CONFINED AND RESTRICTED SPACE ENTRY

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1. CONFINED SPACE AND RESTRICTED SPACE ENTRY ADMINISTRATIVE STANDARD

1.1 Scope

This Code of Practice (COP) will apply to all work done by employees and contractors where the University of Calgary (U of C) is prime contractor or there is no prime contractor on property belonging to the U of C, inclusive of procedures, equipment and installation of Confined Space Entry (CSE) Systems.

1.2 Purpose

The purpose of this COP for Confined and Restricted Space Entry is to ensure the safety of employees and contractors required to enter and conduct work in confined and restricted spaces. This COP describes the U of C's requirements that must be followed to ensure those working in confined/restricted spaces are protected from the hazards associated with work in confined and restricted spaces. It also outlines the requirements for those that assign work, approve entry permits, and are on standby in case of an emergency.

The requirements of the *Occupational Health and Safety Code of Alberta* will be met or exceeded through the application of this COP.

1.3 Description

The Confined and Restricted Space Entry Code of Practice (COP) supports The U of C's Environment, Health and Safety Policy and recognizes the potential hazards associated with confined and restricted spaces at the University.

The COP allows for the following:

- Identification of Confined Spaces
- Identification of locations or situations where entry into confined or restricted spaces is required (as defined in the OHS Code)
- Safe installation, inspection, maintenance, and repair of equipment and facilities by workers in confined and restricted spaces
- An Entry Permit System to ensure that only authorized and trained personnel enter a confined space
- Training and education of workers who supervise or perform work in confined and restricted spaces

2. RESPONSIBILITIES

2.1 Facilities Management/Facilities Development/IT

Senior management shall provide leadership for and assume overall responsibility for the implementation of and compliance with this COP. This responsibility shall include:

- Establishing, promoting, and maintaining the confined and restricted space entry COP and program;
- Providing appropriate financial, human, and organizational resources to plan, implement, check, review, and correct the COP and program;
- Defining roles, assigning responsibilities, establishing accountability, and delegating the authority to implement an effective program in accordance with the COP;
- Ensuring that persons associated with the program are able to competently perform their assigned roles in accordance with the requirements of the COP

- Ensuring the program and COP are reviewed at regular intervals; and
- Ensuring that workers and worker representatives are consulted to encourage their participation as required by this Code of Practice.

While facilities management, facilities development and IT are mentioned specifically, these requirements also apply to all business units or faculties who have employees or contractors entering confined or restricted spaces.

2.2 Managers / Supervisors

Managers and Supervisors who assign work and approve permits for entry are responsible for the implementation and adherence to the COP. They must be knowledgeable and experienced in identifying all actual and potential hazards associated with entry into confined and restricted spaces and possess a current confined space entry training certificate from an approved provider. Manager/Supervisor responsibilities shall include:

- Being familiar with the contents of this COP and the applicable occupational health and safety legislation;
- Completing the approved training for confined and restricted space entry;
- Ensuring employees and/or contractors under their supervision are competent to complete the task in accordance with this COP;
- Verifying that individuals who are entering confined and restricted spaces have completed approved training at intervals prescribed by the U of C;
- Monitoring employee and contractor compliance with this COP and program;
- Ensuring that employees and contractors are informed of the hazards prior to entry into a confined or restricted space;
- Ensuring only authorized employees and contractors enter a confined or restricted space;
- Ensuring pre-entry testing and inspection is completed; and
- Investigating and documenting all incidents that are reported.

2.3 Site Supervisor

A Site Supervisor is the person in charge of directly supervising the work activities. For University of Calgary staff confined space entry where rescue classification is class 1, the site supervisor can be the entrant or tending worker. Responsibilities of the Site Supervisor include:

For Confined Space Entry

- Possessing a current confined space entry training certificate from an approved vendor;
- Being conversant with the COP requirements;
- Being competent in Confined Space Entry (CSE) Procedures as outlined in the COP;
- Ensuring the CSE is performed in accordance with the CSE Permit;
- Ensuring all entrants have proof of valid confined space entry training from an approved vendor;
- Directly supervising the work of any worker who has not been deemed competent;
- Reviewing that all workers understand the hazards, and controls and their responsibilities prior to entry;
- Posting the CSE Permit outside the entrance;
- Ensuring pre-entry testing and inspections is completed;
- Ensuring precautions identified on the permit are followed; and
- Stopping work in the event of an emergency.

For Restricted Space Entry

- Possessing a current confined space entry training certificate from an approved vendor;
- Completing training on hazard recognition;
- Being conversant with the COP requirements;
- Ensuring all entrants have proof of valid confined and restricted space entry training from an approved vendor;
- Ensuring entrants have received training on how to recognize hazards and perform the duties in a healthy and safe manner,
- Ensuring that a hazard assessment has been completed prior to entry into the space;
- Identifying all required safety equipment, personal protective equipment and rescue equipment required for the work; and ensuring all equipment is available;
- Establishing the communication system that will be used by entrants and designating a competent worker to remain in communication with entrants;
- Directly supervising the work of any worker who has not been deemed competent; and
- Ensuring that a safe means of entry and exit are available.

2.4 Employees

- Must possess a valid confined space entry training certificate from an EHS Department approved vendor and provide proof of training on demand;
- Must be competent in the performance of the task and completing work in confined or restricted spaces;
- Must comply with the requirements of this COP;
- Perform all entries in accordance with the CSE Permit for confined space entry, or in accordance with the hazard assessment for restricted space entry;
- Must follow U of C COP for all entries including third party controlled sites e.g. General contractor construction sites, municipal sites, or other sites not on U of C property but where work is conducted by U of C employees;
- Must immediately report any unsafe or harmful conditions;
- Prevent unauthorized entry in the confined or restricted spaces;
- Refrain from entering any restricted space before a hazard assessment has been completed;
- Refrain from entering any confined space without an authorized confined space entry permit; and
- Notify their supervisor if they have any medical concerns related to entering a confined or restricted space.

