PERMIT-REQUIRED CONFINED SPACE PROGRAM

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WEST VIRGINIA UNIVERSITY
Permit-Required Confined Space Program
OSHA 29 CFR 1910.146 and 29 CFR 1926 Subpart AA

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1. INTRODUCTION

The Occupational Safety and Health Administration (OSHA) determined that entry into certain types of confined spaces poses a significant risk to workers. To protect workers from hazards encountered in unique work environments, OSHA developed the Permit-Required Confined Space Standards (29 CFR 1910.146 and 29 CFR 1926.Subpart AA-Confined Spaces in Construction). The Permit-Required Confined Space Program is a campus-wide program for West Virginia University (WVU) to include all WVU satellite campuses.

2. PURPOSE

This program serves to comply with OSHA standards covering permit-required confined spaces by defining the requirements, practices, and procedures to protect employees from hazards of entry into permit-required confined spaces.

3. SCOPE

The Permit-Required Confined Space Program applies to WVU employees who are exposed to permit-required confined spaces, outside contractors on WVU property who are exposed to permit-required confined spaces, or any WVU employees that oversees a WVU project that may be exposed to permit-required confined spaces.

4. DEFINITIONS

The definitions herein will reflect OSHA 29 CFR 1910.146 General Industry and 29 CFR 1926.Subpart AA-Confined Spaces in Construction.

Acceptable entry conditions – the conditions that must exist in a permit space to allow entry and to ensure that employees involved with a permit-required confined space entry can safely enter, and work within the space.

Attendant – the individual stationed outside a permit-required confined space(s) who monitors the authorized entrants and who performs all attendant's duties assigned in the employer's permit space program.

Authorized entrant – an employee who is authorized by the employer to enter a permit-required confined space and is familiar with the hazards associated with the space and methods for controlling and mitigating hazards.

Blanking or blinding – the absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or a skillet blind) that completely covers the bore and that can withstand the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.

Barrier – a physical obstruction that blocks for limited access.

Combustible Gas – an airborne concentration of gas or vapor which may present the risk of fire or explosion if ignition source of enough energy is introduced. This term is synonymous with “flammable”.

Competent person – a person who can identify hazards and working conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them.

Confined space – a space that meets **ALL** the following criteria:

- Large enough and so configured that an employee can bodily enter and perform assigned work.
- Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins hoppers, vaults, and pits are spaces that may have limited means of entry).
- Not designed for continuous occupancy.

Controlling Contractor – the employer that has the overall responsibility for construction at the worksite. Note- If the controlling contractor owns or manages the property, then it is both a controlling employer and a host employer.

Double block and bleed – the closure of a line, duct, or pipe by closing and locking or tagging two in-line valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves.

Emergency – any occurrence (including any failure of hazard control or monitoring equipment) or event internal or external to the permit space that could endanger entrants.

Engulfment – the surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.

Early-Warning System – means the method used to alert Authorized entrants and attendants that an engulfment hazard may be developing. Examples of early-warning systems include but are not limited to: alarms activated by remote sensors; and lookouts with equipment for immediately communicating with the authorized entrants and attendants.

Entry – any part of a person passes into a permit-required confined space spell out. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space, whether such action is intentional, or any work activities are actually performed in the space.

Entry Employer – Decides that an employee it directs will enter a permit space.

Note: An employer cannot avoid the duties of the standard by refusing to decide whether it's employees will enter a permit space. OSHA will consider failure to do so to be an implicit decision to allow employees to enter those spaces if they are working in the proximity of the space.

Entry permit – a written document that is provided by the employer to allow and control entry into a permit space and contains the information necessary for proper entry and documentation.

Entry supervisor – the qualified person responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required by this standard. The entry supervisor shall have completed confined space training.

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

Hazardous atmosphere – an atmosphere that may expose employees to the risk of death, incapacitation, and impairment of ability to self-rescue (that is, escape unaided from a permit space), injury, or acute illness from one or more of the following causes:

- **Flammable gas, vapor, or mist** in excess of 10 percent of its lower flammable limit (LFL).
- **Airborne combustible dust** at a concentration that meets or exceeds its LFL.

  ***Note*:** This concentration may be approximated as a condition in which the dust obscures vision at 5ft or less.
- **Atmospheric oxygen concentration** below 19.5 percent or above 23.5 percent.

  ***Note*:** An atmospheric concentration of any substance that is not capable of causing death, incapacitation, and impairment of ability to self-rescue, injury, or acute illness due to its health effects is not covered by this provision.
- **Atmospheric concentration of any substance** for which a dose or a permissible exposure limit (PEL) is published in subpart D (Occupational Health and Environmental Control), or Subpart G (Occupational Health and Environmental Control), or in Subpart Z (Toxic and Hazardous Substances), and which could result in employee exposure in excess of its dose or PEL.

  ***Note*:** An atmospheric concentration of any substance that is not capable of causing death, incapacitation, or impairment of ability to self-rescue, injury, or acute illness due to its health effects is not covered by this definition.
- **Any other atmospheric condition that is immediately dangerous to life or health.**

  Note: For air contaminants for which OSHA has not determined a dose or PEL, other sources of information such as Safety Data Sheets that comply with the Hazard Communication Standard, 1910.1200, published information, and internal documents can provide guidance in establishing acceptable atmospheric conditions.

Host employer – the employer that owns or manages the property where the construction work is taking place.

Note: If the owner of the property on which the construction activity occurs has contracted with an entity for the general management of that property and has transferred to that entity the information specified in 1926.1203(h)(1), OSHA will treat the contracted management entity as the host employer for as long as that entity manages the property. Otherwise, OSHA will treat the owner of the property as the host employer. In no case will there be more than one host employer.

Hot work – operations capable of providing a source of ignition (for example, riveting, welding, cutting, burning, and heating).

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

Immediately Dangerous to Life or Health (IDLH) – any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a permit space.

