Occupational Health and Safety Programs

CONFINED SPACE ENTRY PROGRAM

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1.0 PURPOSE

The purpose of the Confined Space Entry Program is to specify requirements that will protect workers required to enter and occupy confined spaces, and to provide a baseline to measure the performance of St. Francis Xavier University (StFX) employees and contractors who enter confined spaces on university property.

2.0 SCOPE

This program applies to all St. Francis Xavier University (StFX) work sites, including contractor operations. All legislative jurisdictional, StFX and contractor requirements will be reviewed, and the more stringent requirements will be applied.

3.0 RESPONSIBILITY

3.1 Managers

- Verify implementation and enforcement of this program.
- Verify that the confined space related equipment specified in this program is available and utilized.
- Verify all required confined space procedures are developed and implemented.

3.2 Supervisors

- Evaluate the workplace to determine if any spaces are permit required confined spaces.
- When confined spaces are present, inform workers of the existence and location of and the danger posed by confined spaces.
- Verify confined space procedures exist to address confined spaces identified in the hazard assessment.
- Implement the confined space procedures when workers are required to enter any spaces that meet the Nova Scotia Confined Space definition.
- Know and understand how to implement this program.
- Verify that confined space attendants, entry supervisors, rescue team members and entrants are properly trained.
- Verify that all workers who are required to enter, supervise, and/or monitor confined space work are qualified and properly trained in all aspects of this program.
- Prior to entry into a confined space, verify that all appropriate safeguards are in place and formally advise StFX Manager and OH&S that a confined space entry is going to occur.
- Monitor confined space entry operations for compliance and provide assistance as requested to implement all elements of this procedure.
- Ensure a Confined Space Hazard Assessment is completed for the determination of actual and potential hazards and control measures. Involve all workers involved in the entry in the Hazard Assessment process.
- Know the hazards that may be faced upon entry and hazard controls.

- Conduct initial atmospheric testing for potential confined spaces,
- Determine when and how to terminate entry and cancel the permit.
- Verify rescue personal are available, ready to assist, and are able to summon other trained workers.
- Remove unauthorized or untrained workers.
- Verify procedures remain consistent, effective, and are followed.

3.3 Workers

- Be familiar with the confined space entry procedure and strictly adhere to all procedures to provide for workers' safety.
- Participate in all training and emergency preparation required for safe entry of confined spaces.
- Follow the direction provided by the attendant assigned to monitor the confined space.

3.4 Authorized Confined Space Entrants

- Identify and evaluate hazards of entry and hazard controls.
- Be familiar with the proper use, care, selection, and storage of PPE.
- Recognize signs and symptoms of exposure.
- Detect prohibited conditions.
- Properly enter and exit a space.
- Properly perform their duties in a confined space.

3.5 Confined Space Attendant

- Must know how to follow proper entry procedures and required form(s).
- Have knowledge of hazards of entry and hazard controls.
- Prevent entry to any confined space with a hazardous atmosphere.
- Must monitor behavior of workers both inside and outside of the space to be aware of unsafe situations.
- Continuously monitor space and count of entrants.
- Remain outside the permit space until relieved.
- Order evacuation of space due to behavioral effects of entrants, a condition change inside or outside that causes danger, an emergency in or out of the space or if unable to effectively perform attendant duties.
- Operate the non-entry retrieval system to evacuate workers unable to perform self-rescue.
- Summon third-party rescue team and other emergency services if required.

3.6 Third-Party Technical Rescue Team

- Must be trained to use proper PPE, technical rescue equipment and entry rescue procedures.
- Perform assigned emergency duties.

- Have CPR and first aid training.
- Be completely equipped with all required rescue and retrieval equipment.

4.0 DEFINITIONS

4.1 Competent Person

A Competent Person means a person who is:

a) Qualified because of that person's knowledge, training and experience to do the assigned work in a manner that will ensure the health and safety of every person in the workplace, and
b) Knowledgeable about the provisions of the Nova Scotia Occupational Health and Safety Act and regulations that apply to the assigned work, and about potential or actual danger to health or safety associated with the assigned work.

4.2 Designated Competent Person

A Designated Competent Person means a competent person designated in writing, by the employer. The designation must be in writing and must be clear on a person-by-person basis who is covered and who is not.

4.3 Confined Space

"Confined Space" means an enclosed or partially enclosed space:

1. Not designed or intended for regular human occupancy; and
2. With restricted access or exit; and
3. That is or may become hazardous to a person entering it because of its design, construction, location, atmosphere, or the materials or substance in it or other conditions.