2.5 Contractors

- Must obtain approval from authorized U of C personnel prior to entry into a confined space.
- Must follow the requirements of the University of Calgary Contractor Safety Management Program

Where the U of C COP requirements exceed those of the Contractors, the University requirements shall take precedence.

2.6 Prime Contractors

It is expected that Prime Contractors will have their own programs and COP for entry into confined and restricted spaces and will ensure compliance with their programs and legislation within their designated areas. All prime contractors must have a copy of their COP and Confined Space entry procedures uploaded to their profile on ISNetworld.

Prior to entering a confined or restricted space, the Prime Contractor must notify their designated U of C contact to coordinate the work. This is required in order to ensure the impact or disruption on other systems/work at the U of C is minimized.

2.7 Environment Health & Safety (EHS) Department

- Review this COP at regular intervals in consultation with representatives from stakeholder groups, or more often if there are changes to the U of C OHSMS or applicable legislation. Stakeholder groups may include Safety Improvement Team (SIT) Committees, and representatives from business units and departments who are affected by the COP and program
- Provide necessary technical resources and subject matter expertise;
- May review requests for access and issue permits for entry into confined spaces, as requested;
- Stop any unsafe work and /or not allow permit work to begin or continue unless the requirements as outlined on the permit are followed; and
- Conduct periodic compliance assessments of the COP and the program

3. INVENTORY & IDENTIFICATION OF CONFINED SPACES

The U of C will maintain an inventory of confined and restricted spaces for main campus and any other locations under their direction, control or ownership. Individual departments in conjunction with Environment Health & Safety will develop this inventory, housed by Facilities Management & Development and amended as necessary. The confined and restricted spaces will be labelled, where practical, *(see example Appendix C)* to warn against unauthorized entry and work.

The inventory will include the following information:

- Location (building, floor, room number, location within the room)
- Access type (e.g. panel, hatch, access door, etc.)
- Space type (e.g. sump, air plenum, air handling unit, etc.)
- Access size
- Access frequency
- Whether the space is labelled
- Classification (restricted, confined, restricted and/or confined within)
- Rescue classification
- Photographs of the space

When assessing confined and restricted spaces, the U of C will follow the requirements of the Alberta Occupational Health and Safety Code. The following definitions will be used:

Confined Space means a restricted space which may become hazardous to a worker entering it because of:

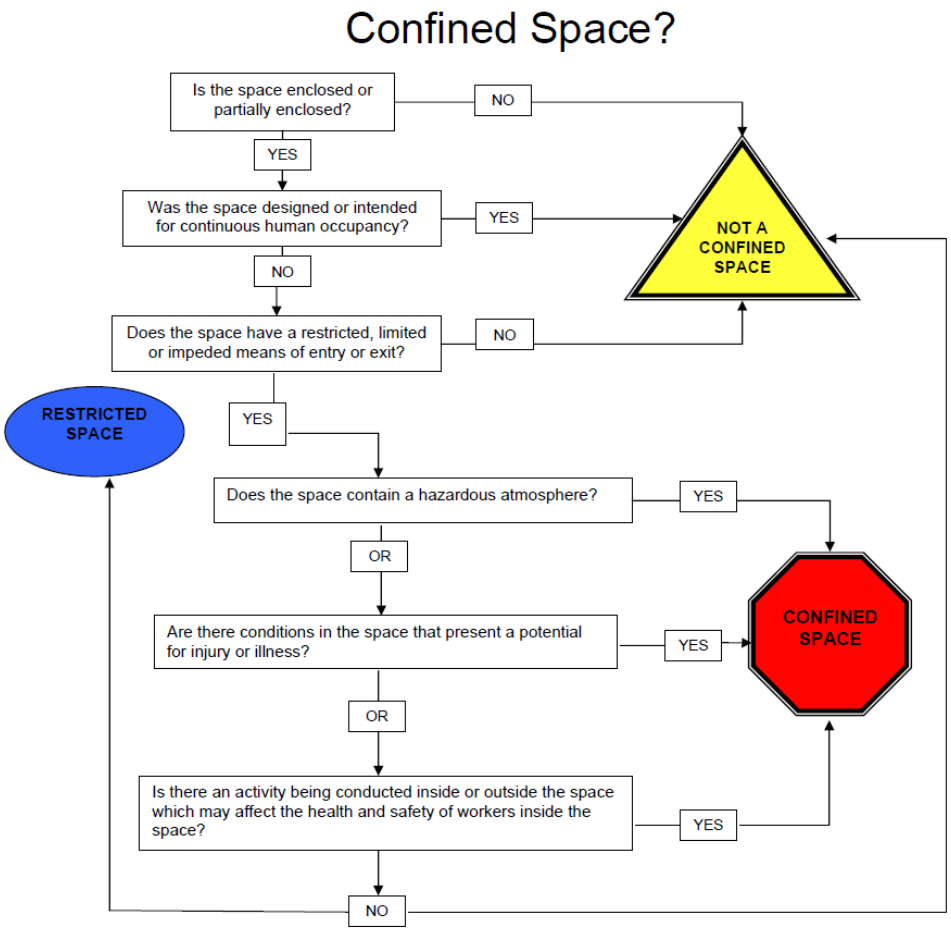
(a) an atmosphere that is or may be injurious by reason of oxygen deficiency or enrichment, flammability, explosivity, or toxicity,
(b) a condition or changing set of circumstances within the space that presents a potential for injury or illness, or
(c) the potential or inherent characteristics of an activity which can produce adverse or harmful consequences within the space.