> **Note**: Hydrogen fluoride gas and cadmium vapor may produce immediate transient effects that, even if severe, may pass without medical attention, but are followed by sudden, possible fatal collapse 12 – 72 hours after exposure. The victim "feels normal" from recovery from transient effects until collapse. Such materials in hazardous quantities are "immediately" dangerous to life or health.

Inerting – the displacement of the atmosphere in a permit space by a noncombustible gas (such as nitrogen) to such an extent that the resulting atmosphere is noncombustible.

> **Note: This procedure produces an IDLH oxygen-deficient atmosphere.**

Isolation – the process by which a permit space is removed from service and completely protected against the release of energy and material into the space by such means as: blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; a double block and bleed system; lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages.

Limited or restricted means for entry or exit – a condition that has a potential to impede an entrant's ability to escape in an emergency. Such conditions may include trip hazards, poor lighting, pipes, ducts, equipment, slippery floors, inclining surfaces & ladders.

Line breaking – the intentional opening of a pipe, line, or duct that is or has been carrying flammable, corrosive, or toxic material, an inert gas, or any fluid at a volume, pressure, or temperature capable of causing injury.

Lockout – the placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

Lower flammable limit (LFL) or lower explosive limit (LEL) – the minimum concentration of a substance in air needed for an ignition source to cause a flame or explosion.

Monitor or monitoring – the process used to identify and evaluate the hazards after an authorized entrant enters the space. This is a process of checking for changes that is performed in a periodic or continuous manner after the completion of the initial testing or evaluation of that space.

Non-entry rescue – occurs when a rescue service, usually the attendant, retrieves employees in a permit space without entering the permit space.

Non-permit confined space – a confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

Oxygen-deficient atmosphere – an atmosphere containing less than 19.5 percent oxygen by volume.

Oxygen-enriched atmosphere – an atmosphere containing more than 23.5 percent oxygen by volume.

Permit-required confined space – a confined space that has one or more of the following characteristics:

- Contains or has a potential to contain a hazardous atmosphere.
- Contains a material that has the potential for engulfing an entrant.
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or
- Contains any other recognized serious safety or health hazard.

Permit system – the employer's written procedure for preparing and issuing permits for entry and for returning the permit space to service following termination of entry.

Physical hazard – an existing or potential hazard that can cause death, or serious physical damage. Examples include, but not limited to explosives (as defined by paragraph (n) of 1926.914, definition of "explosive"); mechanical, electrical, hydraulic, or pneumatic energy; radiation; temperature extremes; engulfment; noise; and inwardly converging surfaces. Physical hazard also includes chemicals that can cause death or serious physical damage through skin or eye contact (rather than inhalation).

Prohibited condition – any condition in a permit space that is not allowed by the permit during the period when entry is authorized. A hazardous atmosphere is a prohibited condition unless the employer can demonstrate that personal protective equipment (PPE) will provide effective protection for each employee in the permit space and provides the appropriate PPE to each employee.

Qualified person – a person who, by position of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated his ability to solve or resolve problems relating to the subject matter, work, or the project.

Rescue – retrieving, and providing medical assistance to, one or more employees who are in a permit space.

Rescue service – the personnel or department designated to rescue employees from permit spaces.

Retrieval system – equipment (including a retrieval line, chest or full-body harness, wristlets, or anklets, if appropriate, and a lifting device or anchor) used for non-entry rescue of persons from permit spaces.

Serious physical damage – an impairment or illness in which a body part is made functionally useless. Such impairment or illness may be permanent or temporary and includes loss of consciousness. Injuries involving such impairment would usually require treatment by a physician or other licensed health-care professional.

Tagout means:

1. Placement of a tagout device on a circuit or equipment that has been deenergized, in accordance with an established procedure, to indicate that the circuit or equipment being controlled may not be operated until the tagout device is removed; and
2. The employer ensures that:
   a. Tagout provides equivalent protection to lockout; or
   b. That lockout is infeasible, and the employer has relieved, disconnected, restrained, and otherwise rendered safe stored (residual) energy.

Test or Testing – process by which the hazards that may confront entrants of a permit space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit space.

Note: Testing enables employers both to devise and implement adequate control measures for the protection of authorized entrants and to determine if acceptable entry conditions are present immediately prior to, and during, entry.

Ventilate or Ventilation – controlling a hazardous atmosphere using continuous forced-air mechanical systems that meet the requirements of 29 CFR 1926.57 (Ventilation).

WVU Project Managers - individuals responsible for hiring external contractors or vendors that will be conducting Permit- Required Confined Space Entry operations while on WVU property.

5. ROLES AND RESPONSIBILITIES

5.1 WVU Administration

The WVU Administration is responsible for assuring the University complies with applicable Federal and State Occupational Safety and Health regulations regarding the permit-required confined space as stated in CFR 1910 General Industry and CFR 1926 Construction Industry and for providing necessary resources to assure the implementation and continuance of this program.

5.2 WVU Department Deans/Directors/Managers/Supervisors

Deans, Directors, Facilities Managers, and Supervisors have primary responsibility for the management and enforcement of the Permit-Required Confined Space Program in their areas.

- Ensure that responsibilities assigned within this program are carried out within their administrative work unit.

- Implement and communicate this program to their departments and provide needed resources.
- Attend required training.
- Ensure employees and contractors know the requirements of the WVU Permit-Required Confined Space Program.
- Ensure employee participation in the permit-required confined space training.
- Inform contractors of entry requirements if their work will involve entering a permit-required confined space.
- Contact Environmental Health and Safety to identify and assess suspected confined spaces.
- Ensure that permits are filled out and submitted to EHS upon completion of work or cancellation of the permit per the requirements of this program.
- Establish and support a plan to fund and carry out the maintenance and calibration of confined space equipment per the manufacturer's specifications.

