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Confined Space Entry Safety Program

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BUT FOR OHIO STATE

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1.0 Introduction

- 1.1 Confined spaces are regulated under OSHA 29 CFR 1910.146 and incorporated by reference under OSHA 29 CFR 1910.252. The Ohio State University workplace contains potentially hazardous enclosed spaces, which may be classified as Permit Required Confined Spaces or Non-Permit Required Confined Spaces. Examples of confined spaces include manholes, vaults, tanks, tunnels, boilers, silos, bins, pits, crawl spaces, storm/sanitary drains, and sumps. Employees may be required, as part of their job duties to enter these spaces to perform inspection, repair or maintenance activities. Spaces such as those mentioned above, may contain hazardous atmospheres including chemical (toxic/flammable) vapors and/or oxygen deficiency.
- 1.2 This program contains the procedures and practices for safe entry into locations at The Ohio State University classified as Permit-required and Non-Permit required Confined Spaces.
- 1.3 The Confined Space Program applies to all OSU employees whose job duties require them to enter or monitor confined spaces.

2.0 Responsibilities

- 2.1 Environmental Health & Safety shall maintain, review and update the Confined Space Entry Safety Program which includes the confined space location inventory, Confined Space Entry Safety written program, confined space entry SOP and confined space web-based training. Additionally, EHS provides confined space training to any affected individual and can provide monitoring equipment for use during confined space entry.
- 2.2 Employees expected to enter a confined space (Authorized Entrants as defined in Section 3.0) are responsible for complying with the provisions outlined within this written program including:
 - 2.2.1 Completion of confined space training
 - 2.2.2 Knowledge of confined space locations and potential hazards
 - 2.2.3 Understanding of what constitutes a hazardous condition or atmosphere in a confined space; how to identify when a hazardous condition is present; and emergency procedures
 - 2.2.4 Properly completing and posting a confined space permit during entry into permit-required confined spaces
 - 2.2.5 Utilize proper communication with the Attendant to ensure information is accurately and frequently provided
 - 2.2.6 Don the appropriate PPE prior to entry into a confined space and may include a full body harness for rescue operations, depending on the type of entry being performed
 - 2.2.7 Be familiar with the rescue operations and plan prior to entry in the case of an emergency.
- 2.3 Attendants oversee the confined space entry without entry into the space. Attendants are responsible for complying with the provisions outlined within this program including:

- 2.3.1 Completion of confined space training
 - 2.3.2 Knowledge of confined space locations and potential hazards
 - 2.3.3 Understanding of what constitutes a hazardous condition or atmosphere in a confined space; how to identify when a hazardous condition is present; and emergency procedures
 - 2.3.4 Knowledge of the signs and symptoms of exposure to hazardous materials.
 - 2.3.5 Maintain accurate count of authorized entrants
 - 2.3.6 Communicates with authorized entrants to ensure safety and monitor status
 - 2.3.7 Ensure efficient exit from the confined space by all entrants in the event of an unsafe condition or once work is complete.
 - 2.3.8 Ensures prompt rescue of authorized entrant in the event of an emergency or unsafe condition where the entrant is unable to perform self-rescue.
 - 2.3.9 Ensure unauthorized personnel do not enter the confined space during work.
- 2.4 Supervisors are responsible for ensuring employees are properly trained prior to entering a confined space. Additionally supervisors shall:
- 2.4.1 Ensure all confined spaces under their jurisdiction are properly identified by the appropriate signage
 - 2.4.2 Ensure rescue procedures are in place for each permit-required confined space entry
 - 2.4.3 Determine if changes made to a non-permit required confined space may present additional hazards and be reclassified to a permit required confined space.
- 2.5 Contractors entering confined spaces must do so as outlined in this program and in accordance with applicable OSHA regulations. Contractors must have a written confined space program that complies with the regulations pertinent to the areas to be entered. Contractors are also responsible for supplying any equipment necessary to perform safe entry into a confined space. When contractors enter a permit-required confined space they must have the permit posted during entry and may utilize the OSU form, if necessary.

3.0 Definitions

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

Atmospheric testing – the process by which the hazards that may confront entrants of a confined space are identified and evaluated.

Attendant - individual stationed outside one or more permit spaces who monitors the authorized entrants

and who performs all attendant's duties assigned in the employer's permit space program.