Restricted Space means an enclosed or partially enclosed space, not designed or intended for continuous human occupancy that has a restricted, limited, or impeded means of entry or exit because of its construction.

There may be some hazards that will always be present in any given space. However, there will be situations where hazards are introduced to the space as a result of the work being conducted. This may include activities such as hot work, painting, coating, using solvents, sandblasting, etc. This document will provide ***general procedures*** for entry, work and emergency response in a confined or restricted space. ***Specific procedures*** may have to be developed by individual departments as they relate to the work activities described above.

The following flow chart will be used to assist with determining whether a space is a confined or restricted space.

Figure 1: Confined and Restricted Space Classification Flow Chart



4. HAZARD IDENTIFICATION & ASSESSMENT

For each space, or group of similar spaces, a competent person will identify existing and potential hazards.

In addition, every task undertaken by a worker may have inherent risks associated with it. It is the responsibility of the worker to complete a Confined Space Entry Permit or Restricted Space Hazard Assessment to assess their current task, the risk associated with it and what precautions must be taken to reduce and/or eliminate that risk. The purpose of the assessment is to ensure that the risk of working in a confined space or restricted space is minimized, or if at all possible, eliminated.

Once a task is identified as involving a confined or restricted space, the first thing to be determined is whether the work requires entry into the space or if it is possible to complete the task from outside the space.

Examples of completing the task without entering would be inspection with a remote camera or power washing from the outside.

The risks associated with the work may still apply, as simply opening the access to a confined space may expose a worker to atmospheric hazards or introduce other objects/substances which may create the hazard, such as disturbing sludge or a chemical reaction.

4.1 Restricted Spaces

Restricted spaces can be thought of as a work area in which the main hazard is the difficulty getting into or out of the space. All other hazards should be either non-existent or eliminated or controlled. Entry permits are not required for entry into restricted spaces.

A Restricted Space Hazard Assessment, using the form included as Appendix B, must be completed prior to entry into a restricted space by a competent person who will be completing the work. The Restricted Space Hazard Assessment must identify:

- The work to be completed in the restricted space;
- The existing or potential hazards associated with the restricted space and the work;
- Existing controls and controls that must be implemented in order to ensure the work can be completed in a healthy and safe manner;
- Safety equipment and personal protective equipment required to complete the work;
- The rescue equipment required to carry out effective rescue and confirmation that the equipment is available;
- The communication system that will be used;
- How unauthorized entry into the restricted space shall be prevented; and
- Designated competent worker who will remain in communication with the entrants

4.2 Confined Spaces

For all tasks involving confined space entry, a Confined Space Entry Permit shall be prepared by a competent person who will be involved in completing the work. This includes work involving confined spaces where the confined spaces do not need to be entered. All existing and potential hazards must be identified.

A worker has entered a confined space when the workers breathing zone crosses the plane of the confined space. Workers must be aware that in the presence of a potential atmospheric hazard, simply not having crossed the plane of the space with their breathing zone does not mean they are “safe.” The hazardous atmosphere may contaminate the area outside the plane of the space once it has been opened, thus a “hot zone” must be identified and all workers remain outside of this zone unless appropriate PPE is worn.

Confined space hazards are placed into three categories:

- Atmospheric;
- Physical hazards; and
- Other hazards.

Additional consideration should also be given to the individual(s) completing the work. Some factors to consider include:

- Claustrophobia – This psychological phenomenon is common and potentially life threatening for both the person affected and other workers that may be in the space. A worker suffering from claustrophobia may have a total loss of control, act/react irrationally/ unpredictably. Training for workers entering confined spaces must include a practical component exposing workers to various confined spaces under varying conditions (light/dark, with/ without respiratory protection) in a controlled environment.
- Physical fitness / condition – Are workers physically able to perform the work? Simply moving about a confined space may be a strenuous activity.
- Medical conditions – Temperature, humidity, exertion, claustrophobia, etc. may affect existing medical conditions.
- Fatigue – **A worker suffering from fatigue shall not enter a confined space.** Fatigue results in impairment of faculties.
- Alcohol / drug impairment, including over the counter or prescription medications – **A worker under the influence of alcohol and/or drugs must not enter a confined space.**

4.3 Confined Space Entry Permit

A permit, compliant with the requirements of this COP, is required for all confined space entries within the scope of this COP. The permit shall be prepared by a competent worker who is experienced in the work to be completed and is familiar with the hazards of the confined space. All U of C employees will use the U of C Confined Space Entry Permit in Appendix A.

Permits for confined space entry must be forwarded to and approved by a competent, trained and designated U of C Manager or Supervisor or Environment, Health and Safety (EH&S) Manager/consultant.

Permits shall be evaluated a minimum of 2 business days prior to planned commencement of the work. Confined space work is not allowed to commence until the completed permit has been approved.

The Confined Space Entry Permit sets out the work to be done and the precautions to be taken. It functions as a Safety Checklist. The permit must:

(a) List the name of each worker who enters the confined space and the reason for their entry;
(b) Identify the Tending Worker;
(c) Provide the location of the confined space;
(d) Specify the time period for which the entry permit is valid;
(e) Take into account the work being done in the confined space, and therefore the safety precautions that must be taken; and
(f) Take into account the requirements of this COP for entering, being in and leaving the confined space.

The completed Permit must be readily available and posted at the work site. If multiple entry locations are involved a copy of the permit must be posted at each entry point.

The time frame that the permit is based on is the estimated time to complete the task and may cover several shifts. A Permit is considered to expire prior to the stated expiry time if one of the following occurs:

(a) The confined space is returned to service;
(b) Continuity of responsible supervision for the confined space is broken; or

(c) The task or project is interrupted for a significant time because of an emergency that affects the confined space, e.g. an incident, rescue or a breakdown of engineering control equipment.