4.4 Confined Space Attendant

An individual stationed outside a confined space who monitors the authorized entrants and who performs all (attendant) duties assigned in the employer's confined space entry permit.

4.5 Confined Space Entrant

A worker who is trained and formally authorized by the employer to enter a confined space.

4.6 Entry

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

4.7 Confined Space Entry Permit

The Confined Space Entry Permit is a written document in which the supervisor authorizes the employee to enter the confined or enclosed space.

4.8 Hazardous Atmosphere

An atmosphere prohibiting entry that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue, injury or acute illness from one or more of the following:

- Flammable gas, vapor, or mist in excess of 10% of its lower flammability limit.
- Airborne combustible dust at a concentration that meets or exceeds its LFL. (This concentration may be approximated as a condition in which the dust obscures vision at a distance of six feet or less).
- Atmospheric oxygen concentrations below 19.5% or above 22.5%.
- Atmospheric concentrations of any substance for which a dose or occupational exposure limit published in applicable standards or regulations. and/or
- Any other atmospheric condition that is immediately dangerous to life or health (IDLH).

4.9 Hot Work

Any work being performed that presents an ignition or heat source. Examples are welding, grinding, burning, chipping, or electrical equipment. LEL readings must be at ZERO to perform any hot work in a confined space.

4.10 Immediately Dangerous to Life or Health (IDLH)

A condition characterized by an oxygen deficient atmosphere or an atmosphere concentration of any harmful substance that poses an immediate threat to life or health that may cause irreversible or delayed adverse health effects or may interfere with an individual's ability to escape from dangerous atmosphere.

4.11 Isolation

Refers to the act of verifying that the space cannot be inadvertently refilled with product and/or re-energized electrically or mechanically while workers are inside through implementation/ installation of isolating devices such as blanking or blinding pipes, removing sections of inlet lines, pipes or ducts, a double-block-and-bleed, lockout of all sources of energy or installing a mechanical block.

4.12 Confined Space

A confined space will always require a permit, if the hazards in the confined space or in its proximity are either not known or have not been determined or include any of the following conditions:

- Oxygen concentration is less than 19.5% or more than 22.5% by volume.
- Explosive or flammable atmosphere between 10% and 50% LEL.
- Concentrations of toxic substances exceed the ACGIH Safe Occupational Exposure Limit.

Note: No entrees are allowed into an atmosphere with an LEL over 50% or if IDLH conditions are measured.

4.13 Natural Ventilation
Ventilation provided to a space by non-mechanical means. Air moving into a space opening would be considered natural ventilation. This is not an effective method for maintaining the safety of workers inside a confined space.

4.14 Oxygen Deficiency
An atmosphere where oxygen concentration is less than 19.5% by volume. Provincial safety regulations require that workers wear air-supplied respirators in oxygen deficient atmospheres.

4.15 Oxygen Enriched
An atmosphere where oxygen concentration is greater than 22.5% by volume. Fire and explosion potentials are greatly increased.

4.16 Retrieval System
Equipment used for non-entry rescue of persons from confined spaces.

4.17 SAR
Supplied Air Respirator.

4.18 SCBA
Self-Contained Breathing Apparatus.

5.0 PROCEDURE

5.1 General
This procedure must be followed before entering a confined space for any work task. Strict adherence with this procedure is necessary. Failure to follow this procedure will be considered a serious violation of the StFX Occupational Health and Safety Policy and will result in disciplinary action. Subcontractors shall meet or exceed this procedure based on legislative jurisdictional requirements.

Before mobilization, the spaces identified by management as confined spaces must be determined and verified.

Any person or persons entering a space of unknown hazard will wear a SCBA or SAR and retrieval equipment.

No person, under any circumstances, may enter a space containing an explosive or oxygen deficient or oxygen enriched atmosphere.

All entries into spaces with unknown hazards will be supervised. This supervisor will be responsible for enforcing all the provisions contained in this procedure. Remote sampling and atmospheric testing will be conducted with sampling tubes and pumps and a Confined Space

Hazard Assessment and Confined Space Entry Permit will be completed before entry and posted at the work location.

No matches, lighters, or any other items capable of producing a spark or flame are allowed in a confined space. Only intrinsically safe radios, cell phones, flashlights, or lanterns shall be used in a confined space containing potentially flammable vapors or gases.

All procedures will be reviewed with all involved workers prior to the entry. Any deviations from this procedure will require the approval of the Supervisor.

A combustible gas/oxygen meter and/or a gas specific instrument must be used to monitor the atmosphere inside a confined space initially before entry and on a continual basis.