Authorized entrant - employee who is authorized by the employer to enter a permit space.

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

Confined space - a space which (1) is large enough and so configured that an employee can bodily enter and perform assigned work; (2) has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry.); and (3) is not designed for continuous employee occupancy.

Double block and bleed - 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.

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

Entry - action by which a person passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.

Entry permit (permit) - written or printed document that is provided by the employer to allow and control entry into a permit space and that contains the information specified in paragraph (f) of this section.

Entry supervisor - 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 section.

Hazardous atmosphere - 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;
- Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent;
- Atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in Subpart G, Occupational Health and Environmental Control, or in Subpart Z, Toxic and Hazardous Substances, of this Part and which could result in employee exposure in excess of its dose or permissible exposure limit;
- Any other atmospheric condition that is immediately dangerous to life or health.

Hot work permit - 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) - 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.

Inerting – the displacement of the atmosphere in a confined 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 - 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.

Line breaking - 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.

Non-permit confined space - 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 - atmosphere containing <19.5 percent oxygen by volume.

Oxygen enriched atmosphere - atmosphere containing >23.5 percent oxygen by volume.

Permit-required confined space (permit space) - 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.

Prohibited condition - condition in a permit space that is not allowed by the permit during the period when entry is authorized.

Rescue service – the personnel designated to rescue employees from confined spaces during emergencies.

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

4.0 Permit Required Confined Space

4.1 Identification of Confined Spaces

4.1.1 Environmental Health & Safety is responsible for identification and the initial posting of signage for all OSU Columbus Campus confined spaces.

4.1.1.1 Permit required confined spaces are labeled with signage indicating “Danger-Permit Required Confined Space: DO NOT ENTER” or similar wording.

4.1.1.2 Non-Permit required confined spaces are also labeled with signage indicating “Danger Confined Space: Use Confined Space Entry Procedures” or similar wording.

4.1.2 Confined spaces should be inspected on a regular basis to ensure signage is maintained to prevent unauthorized access.

4.1.2.1 If problems are discovered during an inspection, notification should be made to Environmental Health & Safety (614-292-1284) for resolution.

4.2 Pre-Entry Requirements – Prior to any entry into a permit required confined space the supervisor(s), authorized entrant(s) and attendant(s) must ensure the following parameters are met to allow for confined space entry and completion of work.

4.2.1 Equipment must be provided and available for use during confined space entry. Equipment may include:

4.2.1.1 Air monitoring devices,

4.2.1.2 Personal Protective Equipment (PPE) including full body harness, hard hat, hand/eye protection and any other required,

4.2.1.3 Rescue equipment,

4.2.1.4 Communication devices,

4.2.1.5 Ventilation devices,

4.2.1.6 Lighting equipment,

4.2.1.7 Barriers to prevent unauthorized access and

4.2.1.8 Tools or equipment necessary to complete the required task.

4.2.2 Isolation of the confined space – Isolation is the process by which a confined space is removed from service and completely protected against the release of energy and material into the space by such means as: misaligning or removing sections of lines, pipes, or ducts; lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages. This will ensure the accidental release of energy or hazardous materials will not occur while entrants are in the confined space.