Once a Permit has expired, a new one must be completed prior to further entries into the space.

If a Hazard Assessment of a representative sample of identical Confined Spaces is performed, a single entry permit can be used for additional identical confined spaces. The permit must be revised to include the location(s) of the spaces being entered as well as the period the permit will be valid for.

A new permit must be completed if there is evidence to indicate it may no longer be valid such as:

- Change in the scope of work;
- Conditions change; and
- Any other hazard is/may be present not included in the original permit.

5. EQUIPMENT

5.1 Selection / Care / Use

Equipment must be selected which is appropriate for the identified hazards with reference to the manufacturer's instructions, OH&S Code and relevant Standards. Equipment selected shall be documented on the pre-job hazard assessment (for restricted spaces) or confined space permit (for confined spaces). As per manufacturer's recommendations and legislated requirements, all equipment shall be inspected prior to use and recertified as required by the manufacturer.

For confined space entry requiring a worker to fully enter a Confined Space, a *Full Body Harness is required to be worn* by each entrant, for the duration of the entry in order to help facilitate a potential rescue. A lifeline shall also be used to facilitate non-entry rescue ***unless it creates an additional hazard*** such as entanglement.

5.2 Tools and Equipment Logging and Inspection

All equipment used in a confined space shall be inspected and inventoried. A written log shall be in place identifying those inspections and the service history of the equipment. The log records shall be retained by the owner of the equipment. Inspections shall be carried out by a competent person, trained in the inspection of that equipment and knowledgeable of the manufacturer's requirements for inspection.

6. TRAINING

All personnel required to work within confined and/or restricted spaces, and personnel with related duties such as Tending Worker and Rescuers, and Site Supervisors shall be trained by a competent person. Managers and supervisors and EHS Department employees who may be required to review and approve permits are also required to complete training. Training will be completed by a training provider approved by the Director EHS.

Workers must be re-trained at a minimum of 3 year intervals or sooner if they fail to demonstrate competency or if there is a change in policy, procedure or legislation.

The training referred to must include, at a minimum, the following elements as part of the theory component of the training:

(a) Review of Part 5 of the OHS Code;
(b) How to identify confined space hazards;

(c) Confined space control methods;
(d) Equipment selection and use;
(e) The importance and elements of a pre-use inspection; and
(f) Rescue, including:
    i. why timely rescue is important,
    ii. simple rescue methods, and
    iii. hierarchy of rescue.

The following elements will be completed as part of the hands-on component of the training:
(a) Inspecting common confined space equipment and components;
(b) Inspecting, fitting and adjusting harnesses; and
(c) Entering into and moving about in a confined space under varied conditions in a controlled environment.

In addition to the training described, the worker must be informed of the site specific hazards as identified on the restricted space hazard assessment, confined space permit and/or the inventory. Information provided shall include the hazards and circumstances particular to that work site, and the steps being taken to eliminate or control those hazards. The information shall be provided to the workers by a competent worker, supervisor or manager. Acknowledgement will be documented through review and signature on the restricted space hazard assessment or the Confined Space Entry Permit.

The U of C must have a record of the training given for the period of time that the training is valid and the worker is employed by the University. The worker will carry proof of training when performing work on campus and be able to provide a copy when requested.

U of C personnel shall not complete confined space rescue involving entry into the space. As such, training on emergency rescue for employees will focus on rescue that can be completed from outside the space. Training on its own does not ensure that a worker is competent to safely perform work. In addition to training, a worker must be competent to work safely in a confined or restricted space. In cases where a worker is new to the job and does not have sufficient experience, the worker must be teamed up with and work under the direct supervision of a competent worker.

7. COMMUNICATION

Communication is one of the most important factors in planning for safe entry into confined or restricted spaces.

Restricted Spaces

A tending worker is not required for entry into restricted spaces. However, a competent worker must be identified on the field level hazard assessment. The designated worker shall remain in contact with the entrant(s) for the duration of the entry. The frequency of contact shall be documented on the Restricted Space Hazard Assessment and will be based on the risk of the work being completed and the hazards present within the space.

The designated worker must remain in the vicinity of the work and not be assigned other duties that may prevent prompt assistance.

Confined Spaces

Where work requires entry into a confined space, continuous communication must be maintained between workers within the space and the Tending Worker stationed outside the space. The Tending Worker must also have a suitable means of summoning assistance. The system of communication chosen must be appropriate to the space, considering the hazards and environmental conditions affecting the system.

Examples of ineffective communication systems:

1. The tending worker selects a cell phone as his communication system, however he is below grade in a large concrete building and does not test his cell phone reception. The workers within the space encounter difficulty requiring the ERP to be activated, but when the cell phone is used there is no signal.
2. The communication system chosen is verbal, however there is equipment in or near the space starting intermittently producing sufficient noise that verbal communication is not possible.
3. Radio communication is the system chosen for an entry, however no one has ensured the batteries are fully charged. The CSE entrant's battery dies and the tending worker subsequently does not receive a response when trying to raise the entrant on the radio.

Communication signals must be clear and concise. Avoid words that sound similar such as: *no, whoa, slow, go*. Whatever the system used, all workers involved in the confined space entry must understand what the signals are and what they mean. If the communication is not clear the CSE is compromised and may result in injury or fatality.

Example:

The CSE is a top entry where the entrant must be lowered down into the space with a winch and fall arrest attached to his harness. The entrant notices that he is about to be lowered into a hazardous substance and calls "whoa, whoa, whoa" but the winch operator interprets this as "go, go, go" resulting in accelerated lowering. The worker would then be lowered even more quickly into the hazardous substance.