5.3 WVU Project Managers/WVU Personnel Who Hire External Contractors

- Shall attend WVU permit-required confined space training.
- Ensure contractors have their own program and equipment while working on WVU owned properties and comply with the requirements of 1910.146 and 1926.1201 as applicable.
- Shall obtain the permit-required confined space evaluations that have been performed of the work area. These are located on the WVU EHS website at http://confinedspaces.wvu.edu/.
- Inform the contract personnel of the work area(s) that contain permit-required confined spaces on the construction site of the known hazards within or around the confined space.
- Coordinate entry operations with contract personnel when both WVU and contractor personnel will work in a permit confined space entry simultaneously. Refer to Appendix C or see CFR 1926.1203(h)(1).

5.4 Environmental Health and Safety (EHS)

- Develop and provide overall administrative support for the Permit-Required Confined Space Program as per 29 CFR 1910.146 and 29 CFR 1926 Subpart AA for WVU, including interpretation of the program.
- Evaluate WVU property to determine if any spaces are permit-required confined spaces.
    - If they are permit-required confined spaces label them accordingly and update as necessary.
- Assist WVU department personnel with selecting appropriate PPE and safety equipment when requested.
- Provide guidance to West Virginia University employees concerning any questions that they have concerning the Permit-Required Confined Space Program.
- Manage and update the permit confined space inventory database.
- Provide access to permit confined space entry inventory database through WVU EHS website.
- Maintain training records associated with this program.
- Provide or coordinate training for work units on the content of this program.
- Maintain canceled and terminated confined space entry permits for one year after each entry.

5.5 Safety and Health Extension

Safety and Health Extension is responsible for the development and delivery of training per this program as required by 29 CFR 1910.146(g) and 29 CFR 1926.1207 Subpart AA.

5.6 Entry Supervisors

- Shall be trained in accordance with 29 CFR 1910.146 and 29 CFR 1926 Subpart AA.
- Check the permit confined space inventory to determine the classification, potential hazards, and entry requirements for that space prior to starting the work.
- Know the hazards that may be faced during the entry, including information on the mode, signs or symptoms, and consequences of the exposure.
- Determine and provide all necessary safety equipment as needed.
- Obtain Entry Permit.
- Ensure the air monitoring equipment is in proper working order and functioning according to the manufacturer's specifications. If equipment isn't working, report it to your immediate supervisor.
- Verify by checking that the appropriate entries have been made on the permit, that all tests specified by the permit have been conducted and that all procedures and equipment specified by the permit are in place **before** endorsing the permit and allowing entry to begin.
- Ensure that entry permit is posted on site and made available to all persons.
- Inform entrants and attendants of the potential hazards associated with entering each space.
- Check that the entry operations are consistent with those outlined in the confined space entry permit.
- Coordinate permit confined space entry operations with contractor if work involves WVU and contractor employees in the same permit confined space.
- Terminate the entry and cancel the permit when:
    - The entry operations covered by the permit have been completed; or
    - A condition that is not allowed under the entry permit arises in or near the permit space
- Ensure the means for summoning the Rescue Service is available and functioning.
- Remove unauthorized individuals who enter or who attempt to enter the permit space during entry operations, or call's 911 for assistance if necessary.
- Submit canceled or terminated entry permits to:

  Email: ehssafetyteam@groups.wvu.edu
  Or mail to: Environmental Health and Safety PO Box 6551 Morgantown, WV 26506
  Or Fax to: (304)-293-7257

5.7 Authorized Entrant

- Attend WVU permit-required confined space training as required.
- Understand all the hazards associated with working in the permit-required confined space, including information on the modes, the signs, symptoms, and consequences of the exposures.
- Ensure the air monitoring equipment is in proper working order and functioning according to the manufacture's specifications before entering the confined space. If equipment is not working properly, report to your immediate supervisor.

- Properly use equipment as required by the Entry Permit for the work task.
- Communicate with the attendant as necessary to enable the attendant to monitor entrant status and enable the attendant to alert entrants of the need to evacuate the space as required.
- Ensure appropriate methods of hazard control are practiced, including but not limited to, lock-out-tag-out, hot work permits, and ventilating a hazardous atmosphere.
- Maintain constant communication with the attendant.
- Alert the attendant whenever:
    - The entrant recognizes any warning sign or symptom of exposure to a dangerous situation, or
    - The entrant detects a prohibited condition.
- Exit the permit-required confined space whenever:
    - An order to evacuate is given by the attendant or the entry supervisor.
    - The entrant recognizes any warning signs or symptoms of exposure to a dangerous situation.
    - The entrant detects a prohibited condition.
    - An evacuation alarm is activated.
    - If monitoring equipment malfunctions.

5.8 Attendant

- Attend WVU permit-required confined space training as required.
- Understand all the hazards associated with working in the identified space, including information on the mode, signs, symptoms, and consequences of the exposures.
- Ensure the air monitoring equipment is in proper working order and functioning according to the manufacture's specifications before allowing entry into the confined space. If equipment isn't properly working, report it to your immediate supervisor.
- Continuously maintain an accurate count of authorized entrants in the permit space and ensure that the means used to identify authorized entrants are accurate.
- Remain outside the permit space during entry operations until relieved by another attendant.
- Monitor activities inside and outside the space to determine if it is safe for entrants to remain in the space and orders the authorized entrants to evacuate the permit space immediately under any of the following conditions:
    - If the attendant detects a prohibited condition.
    - If the attendant detects the behavioral effects of the hazard exposure in an authorized entrant.
    - If the attendant detects a situation outside the space could endanger the authorized entrants; or if the attendant cannot effectively and safety perform all the duties required under the section.

- Summon rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from permit space hazards.
- Keep unauthorized persons from coming near or entering the space.
- Inform the authorized entrants and supervisor if an unauthorized person manages to enter the space.