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- 4.2.2.1 It may not be feasible to isolate a confined space (i.e. sewer system). In this situation, all air monitoring and PPE requirements must be met.
 - 4.2.3 Ensure no hazardous conditions exist within the space. This may be accomplished by purging, inerting, flushing, or ventilating the confined space.
 - 4.2.4 Ensure pedestrian and vehicle access is blocked during all confined space entry activities.
 - 4.2.5 Ensure atmospheric testing, and written permit for entry are complete as outlined in sections 4.3 and 4.4 of this program.
- 4.3 Pre-entry atmospheric testing – Permit Required Confined Space's must be declared safe for entry prior to authorized entrants occupying the space. To accomplish this, the atmosphere must be tested and continuously monitored to ensure no hazards exist, which may cause adverse affects on entrants.
- 4.3.1 Atmospheric monitoring must take place prior to entry and throughout the entry to ensure hazardous conditions do not arise during work being completed within the confined space.
 - 4.3.2 Pre-entry air monitoring must be accomplished from outside the confined space. Use of extensions and/or tubing should be utilized to capture air monitoring results from the breathing zone, and various depths if applicable, within the confined space.
 - 4.3.3 The following hazardous components of a confined space atmosphere must be tested and deemed safe prior to entry:
 - 4.3.3.1 Oxygen – oxygen levels must be between 19.5% - 23.5% to be declared safe for entry. Confined spaces with oxygen levels outside this range may not be entered unless a Self-Contained Breathing Apparatus (SCBA) is utilized by a fully trained authorized entrant.
 - 4.3.3.1.1 Atmospheres with oxygen levels less than 19.5% are considered oxygen deficient and lead to adverse health effects.
 - 4.3.3.1.2 Atmospheres with oxygen levels greater than 23.5% are considered oxygen enriched, which poses a fire/explosion hazard.
 - 4.3.3.1.3 Oxygen levels may change during the course of work within a confined space through displacement by other chemicals (Nitrogen, carbon dioxide, welding/cutting/brazing off gases, etc.). Therefore it is vital to continuously monitor the space during work.
 - 4.3.3.2 Combustible gases and vapors – Combustible gases and vapors are evaluated using a Lower Explosive Limit (LEL) detector. A volatile organic compound (VOC) detector may also be utilized to detect the presence of chemicals, which may cause adverse effects.
 - 4.3.3.2.1 Prior to entry, the confined space must not contain elevated LEL or VOC levels to ensure the safety of the workers performing the entry. LEL levels less than 10% may be deemed safe for entry. VOC levels, if detected, should

be investigated to determine their source and attempt should be made to clear the elevated levels prior to entry.

4.3.3.3 Toxic gases and vapors – Toxic gases, specifically Hydrogen Sulfide and Carbon Monoxide, must be evaluated.

4.3.3.3.1 Hydrogen Sulfide is a common component of sewer gas and is a toxic material. The ceiling exposure limit is 20 parts per million (ppm) with a 10-minute peak of 50ppm. The immediately dangerous to life and health (IDLH) is 100ppm.

4.3.3.3.2 Prior to entry, ensure no Hydrogen Sulfide gas is present within the confined space.

4.3.4 Air monitoring data must be recorded on the Confined Space Permit.

4.4 Confined Space Permit – The “Permit” is the written authorization to be completed for each permit required confined space entry. Information provided on the permit will identify key personnel involved in the entry, all monitoring data and other hazards, control measures, personal protective equipment, other applicable standards and communication methods. See Appendix A for the Ohio State University Confined Space Permit. The confined space entry permit is also available online at the [EHS website](#).

4.4.1 The permit must be available for all authorized entrants for review and be posted outside the confined space during entry operations.

4.4.2 The confined space permit must be completed and signed prior to entry into the space. Additionally, the permit must be signed and dated at the termination of the permit.

4.4.3 It is the responsibility of the entry supervisor to terminate the permit and remove personnel in the event:

4.4.3.1 The entry operations are complete

4.4.3.2 A hazard/condition arises making work unsafe.

4.4.4 The following must be documented on the permit:

4.4.4.1 Location and purpose of entry

4.4.4.2 Personnel involved in the entry including entry supervisor, attendant(s) and authorized entrant(s).

4.4.4.3 Any additional permits or standards to be followed including hot work, lockout/tagout/line breaking or other. Follow all standard operating procedures and applicable standards and regulations if additional permitting is required.

4.4.4.4 Adequate method of communication such as portable radio use, hand signals or unaided voice.

- 4.4.4.5 Name and contact information for emergency services.
 - 4.4.4.6 Expected hazards within the space including physical hazards (mechanical, electrical, engulfment and/or entrapment); atmospheric hazards (oxygen deficiency, explosive, carbon monoxide, and/or hydrogen sulfide); and other hazards (radiation, noise, heat, etc.).
 - 4.4.4.7 Control measures for identified hazards and known permits.
 - 4.4.4.8 Protective equipment including both protection of the space from unauthorized entrance or introduction of hazards to the confined space; and personal protective equipment provided to the entrants.
 - 4.4.4.9 Initial and continuous results of the air monitoring within the confined space.
- 4.5 Confined Space Entry – Once atmospheric testing has deemed the confined space safe for entry, and the permit is complete and posted outside the confined space, the authorized entrants are permitted to enter the confined space.
- 4.5.1 During entry, each confined space must be assigned an attendant to remain outside the confined space, be in constant communication with the entrants, and be capable of summoning emergency rescue personnel in the event of an accident or hazardous exposure within the confined space.
 - 4.5.1.1 Attendants may be authorized to attend multiple confined spaces at one time provided they can adequately respond to issues in any confined space without disrupting service to other spaces.
 - 4.5.2 Atmospheric hazards must be continuously monitored during entry and appropriate steps taken if changes take place resulting in unsafe breathing air, or explosion/fire hazards.
 - 4.5.3 Once work is complete within the confined space, all authorized entrants must be safely removed from the space and the permit terminated and signed by the entry supervisor.