Communication Systems fall into one of three categories:

1. Audible – Can be *heard* such as talking, radio, whistle, tapping/ banging on structure, air horn
2. Visual – Can be *seen* such as hand signals, flashlight, flags
3. Tactical – Can be *felt* such as tugging on a rope or tapping on the shoulder

In the case where none of the above techniques is practical, a second worker may be positioned safely in the confined space to relay communication.

The signal system must be pre-arranged and can be designed by the workers involved as long as all workers understand the signals and their meanings. A Pre-arranged signal system can be used whether the communication is audible, visual or tactical. One such system is **S**top **U**p **D**own **O**k **T**rouble.

The Confined Space Entry Permit must specify both a primary and back-up system in case of failure of the primary system. The back-up system could be as simple as flashing a light or tapping on the walls.

8. CONFINED AND RESTRICTED SPACE RESCUE

For confined space entry requiring a worker to fully enter a Confined Space, a *Full Body Harness is required to be worn*, by each entrant, for the duration of the entry in order to help facilitate a potential rescue. A

lifeline shall also be used to facilitate non-entry rescue ***unless it creates an additional hazard*** such as entanglement.

Many confined space casualties are comprised of would-be rescuers. Confined space rescue is classified as a Technical Rescue discipline and workers performing rescues in confined or restricted spaces must have specialized training.

No employee of the U of C shall enter a confined space to carry out a rescue. If entry may be required, external rescue personnel shall be onsite for the duration of the work.

The following table provides guidance on determining the composition of the rescue team. The inventory of confined and restricted spaces also includes rescue classifications.

Table 2: Confined Space Rescue Classifications

Class	Definition	Rescue Team Composition
1	Vertical or horizontal spaces with openings greater than 24 inches with no obstructions restricting access/egress and/or rescue equipment.	Internal employees – no entry into space is required to carry out a rescue.
2	Vertical or horizontal spaces with openings less than 24 inches and/or with obstructions restricting access/egress and/or rescue equipment.	Assessed on a case by case basis determination of appropriate internal/external rescue team made based on hazard assessment in consultation with Manager or above.
3	Integrated spaces that are vertical and horizontal in the same space with openings less than 24 inches and/ or with obstructions restricting access/egress and/or rescue equipment.	External rescue team.

(1) A worker must not enter or stay in a restricted and/ or confined space unless an effective rescue can be carried out.
(2) The worker in charge of the entry must ensure that the rescue plan includes the procedures to be followed if there is an accident or other emergency, including the procedures in place to evacuate the confined space immediately:
    (a) when an alarm is activated;
    (b) if the concentration of oxygen inside the confined space drops below 19.5 percent by volume or exceeds 23.0 percent by volume; or
    (c) if there is a significant change in the amount of hazardous substances inside the confined space.

The Rescue Plan will be placed into action by the Tending worker upon:

- Failure of the ventilation system;
- Communication of emergency by worker(s) inside the space;
- Monitoring equipment alarm; or
- Loss of communication with worker(s) inside the space.

**note: If nature of emergency is unknown and/or due to loss of communication, a Hazardous Atmosphere will be assumed. The subsequent Entry Rescue must be conducted with the use of SCBA or SABA.*

The designated rescue and emergency workers must be trained in emergency response appropriate to the work site. The training specified must include exercises appropriate to the potential Confined Space Emergency.
Though all necessary controls shall be in place to prevent a confined or restricted space emergency, an effective rescue plan must be in place in the event of an unforeseen incident.

In the event of an emergency inside a confined or restricted space, the tending worker or designated worker shall implement the rescue plan as detailed on the Restricted Space Hazard Assessment or Confined Space Entry Permit.

Equipment Required for Rescue as detailed on the Permit must be on site, inspected, and ready for use prior to the entry.

9. UNAUTHORIZED ENTRY

Restricted Spaces

When planning work inside a restricted space, consideration shall be given to how work can be carried out while ensuring that there is no unauthorized entry into the space.

Measures to prevent unauthorized entry into a restricted space may include securing/locking access points, signage, or having a Tending Worker present during entry.

Confined Spaces

Only workers authorized, trained, and listed on the Confined Space Entry Permit are permitted in confined spaces. A Tending Worker must be present at all times during entry. Additional measures to prevent un-authorized entry into a confined space may include securing/locking access points, signage, or physical barriers.

10. ATMOSPHERIC TESTING

If the hazard assessment identifies a potential atmospheric hazard and a worker is required and authorized to enter the confined space, the Site Supervisor must ensure that a competent worker performs a pre-entry atmospheric test of the confined space to:

(a) Verify that the oxygen content is between 19.5 percent and 23.0 percent by volume, and
(b) Identify the amount of toxic, flammable or explosive substance (maximum 10% of the LEL) that may be present.

Monitors used by University of Calgary staff for atmospheric testing of confined spaces should be retrieved from the docking station, which is programmed to conduct a bump test of the instrument daily and is ready for use. If there is no monitor in the docking station or additional monitors are needed, each monitor should be placed into the docking station prior to use. The docking station will determine if the monitor has missed the daily bump test or monthly calibration and will begin to perform this function if needed. Allow the docking station to complete required testing before using the monitor to collect measurements.

The docking station does not Zero the monitor and this should be completed prior to use in fresh uncontaminated air. Refer to Section 2.2 in the iNet Ventis MX4 Monitor – Training Document within the iNet Training dropdown on how to perform this function: https://www.ucalgary.ca/risk/environment-health-safety/training.
Monitor Instructions

The atmosphere must be continuously monitored. If monitoring identifies additional hazards, they must be dealt with in accordance with this Code of Practice.
The results of pre entry or regular tests required by this section must be recorded on the Confined Space Entry Permit Atmospheric Testing Log.