5.9 Outside Contract Personnel (Controlling Contractor)

Prior to beginning of work, Controlling Contractors shall have the following with respect to permit-required confined spaces:

- Contractors entering permit-required confined spaces shall have their own confined space program in accordance with all applicable OSHA Permit-Required Confined Space Standards (29 CFR 1910. 146 and 1926.1201) as applicable.
- Coordinate with WVU Project Managers following CFR 1926.1203(h)(2). **Refer to Appendix C.**
- Contractors and sub-contractors who perform work on WVU property shall be suitably trained to perform the tasks that they have been assigned.
- Outside contractor shall be responsible to supply all equipment necessary to perform safe entry into a confined space, and safe emergency rescue if needed. WVU does not supply equipment or materials to contractors.
- The contractor's entry supervisor must ensure the following:
    - Contractor's employees are aware of the location and potential hazards of relevant confined spaces.
    - Emergency planning and rescue provisions have been established for the contractor's local work in the confined space(s).
    - Inform the Project Manager of hazards that may arise within the permit-required confined space.

6. TRAINING

Training on the purpose, content and function of the permit-required confined space program is required for all employees who participate in any confined space operations. Training can be arranged through WVU Environmental Health and Safety Department. Records must be kept showing training dates, employee attendance, and the name and signature of instructor(s).

Training should ensure employees have an understanding and knowledge of any hazards they may encounter and the skills necessary for the safe performance of their duties in and around a permit-required confined space.
The training must result in an understanding of the hazards of the permit-required confined space and the methods used to isolate, control, and protect employees from said hazards.

The permit-required confined space training must include the following (but is not limited to):

- Definition of a confined space.
- Definition of a permit-required confined space.
- West Virginia University's Permit-Required Confined Space Program.
- Hazard recognition and control.

- Procedures for atmospheric monitoring.
- Safe work practices.
- Duties of an entrant, attendant, and supervisor.
- The Entry Permit system.
- Emergency and Rescue procedures.
- Permit confined space entry rescue.
- Maintenance, calibration, and use of air monitors.

6.1 Initial/Re-training

Initial training is required for each employee involved in permit-required confined space operations **before** they are assigned any permit-required confined space duty.

Supervisors are responsible for ensuring employees attend permit-required confined space re-training whenever one of the following situations occurs:

- Whenever there is a modification to the permit confined space entry procedures or employee duties.
- If a review finds inadequacies in the permit-required confined space program, all affected employees will be informed of any changes.
- There is a change in permit-required space operations that presents a hazard in which an employee has not been previously trained.
- A supervisor has reason to believe that an employee's knowledge of use of these procedures and plan is inadequate.

7. IDENTIFICATION, CLASSIFICATION, AND RECLASSIFICATION

7.1 Identification

West Virginia University has permit-required confined spaces located on campus.
Permit-required confined spaces have hazards that can cause death, injury, or other serious physical harm. The space may only be entered by personnel who are appropriately trained and adhere to the requirements noted in this program.

Examples of permit-required confined spaces at WVU are:

- Sewer Manholes
- Storm Water Manholes
- Feed Bins
- Silos
- Air Handling Units
- Elevator Pits
- Electrical Vaults

- Crawl Spaces
- Steam Tunnels* (See Exception – Section 11)

*WVU Steam Tunnel hazards or potential hazards are:

- Extreme heat
- Low overhead, head bumping hazards.
- High Voltage electrical (most are secured)
- Compressed gas (steam)
- Tripping/Slipping

A complete list of permit-required confined spaces can be found in the database on the WVU EHS website at: https://www.ehs.wvu.edu/general-safety/confined-spaces

7.1.1 Signage

Permit–required confined spaces at WVU are posted with "DANGER - PERMIT-REQUIRED CONFINED SPACE - DO NOT ENTER" signs with a unique identifier number. The identifier number is used to identify the hazards within the permit-required confined space.

Before entering any permit-required confined space on campus, the identifier number must be entered into the WVU EHS database to look up and review all the hazards.

The database is located at: http://confinedspaces.wvu.edu/search.cfm

7.2 Classification

The permit-required confined space vs. non-permit confined space entry evaluation is a process that identifies and classifies all potential confined spaces and their hazards. **(Appendix B)**

Confined Space:

A space that meets **all** the following criteria:

- Is large enough and configured so that an employee can bodily enter and perform work; and
- Has limited or restricted means for entry or exit; and
- Is not designed for continuous employee occupancy.

Permit-Required Confined Space:

A space that meets ALL the criteria for a confined space, AND has one or more of the following four characteristics:

- Contains or has the potential to contain a hazardous atmosphere.
- Contains a material that has the potential for engulfing an entrant.
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor, which slopes downward and tapers to a smaller cross-section; or
- Contains any other recognized serious safety or health hazard.

7.3 Re-classification

Re-classification of a permit-required confined space to a non-permit confined space is permitted in accordance with OSHA 1910.146(c)(7).

To classify an area as a non-permit confined space, the confined space must meet the following requirements:

- There is no actual or potential hazardous atmosphere in the confined space.
    - This is done by using a gas meter to test the air in the confined space without entering the space.
- Any hazards capable of causing death or serious physical harm have been eliminated. This includes any recognized health or safety hazards including engulfment in solid or liquid material, electrical shock, or moving parts.

The confined space can be classified as a non-permit space only for as long as all the hazards remain eliminated.

- If someone must enter the space to remove hazards, the space must be treated as a permit-required confined space until hazards have been eliminated.

NOTE: Control of atmospheric hazards through forced air ventilation **does not** constitute elimination of the hazards.

(See Re-Classification Form in Appendix C)

8. CONFINED SPACE HAZARDS

All potential hazards concerning the permit-required confined space must be identified. Each hazard must be eliminated or controlled. If hazards cannot be eliminated or controlled, individuals must not

enter the permit-required confined space. Should a hazard be created while the confined space is occupied by workers, they must leave the space until the hazard is remediated. Reference existing drawings and historical information as needed to obtain background information of the hazards.

Hazards may exist in, but are not limited to, the following categories:

8.1 External Hazards

External hazards such as vehicle traffic, machinery, equipment, and work activity may increase the hazards of the permit-required confined space.