All combustible gas/oxygen meters and/or a gas specific instruments are to be calibrated or span (bump) checked prior to use. Calibrations shall be documented and retained.

Any monitoring will be performed by workers who are competent with the equipment and its operation.

Daily records will be maintained for all confined space entry work.

5.1.1 Confined Space Entry Permit

The Confined Space Entry Permit needs to be filled out prior to any confined space entry. Complete use of the form will verify that all health and safety considerations have been addressed prior to entry.

The Confined Space Entry Permit is to be signed by the Supervisor and acts as a permission to enter the confined space. The Confined Space Entry Permit is used in conjunction with this program and entry procedures to determine special precautions necessary for entry.

The Confined Space Entry Permit shall be available at the work facility location of the confined space and shall be dated and valid for one shift only.

The Confined Space Entry Permit cannot be completed until all testing and sampling has been accomplished. This means that it must be filled out at the site.

The Supervisor is responsible for the safety of workers involved in an entry and shall evaluate, plan, and implement the procedures necessary to safeguard the workers assigned to the job.

Efforts should be made to determine the present and previous contaminants contained in the confined space. The information should be listed on the Confined Space Entry Permit.

5.2 Control Measures

- Hazard assessment of the area.
- Qualified Confined Space Attendant.
- Specific rescue plan complete with required rescue equipment.
- Completed Confined Space Entry Permit.
- All entrants and attendants must be trained on entry process, PPE use, rescue equipment, and rescue plan.
- Communication procedure.
- First aider must be available.
- Appropriate PPE made available. and
- Written authorization from the Supervisor.

5.3 Coordination of Work

When workers from more than one employer perform work in the same confined space, the Supervisor controlling the site activities must coordinate entry operations. The Supervisor controlling the site must prepare a Pre-Job Toolbox Meeting to verify that all employers workers perform their duties in a way that protects the health and safety of all workers entering the confined space.

The Supervisor must also conduct the Pre-Job Toolbox Meeting with all workers who perform work in the confined space. Each employer is responsible for the health and safety of their own workers and for verifying compliance with confined space legislative requirements.

5.4 Fall Protection

Anyone who is at risk of falling into a confined space must have appropriate fall protection. All workers must have completed fall protection training.

5.5 Intrinsically Safe/Explosion Proof

Electrical equipment which does not present the potential for electrical spark and which has been certified as safe for use in flammable atmospheres must be used as necessitated by space classification (10-50% LEL)

5.6 Energy Isolation

Energy isolation is the act of physically locking out electrical, hydraulic, or pneumatic controls and/or mechanical linkage to provide isolation.

Typically, this is performed by lock and key or the physical removal of key components that make it impossible for a system to be restarted while workers are working on, or inside the system.

An Energy Isolation procedure for the machinery and equipment must be used in conjunction with this section.

All workers must be trained as to the specifics of the Energy Isolation procedure prior to commencing work operations, and records of the training must be maintained.

Before entering any confined space, workers will take sufficient steps to verify that toxic contaminants or potentially hazardous products do not re-enter a space or that hazardous situations do not develop while workers are inside. This is accomplished by validating that the confined space is completely isolated from all other electrical or mechanical systems by physical disconnection. Isolation includes the verification that mechanical or electrical apparatus cannot become energized while workers are inside.

Isolation in these cases can include physical lockout of switches or controls, disconnecting electrical supplies, or the mechanical blocking of moving equipment and process systems. Isolation shall be achieved by locking circuit breakers and/or disconnecting the ON position lever with a key type padlock. Isolation of all moving parts shall be achieved by disconnecting, blinding, or capping any linkage, valves, water/streamlines, chaining controls, or systems which enter, feed, or impact in the confined space. Equipment with moving mechanical parts shall be blocked/ secured so there can be no inadvertent movement.

The key must remain with the person working inside the confined space. If more than one person is inside the confined space, each person shall place his/her own lock on the lockout point.

5.7 Mechanical Ventilation

Mechanical ventilation is a method of providing ventilation into a confined space, which is typically provided by electrically powered or air driven blowers. From a ventilation engineering standpoint, air blown into a space (forced air) is more effective in providing consistent dilution inside the space than air exhausted, (induced air).

Negative pressure can be provided by placing the blower inside the space. This method can be effective in allowing clean air to be drawn into the space but is not as effective in producing uniform dilution of contaminants. Ventilation must be provided at the minimum rate of four air changes per hour.

Flexible tubing or ductwork is used to distribute air to all areas of the space. Electrical ventilation equipment must be bonded and or grounded.