11. VENTILATION AND PURGING

Ventilating means the use of mechanical ventilation to force fresh air into the confined space and/or exhausting contaminated air through a venturi system while workers are working.
Purging means the introduction of substances such as an inert gas, steam, or water into a confined space to displace or flush out contaminants prior to workers entering the space. The method of purging must take into account other hazards within the space as per the hazard assessment. Purging may create its own hazards, for example some chemicals react with water, steam creates heat, inert gases displace oxygen.

If atmospheric testing identifies that a hazardous atmosphere is present or is likely to be present in a confined space, the space must be ventilated, purged, or both before a worker enters the confined space. If ventilation is used as a control, the space must be ventilated for a *minimum* of 15 minutes prior to entry, and continuously for the duration of the entry.

If ventilating or purging is impractical or does not eliminate the atmospheric hazards, workers are then required to wear appropriate personal protective equipment. Personal Protective Equipment *is not* an acceptable method of worker protection from flammable or explosive atmospheres.

If mechanical ventilation is required to maintain a safe work atmosphere within a confined space, *the ventilation system must incorporate a method of alerting workers if the system fails*. The warning system may be the Tending Worker monitoring the ventilation, a piece of flagging that is visible to tending worker or workers inside the space, an audible alarm on the ventilation device, or any other suitable method of alerting workers to a failure of the system. Workers must be trained in the evacuation procedures to be used if the ventilation system fails.

If ventilation or purging is required, continuous atmospheric testing is also required.

12. INERTING

U of C employees will not enter a space that has been rendered an inert space. Work in an inert atmosphere will be carried out only by qualified contractors. EH&S must be notified in writing a minimum of 7 days prior to inerting a space.

Inerting means the introduction of an inert (un- reactive) gas such as nitrogen or carbon dioxide into a confined space to completely displace all oxygen. For a flammable mixture to burn or explode, a source of oxygen and a source of ignition are required. Inerting is a technique that is used to remove air and the oxygen that it contains. This creates an oxygen deficient atmosphere and workers who enter the space must be properly trained and equipped with Self Contained Breathing Apparatus (SCBA), self-contained oxygen generating apparatus or Supplied Air Breathing Apparatus (SABA) with an emergency escape bottle.

Care must be taken to ensure that the atmosphere remains inerted while workers are within the confined space. To ensure an additional level of safety, all ignition sources must be controlled so that they cannot

trigger a fire or explosive. See Part 10 of the OHS Code for requirements dealing with fire and explosion hazards.

13. DESIGNATED CONTACT DURING ENTRY (RESTRICTED SPACE ENTRY)

Where entry into a restricted space is required in order to carry out work, the Site Supervisor or Manager shall designate a contact to remain in communication with the entrants. The frequency of communication shall be determined based on the risk from the work being completed and the hazards within the space.

The designated worker shall be experienced in the work being performed, familiar with the hazards of the restricted space, and aware of the rescue plan.

The designated worker does not need to remain outside of the restricted space, but shall be in the vicinity and be capable of responding promptly if communication systems fail or if an emergency situation arises.

Prior to commencement of the work, the designated worker shall review and acknowledge the restricted space hazard assessment.

14. TENDING WORKER (CONFINED SPACE ENTRY)

A Tending Worker must be designated for *every* confined space entry. The Tending Worker must be in constant communication with the worker(s) in the space and have a system for activating the emergency response plan that is suitable to the conditions i.e. cell phone/ radio reception, intrinsically safe device in potentially flammable atmosphere.

The Tending Worker must be stationed at the entrance *at all times* with no additional duties.

The Tending Worker must also keep track at all times of the workers inside the space on the Entry/Exit Log portion of the Confined Space Entry Permit and must not leave the area until *all* workers have left the confined space or another Tending Worker is in place.

The Tending Worker shall communicate with the entrants at intervals that shall not exceed 5 minutes.

15. RETAINING RECORDS

A copy of the CSE permit and accompanying documentation must be retained by the department/ business unit responsible for the entry. The permits must be organized in a manner in which they can be easily retrieved. Retention shall be:

(a) 1 year if no incident or unplanned event occurred during the entry, or
(b) 2 years if an incident or unplanned event occurred during the entry.

If an incident occurs, a copy of the permit shall immediately be submitted to EHS @ ucsafety@ucalgary.ca

16. DEFINITIONS

Authorized Person – A person approved or assigned by the employer to perform a specific type of duty or duties or to be at a specific location or job site (i.e., building maintenance, roof repair, etc.).

Competent Person – A person capable of identifying existing and predictable hazards in the surroundings or working conditions, which are hazardous to employees. A person who has the authorization to take

prompt corrective action to eliminate such hazards. A person who has completed the required training for confined space entry and rescue as approved by the Director EHS.

Hazard – Means a situation, condition, process, material or thing that may cause an injury or illness to a worker.
Hot Zone – Area of Immediate Danger at a rescue site, e.g. Area that may pose an Atmospheric Hazard around a CSE.

Rescue – The process of evacuating a worker after an incident to a safe location where he or she can receive medical attention.

Site Supervisor – The individual in charge of the CSE who is trained, competent and able to authorize the Entry Permit.

Worker – Any person engaged in work at the University of Calgary, including employees, contracted workers, volunteers, and graduate students.