When entrances are removed, the opening shall be promptly guarded by a railing, temporary cover, or other temporary barrier that will prevent an accidental fall through the opening and that will protect each employee working in the space from foreign objects entering the space.

8.2 Internal Hazards

Before entering a permit-required confined space, evaluation of the atmosphere is critical. Additionally, spaces that may have potential electrical, mechanical, heat, fall, entrapment, and other hazards need to be assessed before entry.

Contents should be removed and isolated from re-entering the space when possible. Entrants must assume that residues may be present and protect themselves from contact with harmful materials.

8.2.1 Configuration of the Space

The configuration of the space can make safe operations more difficult. Use particular care when any of the following are present:

- Unusual shape or slope
- Low overhead clearance
- Drop offs in floors
- Complex layout

8.3 Energy Hazards

Potential energy sources must be secured. Potential energy sources include, but are not limited to:

- Electrical equipment and circuits.
- Hydraulic equipment and systems.
- Pneumatic equipment and systems.
- Mechanical equipment and systems.
- Gravity operated equipment and systems.
- Thermal Energy equipment, systems, or apparatuses.

The control of hazardous energy and employee exposure to this type of stored energy shall be controlled in accordance with 29 CFR 1910.147.

8.4 Atmospheric Hazards

Potential atmospheric hazards must be identified and controlled before employees can enter. This could be an atmosphere that is oxygen deficient or enriched, flammable, contaminated with a hazardous gas, chemical or material, airborne combustible dust, or considered immediately dangerous to life or health (IDLH).

8.5 Introducing New Hazards into Spaces

If a new hazard is introduced into the space, during the work period, the permit must be modified, revalidated, and a new permit completed for entry.

9. ATMOSPHERIC TESTING

Air monitoring must be performed by an employee trained in the use of monitoring equipment and authorized to perform required air monitoring prior to entering any permit-required confined space.

At a minimum: Oxygen, flammable/combustible gases, carbon monoxide and hydrogen sulfide must be monitored.

Air monitoring shall be performed using, **at a minimum**, a multi-gas monitor that offers real time sampling results as well as audible and visible alarms to warn the user of dangerous situations.

The atmosphere within a space shall be periodically tested as necessary to ensure that the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere.

If a hazardous atmosphere is detected during entry:
Each employee shall leave the space immediately. The space shall be evaluated to determine how the hazardous atmosphere developed and measures shall be implemented to protect employees from the hazardous atmosphere before any subsequent entry takes place.

Hazard	Regulatory Limits
Oxygen (O2)	**19.5 - 23.5%**
Lower Explosive Limit (LEL)	**< 10 %**
Carbon Monoxide (CO)	**< 35 ppm**
Hydrogen Sulfide (H2S)	**< 10 ppm**

(ppm = parts per million)

Air monitoring is conducted to evaluate potential atmospheric hazards or oxygen deficiency, or enrichment exists and determine if acceptable entry conditions exist. Air testing must be done **prior to entry** and in the order mentioned above.

If the pre-entry testing shows no hazardous atmosphere or oxygen deficiency/enrichment within the space, and there is no reason to believe that there is a chance for one to develop, and other potentially hazardous conditions have been removed or controlled, the space may be entered, and work can begin. **Requirements of entry and re-entry are listed on the Entry Permit (Appendix A).**

9.1 Calibrating and Maintaining Air Monitoring Equipment

- All monitoring equipment must be properly calibrated and maintained in good working condition by the WVU Department or shop that has purchased an air monitoring unit for their use.
- All calibrations shall be done according to the manufacturer's specifications.
- Calibration logs for each instrument shall be kept up-to-date and inspected regularly to ensure their accuracy.
- Training or assistance contact EHS for assistance.
- Prior to purchasing any monitoring equipment, contact EHS for assistance.

9.2 Hazardous Atmosphere Control

If a permit confined space entry contains atmospheric hazards, the area will require purging before employees can enter.

Forced fresh air ventilation is the first option for correcting an atmospheric hazard.

Continued Force Ventilation:

The minimum length of time needed to ventilate a space before it is considered safe to enter must be calculated as given below. A volume of clean air equal to at least 20 times the volume of the space is blown into the space to purge the atmosphere. This is based on the AIHA acceptable practice of 20 complete air changes per hour or one every 3 minutes for a confined space.

The following parameters must be known:

- Volume of space (cubic feet)
- Ventilation device flow rate (CFM or cubic feet/min.)

It is advisable if hazardous atmosphere conditions exist to contact EH&S to review the measurements and the planned corrective measures before proceeding.

If forced air ventilation is used for any hazard other than the control of heat, Environmental Health & Safety should be contacted. Ventilation of the space for the removal of heat will be done using the following procedure (internal procedure):

- Place the ventilator outside the space to be entered with the ventilator inlet six to ten feet from the entrance to the confined space.
- Extend the flexible duct from the ventilator outlet into the area to be ventilated.

- Position the duct so the end of the duct is suspended approximately two (2) feet above the bottom of the space.
- Ventilate the space for a period of not less than ten (10) minutes before entry.
- Continue the ventilation process until the atmosphere is acceptable.
- Maintain the ventilation process during the entire space entry operation.

NOTE: A space that is oxygen deficient or contains a flammable or toxic atmosphere "SHALL NOT" be entered by WVU personnel. Environmental Health & Safety (293-3792) shall be contacted for assistance and evaluation of the space.

9.3 Temperature Monitoring

Many factors play a role in creating a heat stress risk to workers within a confined space. The presence of high temperature and humidity levels could potentially cause heat-related illness.

WVU EHS has a heat stress monitoring device used to measure the Wet Bulb Globe Temperature (WBGT) within the permit-required confined space prior to entry. These readings are used to determine the WVU employee's work/rest schedule. This device may be obtained from EHS.
See Appendix E: Work/Rest Schedule

10. PERMIT-REQUIRED CONFINED SPACE ENTRY REQUIREMENTS

10.1 Acceptable Entry Conditions

Because potential hazards may exist within permit-required confined spaces, there are conditions that must be identified and eliminated before entry. Precautionary steps such as energy isolation, ventilation, and atmospheric testing are required prior to entry. Acceptable entry conditions for specific spaces are contained in the Entry Permit.