5.8 Emergency Retrieval Equipment

Refers to mechanical hoist equipment designed to raise and lower workers from a space. All equipment used for raising or lowering workers will be rated for such operations by the manufacturer.

Workers entering a confined space shall wear a Group E full body harness attached to a life line which is attended at all times by the attendant outside the confined space. Mechanical retrieval devices shall be in place for vertical entries. The full body harness will have such design features as to keep the individual in an upright orientation if a vertical rescue is required.

5.9 Initial Atmosphere Testing

Prior to entry, all spaces will be initially tested for carbon monoxide, flammable vapors and oxygen deficiency, plus toxic vapor or gases (based on the potential for toxics being present).

The Confined Space Attendant shall know how to operate the atmospheric monitor or calibrated gas instrument assigned to him/her and the Supervisor will verify that the atmospheric monitor is properly calibrated.

A calibrated gas instrument will be span (bump) checked prior to use and as per manufacturers' specifications to maintain proper operation and will be calibrated as per manufacturer's specifications. Calibrated gas instruments will not be used for certifying an area "safe for entry" unless these requirements have been met.

When monitoring, measurements will be made from top to bottom and in all remote sections of the space. It may be necessary to enter the space to test remote locations. Continuous monitoring of the atmosphere shall be conducted.

5.10 Purging and Ventilation

Prior to entry, mechanical ventilation will be initiated to reduce, or maintain flammable vapor levels to 10% LEL or less.

This ventilation is primarily designed to verify that oxygen deficiencies or flammable atmospheres do not develop. Ventilation is not always sufficient to maintain toxic-free environments and therefore, continuous monitoring of confined spaces is always conducted.

Note: this ventilation will discharge contaminants outside the space and will therefore present exposure potentials to outside workers. This discharge may also present fire or explosion hazards outside the space.

Electrical fans will not be placed inside a space or set up to move air that contains flammable vapors unless they are equipped with explosion-proof capability and are certified by the appropriate and applicable regulatory agencies.

5.11 Safety Equipment

The following minimum equipment requirements are specified:

- Oxygen and combustible gas monitors and a calibration kit.
- Mechanical ventilation equipment.

- All workers entering a confined space shall wear clothing appropriate to protect the wearer.
- Hearing protection shall be used when noise levels and exceed 85dB.
- The exact level and type of respiratory protection shall be determined based upon the conditions and test results of the confined space and the work activity performed.
- All respirators shall be approved devices and shall be fitted and maintained in accordance with the Respiratory Protection Program.
- The specific type of rescue equipment will depend upon the nature of the confined space with regard to access/egress. This should take into account the exact manner in which the individual could be rescued.
- A full body harness is required when an employee is working in an area that, for purposes of rescue.
- The class "E" harness selected must facilitate removal from the confined space.
- Additional rescue equipment such as a tripod/davit, winches and lifelines shall be available, set-up, and in working order if needed to remove a worker from a confined space. This equipment must be capable of being hand operated.

5.12 Rescue Plans

A rescue plan must be developed and provided to supervisors, entrants, and rescue workers for all confined spaces.

5.13 Rescue Personnel

The Confined Space Attendant must be readily available on site the entire time that operations are being conducted in a confined space. They will be responsible to activate the emergency response plan in the event of an emergency inside or outside of the confined space.

When required because of complex restricted vertical and horizontal entries, specialized third-party technical entry rescue personnel shall be available on site and on station the entire time that operations are being conducted.

5.14 Confined Space Attendant

Confined space entries require a Confined Space Attendant to be assigned to the space. This person's duties include maintaining communication and providing necessary assistance to help non-entry evacuation of workers inside.
The Confined Space Attendant's primary responsibilities are the initiation of emergency/rescue procedures (although this person will never go inside the space).

The Confined Space Attendant shall maintain an accurate count of personnel inside the confined space on the Confined Space Entry/Exit Log

Confined Space Attendants cannot leave for any reason unless relieved by another trained confined space attendant or the space is evacuated.

Communication needs to be established for attendants so assistance can be summoned without the Confined Space Attendant having to leave the area.

5.15 Continuous Atmospheric Monitoring

It is recognized that the condition in some spaces may change over time. Initial testing may underestimate hazards in these situations.

Continuous monitoring of flammables, oxygen, and/or toxics is always required in confined spaces. Recording of those results are required on the Confined Space Entry Permit.

Equipment designed for continuous monitoring with an audible alarm, light and vibration shall be used.

5.16 Continuous Ventilation

Once ventilation is started, periodic checks should be made of the surrounding area to verify that contaminated air is exhausted in a location that creates no hazard to people or equipment.