5.0 Rescue and Emergency Service

- 5.1 It is the responsibility of the entrant supervisor to ensure rescue and emergency services are available to authorized entrants of confined spaces in the event of an emergency requiring removal of personnel from the space. The supervisor must ensure there is a suitable rescue team to perform this function; or authorized entrants and attendants are properly trained to perform rescue and emergency services. 9-1-1 may not be utilized as the primary rescue and emergency service resource, however should be contacted in the event of an emergency or rescue to perform first aid or medical transport for injured personnel.
- 5.2 The rescue team or personnel identified to perform rescue operations must be adequately trained to perform the necessary tasks and equipped to do so. Additionally the rescue personnel must meet the following:
 - 5.2.1 Be provided with appropriate PPE to perform rescue operations

- 5.2.2 Be fully trained in rescue operations including basic first aid and cardiopulmonary resuscitation (CPR).
- 5.2.3 Complete and document annual rescue training operations consisting of review of rescue and emergency procedures and physical removal of dummy, manikin, or actual person from a confined space or representative confined space.

5.3 Rescue operations must be entry-free

- 5.3.1 To facilitate entry-free operations, retrieval systems shall be used whenever an authorized entrant enters a permit required confined space.
- 5.3.2 Each authorized entrant must wear a full body harness during entry operations with a retrieval line attached. The other end of the retrieval line must be attached to a mechanical device (hoist) or fixed point outside the confined space to ensure prompt rescue can be performed if necessary.

6.0 Contractor Entry of Permit Required Confined Space

- 6.1 If contractors are expected to enter OSU permit required confined spaces, the entrant supervisor must ensure the following.
 - 6.1.1 Contractor is aware of the location and potential hazards of relevant confined spaces.
 - 6.1.2 Inform the contractor of the OSU confined space program and specific procedures developed for the confined space.
 - 6.1.3 Ensure contractor has their own confined space entry program including PPE, training, and rescue operations.

7.0 Reclassification of Confined Spaces

- 7.1 Changes made to non-permit required confined spaces which introduce hazards to entrants must be reevaluated and potentially reclassified to permit required confined spaces unless it can be determined and documented to remain non-permit required.
- 7.2 A permit required confined space may be reclassified to a non-permit required confined space under the following circumstances:
 - 7.2.1 The confined space poses no actual or potential atmospheric hazards and all hazards are eliminated without entry into the space as determined and documented through appropriate air monitoring techniques.
- 7.3 Contact OSU Environmental Health & Safety prior to reclassification of any confined space to obtain written authorization for approval.

8.0 Training

8.1 All entrant supervisors, attendants and authorized entrants shall be trained in areas relating to safe confined space entry. Training shall:

8.1.1 Be provided to employees prior to entry or attendance in/of a confined space

8.1.2 Include all precautions to take when entering a confined space including rescue operations.

8.2 Retraining shall take place:

8.2.1 When changes arise in existing confined spaces requiring retraining;

8.2.2 When newly established or identified confined spaces are introduced;

8.2.3 When it employees fail to follow procedures outlined in this program;

8.2.4 When there is an accident or injury resulting from confined space entry.

8.3 Training must be documented to include the type of training, employee name, signature of trainer/trainee, and the date of training.

9.0 Recordkeeping

9.1 Confined Space inventory – Environmental Health & Safety shall maintain an updated inventory of all permit and non-permit required confined spaces.

9.1.1 Departments shall notify EHS when changes are made to confined spaces or new confined spaces are identified.

9.2 Confined Space training – EHS shall provide and document training for all employees with duties relating to confined space. Any refresher training or retraining shall be documented by entrant supervisors.