17. REFERENCES

Legislation and Standards

- ALBERTA Occupational Health and Safety Code
- Alberta OH&S Explanation Guide 2009
- Part 5 Confined Space Entry
- Part 2 Hazard Assessment, Elimination and Control
- Part 4 Chemical Hazards, Biological Hazards and Harmful Substances
- Part 7 Emergency preparedness and Response
- Part 8 Entrances Walkways and Ladders
- Part 9 Fall Protection
- Part 10 Fire and Explosive Hazards
- CSA Z1006-10 Management of Work in Confined Spaces
- Part 18 Personal Protective Equipment
- Part 26 Ventilation Systems
- U of C Fall Protection Code of Practice
- NIOSH
- Work Safe BC Confined Space Entry Program: A Reference Manual
- ANSI Z117.1-2003, *Safety Requirements for Confined Space*

CONFINED AND RESTRICTED SPACE ENTRY

Appendix A: Confined Space Entry Permit

Effective Date:	Work Request # or Project ID #:
Start Date:	End Time (Permit Expiry Time:

1. Work Area Detail

Building and Location (include ID number as noted on the inventory):

Work Area Description (describe work to be completed):

2. Hazard Identification

Atmospheric Conditions (Confined Space is HIGH RISK if any of the following atmospheric conditions exist)

- ☐ Oxygen Deficiency (below 19.5%)
- ☐ Oxygen Enriched (above 23%)
- ☐ Concentration exceeding 8-hr exposure limit (OEL)
- ☐ Concentration of hazard above specified LEL
- ☐ Dust / Mist / Fumes
- ☐ Other (specify):

NOTE[1]: For all Hazardous atmospheres, a Record of Continuous Monitoring (pg. 6) must be completed.
NOTE[2]: If the atmosphere must be purged and/or inerted prior to entry, a qualified contractor MUST be used.

Physical Conditions and Other Hazards

- ☐ Moving / Rotating Equipment
- ☐ Slips / Trips / Falls
- ☐ Falls from Height / to Lower Level / Floor Openings
- ☐ Hot Work
- ☐ Extreme Heat / Cold
- ☐ Chemicals (MSDS reviewed)
- ☐ Traffic
- ☐ Noise
- ☐ Worker Fitness / Medical Condition
- ☐ Static Electricity
- ☐ Radiation
- ☐ Overhead Loads / Falling Objects
- ☐ Stored Energy
- ☐ Entrapment / Engulfment in Product or Liquid
- ☐ Piping or Physical Configuration of Space
- ☐ Inadequate Lighting
- ☐ Claustrophobia (no entry if in doubt)
- ☐ Other (specify):

Additional Description of Hazards

Provide further details of the identified hazard including specific dimensions, location, levels, etc. (attach additional information if required)

3. Hazard Control

Control Systems:

- ☐ Ventilation – Intrinsically Safe
  Supply Fan Rating _____ cfm (min. 50 cfm/ person)
- ☐ Isolation – Control of Hazardous Energy (i.e. LOTO)
- ☐ Purging (by qualified contractor)
- ☐ Inerting (by qualified outside contractor)
- ☐ Travel Restraint / Fall Arrest
- ☐ Lighting
- ☐ Guard Rails (site specific training required)
- ☐ Barricades / Pylons / Warning Tape
- ☐ Tripod / Man-Winch / SRL
- ☐ Davit Arm / Man-Winch / SRL
- ☐ Gas Monitoring
- ☐ Continuous / Periodic at intervals
- ☐ Posted signage
- ☐ Communication system
- ☐ Other (specify): _____

Personal Protective Equipment:

- ☐ SCBA / SABA
- ☐ Respirator – Cartridge Type: _____
- ☐ Full Body Harness Class: _____
- ☐ Lifeline
- ☐ Flame Resistant Clothing
- ☐ Hard Hat with chin strap / Rescue Helmet
- ☐ Gloves – Type: _____
- ☐ Boots – Type: _____
- ☐ Radios / Cell Phone (ensure reception at site)
- ☐ Flashlights - intrinsically safe? Yes / No
- ☐ Face Shield
- ☐ Safety Glasses
- ☐ Other (specify): _____

4. Communication

Audible		**Visual**	**Tactical**	☐ Other (specify):
☐ Verbal*	☐ Tapping / Knocking	☐ Hand Signals	☐ Tug on Lifeline	
☐ Radio	☐ Whistle	☐ Flashlight	☐ Tap on Body	
☐ Cell Phone		☐ Flags		

**Note: Avoid use of words such as slow, no, go, whoa.*

Additional Description of Communication Procedure / Commands
Provide further details of the planned communication procedures (i.e. SUDOT System with check intervals) (attach additional information if required)

5. Rescue Plan

Identify the Procedure for prompt and safe removal of injured workers:

- ☐ Site First Aid (list designated first aiders)
- ☐ Self-Rescue (entrant is able to remove self from the space)
- ☐ Rescue can be carried out without entry into the space (verify training of tending worker)
- ☐ Other (specify):
- ☐ Class 1 – Internal (>24" Opening with no obstructions) – rescue can be completed from outside the space
- ☐ Class 2 – Internal/External (<24" Opening and/or with obstruction, based on hazard assessment) – rescue plan to be approved by manager, and/or competent EH&S manager or consultant.
- ☐ Class 3 – External (<24" Opening and/or with obstruction) – external rescue team will be onsite

- ☐ All equipment has been inspected

5. Rescue Plan (continued)

Rescue Procedure and Equipment

Please provide further details on rescue procedures and equipment. Note: Campus Security and or Calgary Fire Department is not an effective rescue plan) and First Aid attendant. (Example: Non-entry rescue standby to winch / pull out Entrant with lifeline)

6. Worker Details

The worker in charge of Entrants is referred to as *Tending Worker*:

I, _____ certify that my sole duty at this worksite in the time period specified on this permit is as Tending Worker. I will be documenting the continuous monitoring readings (if applicable) and ensuring the Entry / Exit Log is completed in addition to any duties required of the Tending Worker.

Tending Worker (print name and sign)

_____ _____

Entrant(s)

By signing this document, Entrants acknowledge the following:

a) That all Entrant(s) have reviewed this permit in its entirety.
b) The conditions and controls are as stated on the permit.
c) Are aware of all procedures for the job, communication and emergencies.