Continuous ventilation shall be maintained as part of the work procedure when conditions such as desorbing of walls, evaporation, or chemicals and toxic atmospheres which may develop due to the nature of the confined space activity, i.e. welding or painting.

Continual forced air ventilation shall be provided in all confined spaces. If monitoring identifies that the ventilation is not sufficient to maintain the atmosphere below 10% LEL, the confined space shall be evacuated immediately until the problem is corrected.

Air intake fans shall be located so they will not pick up exhaust gases from vehicles, heaters, furnaces, or adjacent operations capable of generating airborne contaminants. Blowers should be located so that there are no unnecessary bends in the hose. One 90 degree bend can reduce the output to 70% of rated capacity; two 90 degree bends to 50%; three bends to 33%; etc.

5.17 Lighting

All portable lights shall have protective covers and be intrinsically-safe when working in potentially flammable atmospheres.
Heavy duty flexible cords will be used with good insulation and connectors. No splices are permitted. Cracked or worn insulation shall be replaced.

All lights and plug assemblies and GFCIs should be checked with a volt/ground meter prior to use in a confined space.

5.18 Confined Space Entry Hazard Assessment

The Confined Space Entry Hazard Assessment shall include:

- Oxygen deficient or oxygen enriched atmosphere.
- Flammable or explosive.
- Poisonous or toxic.
- Egress and entry limitation.
- Isolation/lockout and tag out requirements.
- Electrical hazards.
- Mechanical hazards.
- Communication equipment and procedures.
- Confined Space Attendant and Entry/Exit Log
- Permit requirements.
- Visibility.
- Ventilation.
- Intrinsically safe equipment.
- Eliminate ignition source.
- Proper safety gear.
- Safety lines.
- Positive pressure SCBA.
- In-line system.
- Back-up system/resources.
- Air monitoring equipment.
- Removal equipment.
- Stretchers, baskets.
- Medical help. and
- Contingency plan including rescue workers and equipment.

5.19 Training Requirements

All workers entering a confined space must have Nova Scotia Confined Space Entry training and be thoroughly trained in this procedure at least every two years as per legislative jurisdictional requirements. Special emphasis must be placed on verifying competency so that workers can perform operations safely.

5.20 Supervisors Shall Know

- Prior to entry:
    - Identification and control of hazards
    - Procedures
    - Practice
    - Equipment
- How to determine that entry operations remain consistent with terms of permit.
- How to determine that acceptable conditions are present.
- How to cancel or terminate the permit if acceptable conditions are not maintained. and
- How to take necessary measures:
    - Concluding and operation.

    - Close off a permit space.
- Cancel the permit after completion of work.

5.21 Authorized Entrants Shall Know:

- Hazards of entry.
- Hazard controls.
- How to select, fit, use, and care for PPE.
- Communication procedures to signal the authorized attendant if conditions change, a worker is injured, PPE failure, lighting failure or if rescue is required.
- How to recognize behavioral changes due to exposure.
- How to detect prohibited conditions such as unblinded lines, unvented or purged areas, electrical energization, and improper or non-intrinsically safe tools and equipment. and
- How to properly enter and exit a confined space.
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5.22 Authorized Attendants Shall:

- Remain stationed outside permit space.
- Maintain accurate count of entrants.
- Know potential hazards associated with space.
- Know the hazard controls.
- Monitor activities inside without physically entering the space.
- Monitor activities outside, which may negatively impact the space.
- Maintain effective and continuous contact.
- Summon rescue and other emergency services.
- Perform any assigned rescue and emergency duties without entering permitted spaces.
- Be trained to properly use retrieval systems necessary for making non-entry rescues.
- Be trained to perform assigned rescue functions at least annually. and
- Know how and when to coordinate efforts with third-party technical rescue teams.

5.23 Third-Party Technical Rescue Team

- Must verify that rescuers are aware of hazards they may confront when called on to perform rescues.
- Provided access to permit spaces so they can:
    - Develop rescue plans.
    - Practice rescue operations.

6.0 SUPPLEMENTARY DOCUMENTS

- Confined Space Entry Permit
- Confined Space Entry/Exit Log
- Confined Space Hazard Assessment

REVISION SUMMARY		
DATE	**REVISION**	**SUMMARY**
1 Nov 17	1	New program
15 Apr 19	2	Updated purpose and scope for consistency, added Group E harness requirement, grammatical and formatting changes (on file), updated page 2 of permit to allow more tests to be recorded.
2 Mar 20	3	Changed Security to OH&S in 8th bullet point under Supervisor's responsibilities, changed StFX logo.
7 Sep 22	4	Updated to new OHS programs format