9.3 Confined Space Permit – Each permit for confined space entry shall be maintained by the entrant supervisor. Copies of all permits shall be forwarded to EHS for filing as well.

9.4 Records shall be retained indefinitely.

10.0 Additional Documentation

10.1 In addition to this written program, departments shall develop, update, and maintain site-specific procedures for use during confined space entry. These may include:

10.1.1 Electrical confined space entry

10.1.2 Telecommunications confined space entry

10.1.3 Steam line confined space entry

10.1.4 Rescue operations

10.1.5 Atmospheric testing equipment

10.1.6 PPE use

11.0 Applicable Standards

11.1 Standards applicable to confined space entry must be made available to all affected employees and include the following.

11.1.1 29 CFR 1910.146 Permit Required Confined Space

11.1.2 29 CFR 1910.269 Electrical Power Generation, Transmission and Distribution

11.1.3 29 CFR 1910.268 Telecommunications

Appendix A – The Ohio State University Confined Space Entry Permit

CONFINED SPACE ENTRY PERMIT (Must be Posted at Entrance to Permit Required Confined Space)

<u>GENERAL INFORMATION</u>			<u>PERSONNEL</u>		
Location _____		Entry Supervisor _____		Attendant(s) _____	
Entry Purpose _____		Entrant(s) _____			
<u>ADDITIONAL PERMITS REQUIRED</u>			<u>COMMUNICATIONS</u>		
	Yes	No		Yes	No
Hot Work	_____	_____	Portable Radio / Phone	_____	_____
Lockout / Tagout	_____	_____	Hand Signals	_____	_____
Line Breaking	_____	_____	Unaided Voice	_____	_____
Other (Explain) _____			Other (Explain) _____		
<u>EMERGENCY SERVICES</u>					
Name _____			Telephone / Radio _____		
<u>HAZARD EXPECTED</u>					
	Yes	No		Yes	No
Mechanical	_____	_____	Atmospheric	_____	_____
Electrical	_____	_____	Oxygen Deficiency	_____	_____
Engulfment	_____	_____	Explosive	_____	_____
Configuration	_____	_____	Carbon Monoxide	_____	_____
(Entrapment)	_____	_____	Hydrogen Sulfide	_____	_____
			Other (i.e., Radiation; Noise; Heat; Toxins; etc.)	_____	_____
<u>CONTROL MEASURES</u>					
		Yes	No		Yes
Isolation (Chemical, Utility, Outlets, etc.)		_____	_____	Area Secured / Posted	_____
Lockout / Tagout / Tryout		_____	_____	Ventilation (Dilution / Local Exhaust)	_____
Line Disconnected		_____	_____	Guarding	_____
Line Blanked / Capped		_____	_____	Inerting / Purging	_____
Other (Explain) _____					
<u>PROTECTIVE EQUIPMENT</u>					
	Yes	No		Yes	No
Thermal Protection	_____	_____	Ear Muffs / Plugs	_____	_____
Safety Shoes / Boots	_____	_____	Respirators	_____	_____
Fire Extinguisher	_____	_____	Face / Eyes	_____	_____
Non-Sparking Tools	_____	_____	Head	_____	_____
Explosion-Proof Lighting	_____	_____	Tripod Mechanical Winch	_____	_____
Other (Explain) _____					
			Gloves	_____	_____
			Coveralls	_____	_____
			Safety Harness	_____	_____
			Life Line	_____	_____
			GFCI (Ground Fault)	_____	_____
<u>ATMOSPHERIC TESTING</u>			<u>ENTRY AUTHORIZATION / CANCELLATION</u>		
Contaminant:	Acceptable Level:	Time(s):	Authorization		
Oxygen	19.5-23.5%	_____	Name _____ Date _____		
Explosive (Gas / Vapor)	<10% LEL	_____	Signature _____ Time _____		
Hydrogen Sulfide	<10 ppm	_____	Cancellation		
Carbon Monoxide	<35 ppm	_____	Name _____ Date _____		
_____	_____	_____	Signature _____ Time _____		
Instrument(s) Used _____	Tester (Initials) _____				
Send Copies to: EHS (Fax 292-6404) Department File					