10.2 Entry Permit

Prior to entry into a permit-required confined space, the entry supervisor shall obtain an Entry Permit.

The **Confined Space Entry Permit (Appendix A)** is the written or printed document provided by WVU to allow and control entry into a permit-required confined space.

Entry Permit includes:

- Identification of the space.
- Purpose of entry.
- Date.
- Length of the permit.
- Names and signatures of authorized entrants and the attendant.
- Name and signature of supervisor who authorized the entry.
- Results of atmospheric monitoring.

- Acceptable entry conditions.
- Hazard Elimination and Control.
- Rescue procedures.
- Communication procedures.
- PPE to be used.

The completed permit shall be made available at the time of entry to all authorized entrants.

During entry, permits must be posted at or near the entry location or by equally effective means.

Entry must not be longer than one work shift.

Additional information will be posted at the permit confined space entry to provide warnings pertaining to hazards created by the work being performed within the space.

Permit-required confined space work must not deviate from the requirements of the permit, including the time required to complete the assignment.

It is the responsibility of the entry supervisor to see that permits are posted.

10.3 Entry Procedures – Entering the Permit-Required Confined Space

Permit Confined Space entry work must not deviate from the requirements of the permit, including the time required to complete the assignment.

- Entry must not be longer than one work shift.
- Assure permit is completed and posted at or near the entry location.
- Identify hazards on the Permit confined space entry permit and methods that are to be used to control the hazards.
- Conduct appropriate atmospheric testing per OSHA.
    - Communicate this information to entry personnel and contractor.
- Assure appropriate equipment needed for entry.
- Assure proper communication systems.
- Monitor for developing hazards using an Early Warning System.
- Identify appropriately trained entry attendant and personnel to enter the confined space.
    - Assure authorized attendant shall remain outside permit space.

Assure the individuals, contractors, service technicians and others who enter a permitted space at the request of WVU for examination, verification, investigation, or information gathering for a bid process, may do so under the requirements of the WVU Permit confined space entry permit and do so while accompanying a WVU employee.

11. WVU STEAM TUNNEL EXCEPTION

The WVU Steam Tunnel System consists of underground passageways supplying steam lines, electrical distribution, and data/telecommunication lines throughout our campus. The steam tunnel system introduces a unique situation with regards to permit-required confined space procedures and compliance per the Occupational Safety and Health Administration regulations. The steam tunnel falls within a category consisting of strict Permit Required Confined Spaces whereas other areas do not, which makes it challenging to define the entire system as a permit required confined space.

Therefore, WVU has concluded: Entry into the steam tunnel by way of a manhole will be considered a Permit-Required Confined Space and all regulations shall apply for entry. Entry into the steam tunnel by way of an equipment room and use a man door may be made without a Permit, as long as, **ALL** of the Following conditions are met:

- The entrant shall be trained in permit–required confined space entry
- The entrant shall be prepared to have and wear appropriate eye protection, hard hat, leather gloves, and any other PPE required to perform the work
- The entrant shall enter through equipment room the personnel man door provided
- Prior to work commencing:
    - Multi-gas meter will be used to determine if the confined space is acceptable to cross over the plane of entry,
    - Heat monitor, "WBGT – Wet Bulb Globe Temperature" will be placed inside the confined space to obtain the ambient temperature, relative humidity, and air movement readings to determine if workers will require a work/rest regimen.
    - If the temperature reading is acceptable see Appendix E workers may cross the plane of entry
- During work, the employee shall continuously monitor internal atmosphere using:
    - Multi-gas meter
    - Wet Bulb Globe instrument - ambient air temperature, relative humidity, air movement
    - If either instrument indicates danger employee shall leave immediately
- Proper and continuous ventilation shall be maintained
- The entrant shall not go beyond 50 feet
- The entrant shall have in their possession key(s) necessary to exit alternate escape routes

12. RESCUE AND EMERGENCY RESPONSE

West Virginia University uses a **Non-Entry Rescue** procedure for its employees. Any means of rescue shall be done from outside the space using retrieval devices. If rescue operations require entering a space, the professional services of the Morgantown Fire Department are to be used.

12.1 Emergency Procedure

During the emergency, the following steps shall be performed:

- Notify the entry supervisor immediately if an evacuation is necessary due to hazardous conditions. Contact the Morgantown Fire Department (9-911 campus phone, 911 all other).
- Call 911 and provide exact location of emergency and a short description of the situation.
- Perform a non-entry rescue if possible.
- Remain at the location.
- Remain a safe distance away.
    - Order Entrants to evacuate the space immediately whenever a prohibited condition is determined, or.
    - If the signs and symptoms of exposure or uncontrolled hazards are identified.
    - A situation outside the space that could endanger that inside is observed.
    - The attendant or Supervisor shall NOT ENTER SPACE

12.2 Non-Entry Rescue

- Entrants shall use a chest or full body harness, with a retrieval line attached at the center of the entrants back near shoulder level, above the entrant's head, or at another point which the employer can establish presents a profile a profile small enough for success for the entrant.
- The other end of the retrieval line 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 personnel from vertical type permit spaces more than 5 feet deep.

13. CONCLUSION OF OPERATION

Upon conclusion of the entry operations, the authorized Entry Supervisor is responsible for terminating the entry and canceling the Permit.

The Entry Supervisor is also required to terminate entry and cancel the Permit when a condition exists that is not acceptable by the Permit.

14. RECORDKEEPING

When the job is completed, the Permit confined space entry Permit must be returned to the supervisor. The Entry Supervisor keeps a copy of the permit and forwards a copy within five working days to Environmental Health & Safety.

