintain skills. This training will be provided by the FM Power Plant Manager.

D. Training shall include but not limited to the following:
   1. Entry supervisors, entrants and attendants of a confined space shall have completed training in the related FM policies and procedures that meet applicable VOSH regulations, including 1910.146 (permit required confined space), 1910.134 (respiratory protection), 1910.1200 (hazard communication) and1910.147 (hazardous energy control [lockout/tagout].)
   2. Use of atmospheric testing devices, for those associates required to perform atmospheric tests, including field checks a specified by the manufacturer, normal use and specific limitations of the equipment.
   3. Use of special equipment and tools, including external rescue equipment.
   4. Emergency and external rescue methods and procedures.
   5. Duties of the entry supervisor during permit required confined space operations.
   6. Duties of the attendant during permit required confined spaces.
   7. Duties of the entrant during permit required confined spaces.
   8. The entry permits system.
   9. A hands-on practice session.

E. Training shall be given to affected associates at the following times:
   1. Before the associate is first assigned duties relating to confined space.
   2. Before there is a change in his/her assigned duties related to confined space.
   3. When there is a change in permit space operations that presents a hazard about which the associate has not been trained.
   4. When the supervisor has reason to believe that the associate's knowledge or use of procedures are inadequate or there have been deviations from those procedures.

5. A written test will be required to be completed by trainees. The test shall be written by the trainer and is to be sufficient in nature to determine the trainee is knowledgeable of the necessary safety requirements of a confined space entry. Failure to pass the written test with a score if at least 70% correct shall result in re-training.

XX. CONTRACTORS AND SUB-CONTRACTORS

A. The term contractor shall also imply sub-contractor.

B. Contractors shall be informed by the project manager via the specifications of the hazardous of the confined. It is the responsibility of the company owner to ensure compliance with all confined space requirements.

C. Contractors who enter confined spaces must be pre-qualified to perform such work by providing the following documentation to the appropriate FM project manager.

1. Their general safety policies and procedures.
2. Their confined space entry procedure (It must meet the requirements of Virginia OSHA 1910.146.)
3. Their entry permit program and permit.
4. Training certification for all involved personnel. At least one contractor employee on the job site must be certified as an entry permit supervisor.
5. Their hot work procedures and permit if the job involves hot work.
   a. Names of past customers where work has been completed involving confined spaces.
   b. List of confined space safety equipment they will provide for use on the job.
   c. Emergency procedures they will use on the job.
   d. A statement indicating that they have never been cited by state or federal safety compliance agencies for any confined space safety infraction. If they have been cited previously, a copy of the citation and a statement from them describing the corrective action they have instituted shall be provided.

(Reference 1910.146 (c) (9): In addition to complying with the permit space requirements that apply to employers, each contractor who is retained to perform permit space entry operations shall:

i. Obtain any available information regarding permit space hazards and entry operations from the host employer;
ii. Coordinate entry operations with the host employer, when both host employer personnel and contractor personnel will be working on or near permit spaces, as required by paragraph (d) (11) and
iii. Inform the host employer of the permit space program that the contractor will follow and of any hazards confronted or created in permit spaces, either through a debriefing or during the entry operation.

D. Contractor personnel shall conduct atmospheric monitoring using their calibrated equipment and must issue an entry permit using their form. Documentation of proper calibration shall be available at the work site.

E. Contractors shall be responsible for the assignment of appropriate PPE for their personnel. The university PPE will not be used by the contractor.

F. Contractors shall have their own appropriate rescue equipment, rescue team and procedures available at the work site.

G. Upon completion of the contractor's confined space work, a copy of the contractor's entry permit shall be forwarded to the appropriate FM office to be filed and retained for annual review.

H. The contractor shall provide a signed statement indicating they assume primary responsibility for compliance with local, state, and federal regulations concerning employee safety and health and environmental issues.

I. The contractor shall provide a signed statement to the FM project manager they have received and understand the items mentioned above.

J. If the project involves joint operations with FM personnel these, operations must be coordinated by the FM project manager.

K. The FM project manager will meet with the contractor to review safety issues involved on the job after completion of work by the contractor.

DISCIPLINE

A. Failure to follow the requirements of this procedure by any FM associate may result in disciplinary action according to the DHRM Standards of Conduct up to and including termination.

RESOURCES

Confined Space Entry Log
Confined Space Entry Roster
Confined Space Entry Permit
Confined Space Hot Work Permit

INITIAL DETERMINATION FLOWCHART FOR &1910.146

If you have an...

ENCLOSED SPACE

Can it be bodily entered by an individual?

Yes — No > then it is not a confined space

Does it have a limited or restricted means of entry and egress?

Yes — No > then it is not a confined space

Is the space unsuitable (I.e., not designed) for continuous employee occupancy?

Yes — No > then it is not a confined space

Then it is a...

CONFINED SPACE

Does it contain or have the potential to contain a hazardous atmosphere?

Yes — No

Does it contain a material that has the potential for engulfing an entrant?

Yes — No

Does it have an internal configuration which could trap or asphyxiate an entrant due to inwardly converging walls or downward sloping floor tapering into a small cross-section?

Yes — No

Does it contain any other recognized serious safety or health hazard?

Yes — No > then it is not a permit-required confined space

Then it is a...

PERMIT-REQUIRED CONFINED SPACE