Entrant(s) (print name and sign)

_____ _____

_____ _____

_____ _____

To be approved by a competent, trained and designated University of Calgary Manager or Supervisor or Environmental, Health, and Safety (EH&S):

All actions and/or conditions for safe entry have been identified. I have verified the conditions as set forth on this permit to be correct and authorize the work to commence.

Department	Print Name	Signature	Phone

A copy of completed permit and related documents must be submitted to approver upon completion of the confined space job. All electronic copies will be saved at designated department shared drive.

CONFINED AND RESTRICTED SPACE ENTRY

Appendix A: Confined Space Entry Permit Checklist

- ☐ Permit and accompanying documents completed and posted at work site access point.
- ☐ Must have a Tending Worker designated, must be in constant communication with Entrant(s) via radio, mike phone. Check in time may not exceed intervals of 5 minutes. Any failure to respond to the communication system will place the rescue plan into immediate effect.
- ☐ Communication System – understood by Tending Worker and Entrant(s)
- ☐ Rescue Plan understood by all involved.
- ☐ * CSA approved Full Body Harness adjusted and inspected in accordance with manufacturer's specifications.
- ☐ * Lifeline affixed to workers Dorsal D-Ring with snap hook, self-locking carabiner, or rescue knot (unless doing so will create a hazard), inspected in accordance with manufacturer's specifications.
- ☐ Manufacturer's assembly, disassembly, inspection instructions reviewed for all equipment present at site.
- ☐ Entrance adequately controlled to eliminate interference from traffic (pedestrian and/or motorized vehicles).
- ☐ Tending Worker posted at work site entrance with no additional duties.
- ☐ * Tripod / Davit Arm properly erected and locked.
- ☐ * Winch (man rated) and/or Haul System tested under load prior to hold being uncovered.
- ☐ 4 head gas monitor appropriate for identified potential hazards (i.e. H2S, Oxygen, LEL, CO). Calibration date reviewed, monitor zeroed in known source of clean respirable air, whole volume of space tested.
- ☐ Monitor operator trained in proper working procedure for monitor.
- ☐ Entrant(s) to test atmosphere prior to entering space.
- ☐ Mechanical ventilation is continuous and started minimum of 15 minutes prior to entry until atmospheric testing demonstrates clean respirable air.
- ☐ Rescue equipment on site and inspected by a competent person.
- ☐ Rescue Team has reviewed the permit and/or work site.
- ☐ SABA / SCBA inspected by a competent person. 2000 psi of air minimum.
- ☐ Lanyard or Lifeline selected / adjusted to shortest possible length while still permitting unimpeded movement. **DO NOT USE** if it will create an additional hazard (i.e. get wrapped around piping or machinery).
- ☐ Hole covers are secured, markers and capable of withstanding anticipated weight loads.
- ☐ Rescue Team and equipment on standby at worksite with no additional duties.
- ☐ Approver has reviewed the permit and work site conditions.
- ☐ Continuous monitoring of space conducted.

*For "TOP" Entry

CONFINED AND RESTRICTED SPACE ENTRY

Appendix A: Confined Space Entry Permit Record of Monitoring

Type of Monitor:

Monitor must be calibrated and bump tested prior to use:

Atmospheric Testing						
Permissible Atmospheric Conditions:		**19.5% - 23% Oxygen**	**<25 ppm Carbon Monoxide**	**<2.0% LEL Methane**	**<10 ppm Hydrogen Sulphide**	
Location (e.g., ceiling, floor, corner, etc.)	**Time**	**Oxygen (%)**	**Carbon Monoxide (ppm)**	**LEL (%)**	**Hydrogen Sulphide (ppm)**	**Initials**

Entry / Exit Record						
Name	**Time In**	**Time Out**	**Time In**	**Time Out**	**Time In**	**Time Out**

CONFINED AND RESTRICTED SPACE ENTRY

Appendix B: Restricted Space Hazard Assessment

1. Restricted Space Entry Information			
Zone Code:	**Building Code:**	**Floor Code:**	**Restricted Space Number:**
Hazard Assessment Completed by:			
Date of Entry:	**Time of Entry:**		**Estimated Duration of Entry:**
Reason for Entry:			**Number of Entrants:**
Name of Entrants:			
Description of Work to be Completed (including tools/materials to be used):			

2. Hazard Assessment			
Existing and Potential Hazards in the Restricted Space:			
Hazard	**Description**	**Controls**	
		Already in Place	**Required for Entry**
Configuration of Space			
Slippery Interior Surfaces			
Temperature Extremes			
Presence of Chemicals or Hazardous Materials			

Fall Hazards			
Limited Illumination			
Additional Hazards			

2. Hazard Assessment (continued)			
Hazards Associated with Work Inside the Restricted Space:			
Hazard	**Description**	**Controls**	
		Already in Place	**Required for Entry**
Fire (sparks of open flames from equipment)			
Toxic fumes (from solvents, cleaning products, etc.)			
Release of Hazardous Materials (asbestos, gases)			
Additional Hazards			

4. Communication Plan		
Type of Communication (e.g., call in prior to entry, radio, watch at door):		
Contact During Entry	**Name**	**Phone Number**
Primary		
Alternate		
Check in Frequency:	**Reason for Selected Frequency:**	

5. Emergency Response Plan		
Emergency Contact	**Name:**	**Phone Number:**
Rescue Classification for Space:		
Equipment Required for Emergency Response in this Space:		

6. Sign Off	
By signing below the employee acknowledges that they have reviewed the restricted space hazard assessment and agree with the procedures and controls required for entry into the restricted space and that all equipment has been inspected.	
Name (please print)	**Signature**


WARNING
Restricted Space
Complete Field Level Hazard Assessment prior to entry


DANGER
Confined Space
Entry by permit ONLY


CAUTION
THERE IS A CONFINED SPACE ACCESS POINT LOCATED WITHIN