- Entry must not exceed the expiration date and time posted on the Entry Permit.
- Upon conclusion of entry operations, the Entry Supervisor must cancel the Permit.
- The permit will be kept on file in the department for at least one year, or at least 30 years if the permit includes air monitoring data, and a copy sent to EHS.

15. REVIEW

15.1 Post-Entry Review

EH&S and/or the department will review specific entry operations under the following circumstances:

- Unauthorized entry
- Detection of hazards not addressed on a permit
- A condition prohibited by the permit occurs during entry
- An injury or near miss occurs during entry
- A change in the use or configuration of a Permit Space
- Complaints of the effectiveness of entry procedures

Subsequent entries will not be authorized until the review is completed with all necessary revisions made.

15.2 Program Review

- The Permit-Required Confined Space Program must be reviewed when there is any reason to believe the entry program may not protect employees, and it must be revised before allowing subsequent entries.
- Permits must be reviewed within one year of the date of cancellation of the permit to evaluate the program and the protection provided to employees entering confined spaces. EH&S and the department may perform a single annual review meeting covering all entries performed during a 12-month period. The program must be updated, as necessary.

APPENDIX

APPENDIX A: CONFINED SPACE ENTRY PERMIT

West Virginia University
ENVIRONMENTAL HEALTH & SAFETY

Valid for one eight (8) hour shift
MUST BE POSTED ON WORK SITE

CONFINED SPACE ENTRY PERMIT

General Information

Date Issued:_____ **Time Issued:**_____ **am pm** **Duration (hours):**_____

Location:_____ **Confined Space ID:**_____

Reason for Entering:_____

Work to be Performed:_____

Authorized Personnel	Name	Department	Employee ID (700 or 800#)
Supervisor			
Attendant			
Entrant #1			
Entrant #2			
Entrant #3			

Atmospheric Testing - Int._____

Time:_____ **am pm** **Testing performed by:**_____

Time (specify am or pm)	% of Oxygen (19.5 - 23.5%)	% LEL (<10%)	CO (50 ppm PEL)	H_2S (20 ppm PEL)	Temp. (<115° F)	Other (please specify)

Tester Signature: _____

Requirements Completed (must be inspected and operational)

If the item does not apply, enter "N/A" into the blank.

Communication Procedures:_____

LOTO/Denergization:_____ **Purge/Flush/Vent:**_____

Ventilation:_____ **Secure Area:**_____

Lifelines:_____ **Signage:**_____

Fire Extinguishers:_____ **PPE:**_____

Lighting:_____ **Supplied Air Respirators:**_____

Additional Permit (Hot Work):_____ **Additional Tools:**_____

Retrieval/Rescue:_____

Continuous Monitoring

Monitoring performed by:_____

Time (specify am or pm)	% of Oxygen (19.5 - 23.5%)	% LEL (<10%)	CO (50 ppm PEL)	H_2S (20 ppm PEL)	Temp. (<115° F)	Other (please specify)

Instrument(s) Used:_____ **Serial/Unit #**_____

This permit is not valid unless all items are completed.

Entry Supervisor (Issued): Printed Name:_____ Signature:_____

Entry Supervisor (Closed): Printed Name:_____ Signature:_____

UPON JOB COMPLETION, SEND COMPLETED FORM TO ENVIRONMENTAL HEALTH AND SAFETY WITHIN 24 HOURS TO: ehssafety@mail.wvu.edu

APPENDIX B: CONFINED SPACE IDENTIFICATION & HAZARD EVALUATION

WestVirginiaUniversity.
ENVIRONMENTAL HEALTH & SAFETY

Date of Evaluation:_____

Evaluator:_____

CONFINED SPACE EVALUATION FORM

Section 1: Confined Space Identification and Location

Confined Space #:

Location of space (e.g. site, area, room):

Person in charge of space or location:

Description of space (include physical characteristics, configuration, number of entry points):

Section 2: Confined Space Determination

1. Is the space large enough and configured in a way that a worker can bodily enter? **Yes** ☐ **No** ☐

2. Does the space have limited or restricted means of entry and/or exit? **Yes** ☐ **No** ☐

3. Is the space **not** designed for continuous human occupancy? **Yes** ☐ **No** ☐

If all of the answers to questions 1, 2, and 3 are "YES," then the space is a confined space.
If it is a confined space - complete all following sections. If not, consult other applicable OSHA guidelines.

Section 3: Permit-Required Confined Space Determination

1. Does the space have, or the potential to have, a hazardous atmosphere? **Yes** ☐ **No** ☐

2. Does the space have the potential to engulf an entrant? **Yes** ☐ **No** ☐

3. Is there an internal configuration that can cause an entrant to become trapped or asphyxiated? **Yes** ☐ **No** ☐

4. Does the space have any other serious safety hazards? **Yes** ☐ **No** ☐

If yes to #4, what are the hazards? (Check all that apply)

- ☐ Exposed/Unprotected Equipment
- ☐ Extreme High or Low Temperatures
- ☐ Unprotected Fall Hazards
- ☐ Exposed/Unprotected Electrical Systems
- ☐ Other recognized energy hazards: ☐ Hydraulic ☐ Mechanical ☐ Pneumatic
- ☐ Other:_____

If any of the answers to questions 1, 2, 3, or 4 are "YES," the space is a permit-required confined space.
If all of the answers to questions 1, 2, 3, and 4 are "NO," the space is non-permit required.

Section 4: Space Classification

Space classification during NORMAL operating conditions:

☐ Non-Permit Required Confined Space ☐ Permit-Required Confined Space

Section 5: Occupants and Use

Departments/Personnel accessing space:

Purpose(s) for accessing space:

APPENDIX C: TEMPORARY RE-CLASSIFICATION PERMIT

West Virginia University. ENVIRONMENTAL HEALTH & SAFETY

Valid for one eight (8) hour shift
MUST BE POSTED ON WORK SITE

RECLASSIFICATION FORM

Use this form to temporarily reclassify a permit-required confined space to a non-permit confined space, which is only valid for the duration of work being performed and for no more than 8 hours.

The space cannot contain any actual or potential atmospheric hazards, and all hazards within the space must be eliminated without entry into the space. If someone must enter the space to remove hazards, the space must be treated as a permit-required confined space until hazards have been eliminated.
Control of atmospheric hazards through forced air ventilation does not constitute elimination of the hazards.

If hazards can be permanently eliminated from a confined space and the space can be reclassified as non-permit required space on a long-term basis, please contact EHS at ehssafety@mail.wvu.edu or (304)293-3792 to complete a Confined Space Evaluation.

Section 1: General

Space to be Entered:		Date Issued:	
Location of Space:		Time Issued:	
Purpose of Entry:		Department:	
ENTRANT(S):			
ATTENDANT(S):			

Section 2: Atmosphere Requirements (Check Y/N for each question)

If the answer to any question is **YES**, reclassification is **not permitted.**	**YES**	**NO**
Flammable gas, vapor, or mist in excess of 10% of its Lower Flammable Limit is detected?		
Airborne combustible dust meets or exceeds its Lower Flammable Limit?		
Oxygen concentration is below 19.5 % or above 23.5%?		
Is there any dangerous substance in the atmosphere that are passed the Permissible Exposure Limit (PEL) or dose? (Published in 29 CFR 1910 Subpart G or Z)		
Are there any atmospheric conditions that are immediately dangerous to life and health?		

Section 3: Hazardous Energy Requirements

Hazards	**YES**	**NO**	**If YES, describe how the hazard is eliminated without entry into the space.**
Does the space contain **chemical** hazards?			
Does the space contain **electrical** hazards?			
Does the space contain **engulfment** hazards?			
Does the space contain **mechanical** hazards?			
Does the space contain **entrapment** hazards?			
Does the space contain extreme **temperatures**?			
hazards?			
Will the work being done inside or near the space introduce new hazards into the space? (ex. welding, chemicals, painting)			

Section 4: Certification and Authorization

By signing below, I certify that the space does not contain or have the potential to contain a hazardous atmosphere, all hazards within the space have been eliminated without entry, and no hazards will be introduced into or created within the space during the entry. I certify that all actions and conditions necessary for safe entry have been performed to temporarily reclassify the permit-required confined space to a non-permit confined space.

Supervisor:	**(print):**	**(sign):**

APPENDIX D: CONTRACTOR/HOST-EMPLOYER GUIDANCE FOR PERMIT-REQUIRED CONFINED SPACE

OSHA has established the following specific requirements with respect to contractor work, as further summarized.

The rule makes the controlling contractor, rather than the host employer, the primary point of contact for information about permit spaces at the work site.

Host employer

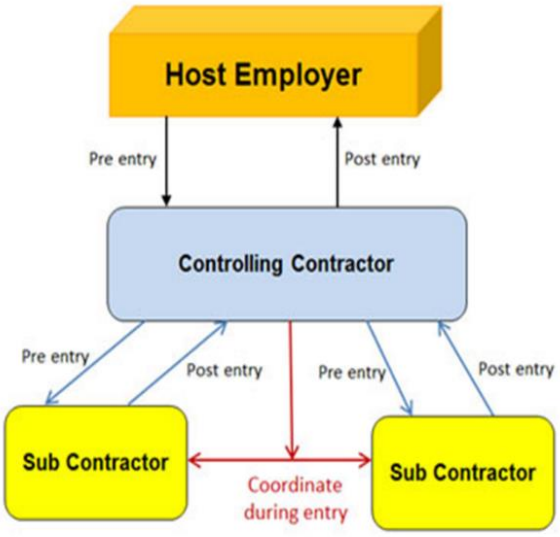
- must provide information about work site permit spaces to **controlling contractor**, who passes info to other entry employers (whose employees will enter the spaces).

Entry employers

- Provide controlling contractor information about their entry program and hazards they encounter (will create) in the space

Controlling contractor

- passes such information to other entry employers and back to the host
- responsible for making sure employers outside a space know not to create hazards in the space, **and**
- entry employers working in a space at the same time do not create [unforeseen] hazards for one another's workers



In Summary:

Host Employer (WVU) provides information to Controlling Contractor:

- Permit space locations
- Permit space hazards
- Permit space precautions

Controlling Contractor (General) provides information to Entry Employers (Sub-Contractors), and others affected:

- Information from Host Employer
- Any additional hazard information
- Permit space precautions

Controlling Contractor also debriefs host and entry employers/exchanges information

Entry Employer (Sub Contractors) must:

- Obtain information from Controlling Contractor
- Inform Controlling Contractor of permit program being followed, including information on created hazards

APPENDIX E - ACGIH Work/Rest Regimen

The most effective way to prevent heat-related illness and fatality is to reduce heat stress in the workplace (e.g., increase air movement, reduce temperature, reduce humidity, and protect workers from solar radiation or other radiant heat sources).

Controls that can help ease may include:

- air conditioning, increasing ventilation, cooling fans, running local exhaust ventilation where heat is produced; Using reflective shields to block radiant heat, insulating hot surfaces (e.g., furnace walls), and providing shade for outdoor work sites. Cool, potable water should always be provided to employees.
- Additionally, when heat stress is high, employers should require workers to take breaks. The length and frequency of rest breaks should increase as heat stress rises. Below are ACGIH guideline work/rest recommendations.

ACGIH Guidelines			
Work/Rest Regimen	**Workload** ***(Wet Bulb Globe Test Categories)***		
	Light	**Moderate**	**Heavy**
Continuous Work	**86° F**	**80° F**	**77° F**
75% work 25% rest each hour	**87° F**	**82° F**	**78° F**
50% work 50% rest each hour	**89° F**	**85° F**	**82° F**
25% work 75% rest each hour	**90° F**	**88 ° F**	**86° F**

from OSHA Technical Manual (OTM) Section III: Chapter 4