



UNIVERSITY OF
TORONTO

CONFINED SPACES PROGRAM

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1.0 INTRODUCTION AND SCOPE

Introduction

A “**confined space**” means a fully or partially enclosed space,

- (a) that is not both designed and constructed for continuous human occupancy, and
- (b) in which atmospheric hazards may occur because of its construction, location or contents or because of work that is done in it;

Due to the significant potential hazards which confined spaces may present to University employees and contractors, it is the University's responsibility as an employer to develop, implement and maintain a written program. The intent of this program is to ensure compliance with the general requirements of the Occupational Health and Safety Act of Ontario, and the specific requirements of Ontario Regulation for Confined Spaces, (O.Reg. 632/05, Extended Workplaces) to prevent unauthorized entry into confined spaces; and to protect the health and safety of those who must enter confined spaces on University property.

Wherever possible, entry into confined spaces will be avoided by moving equipment out of these spaces, using remote methods to do the work, or any other means that will eliminate the need for a worker to enter a confined space.

At the University, there are also “restricted spaces” which are separate and different from confined spaces. A restricted space means a fully or partially enclosed space,

- (a) that is not both designed and constructed for continuous human occupancy, **but**
- (b) in which atmospheric hazards **are not present nor likely to occur**

While the level of risk is lower, there are recommended procedures for working within a restricted space. Refer to the Restricted Spaces Standard on the Office of Environmental Health and Safety (EHS) website for more information.

Scope

This program applies to all confined spaces on University property (**except those under the jurisdiction of a constructor**) and covers any University of Toronto (U of T) employees whose job duties require entry and work within or related to confined spaces. It is expected that this will be composed primarily Utilities and Trades personnel (St. George campus) as well as the employees of Facilities Resources and Management departments at the University of Toronto Scarborough (UTSC) and University of Toronto Mississauga (UTM). However, when employees of other departments, academics, or students are involved, they must also comply. Contractors and subcontractors entering confined spaces at the University must abide by the procedures established by this program and, where necessary, according to the Co-ordination document.

2.0 DEFINITIONS

(adapted from O.Reg. 632/05 and the MOL Confined Spaces Guideline, Sept. 06)

“**acceptable atmospheric levels**” means that,

- (a) the atmospheric concentration of any explosive or flammable gas or vapour is less than,
 - (i) 25 % of its lower explosive limit, if the worker is performing only inspection work that does not produce a source of ignition,
 - (ii) 10 % of its lower explosive limit, if the worker is performing only cold work and,
 - (iii) 5 % of its lower explosive limit, if the worker is performing hot work and is following appropriate procedures,
- (b) the oxygen content of the atmosphere is at least 19.5 per cent but not more than 23 per cent by volume, and
- (c) the exposure to atmospheric contaminants does not exceed any applicable level set out in a regulation made under the Act

“atmospheric hazards” means,

- (a) the accumulation of flammable, combustible or explosive agents,
- (b) an oxygen content in the atmosphere that is less than 19.5 per cent or more than 23 per cent by volume, or
- (c) the accumulation of atmospheric contaminants, including gases, vapours, fumes, dusts or mists, that could,
 - (i) result in acute health effects that pose an immediate threat to life, or
 - (ii) interfere with a person’s ability to escape unaided from a confined space;

“competent person” means a person who,

- (a) is qualified because of knowledge, training and experience to organize the work and its performance
- (b) is familiar with the OHS Act and the regulations that apply to the work and
- (c) has knowledge of any potential or actual danger to health or safety in the workplace;

“confined space” means a fully or partially enclosed space,

- (a) that is not both designed and constructed for continuous human occupancy, and
- (b) in which atmospheric hazards may occur because of its construction, location or contents or because of work that is done in it;

“continuous human occupancy” refers to a space that has been designed and constructed in accordance with recognized codes and standards that contain provisions for structural adequacy, access and egress, ventilation and lighting such that a human could occupy that space.

“engulfment” means the surrounding of a person by a liquid or finely divided solid that can be aspirated to cause death by plugging the respiratory system, or that can exert enough force on the body to cause death by strangulation, constriction or crushing.

“flammable gas” is a gas that is capable of being ignited and burned when mixed with the proper proportions of air, oxygen or other oxidizer

“flammable vapour” is the vapour generated by a flammable liquid that is capable of being ignited and burned when mixed with the proper proportions of air oxygen, or other oxidizer

“flammable liquid” means a liquid with a flashpoint below 37.8 degrees Celsius

“inerting” is a special form of purging and ventilating that involves purging oxygen from a confined space using an inert gas (such as nitrogen, carbon dioxide, or argon) to remove the hazard of fire

or explosion by reducing the concentration of oxygen to below the level that can support combustion

“isolation of energy and control of materials movement” means using adequate methods and procedures to ensure that each worker entering a confined space is protected against

- (a) the release of hazardous substances into the confined space
- (b) contact with electrical energy
- (c) contact with moving parts of equipment
- (d) drowning, engulfment, entrapment, suffocation and other hazards from free-flowing material

“lead employer” means an employer who contracts for the services of one or more other employers or independent contractors in relation to one or more confined spaces that are located,

- (a) in the lead employer’s own workplace, or
- (b) in another employer’s workplace;

“person with adequate knowledge, training and experience” or **“competent worker”** can include a worker, supervisor, consultant, or anyone who has "academic" knowledge of the task at hand, hands-on knowledge in safely performing the work, a knowledge of the associated hazards, the possible controls, and the legal requirements, in order to enact the necessary controls to protect the health and safety of the workers in and about the confined space.

“related work” means work that is performed near a confined space in direct support of work inside the confined space

3.0 ROLES AND RESPONSIBILITIES

Management

The Facilities and Services Department on the St. George campus and Facilities Resources and Management at UTM and UTSC campuses have the primary responsibility for controlling access to and authorizing work in most confined spaces. However, there may also be situations where the Confined Space is owned by a specific researcher or department. In these cases the responsibility would rest with the owner. This applies to work performed both by University employees and contractors hired by the University.

In addition to the general procedures outlined in the University of Toronto Confined Spaces Program, management shall ensure that hazard assessments, entry plans, entry permits, on-site rescue plans and co-ordination documents are written for each confined space in which University employees or contractors perform work, using the forms provided, or other acceptable means, prior to entry.

Supervisors

Supervisors must be familiar with the requirements of this program and ensure that employees or contractors under his/her supervision understand the general and specific procedures and know how to conduct their confined space tasks safely. Supervisors must also ensure that all staff working in or conducting work related to confined spaces are adequately trained. Supervisors may be required to provide plan-specific training.

Employees

University employees who are required to perform work in, or involving, confined spaces shall work in accordance with the University's Confined Space Program.

The attendant

A worker who is trained in the hazards of confined spaces and the work to be done and whose primary responsibility is to monitor and assist the workers in the confined space. The attendant's primary role is to monitor and assist the entrants (workers inside the space.) S/he must understand the hazards that may be present or may develop in the Confined Space and must remain stationed outside and at the entrance at all times. There must be a means for constant communication between the attendant and the entrants, as well as a communication method for the attendant to summon a rescue response if required. The attendant must control activities at the entrance and keep unauthorized people away. S/he also has the authority to order the entrant(s) out of the space if an unsafe condition develops.

If necessary, the attendant will initiate the rescue and may be involved in rescue work, as long as s/he has the appropriate training. However, s/he must never leave the entrance of Confined Space unless replaced by another attendant.

The Entrant

A worker trained in the hazards of confined spaces and the work to be done and who enters the space to perform work. S/he must be aware of all known and potential hazards of the space as well as be capable of performing the work. Constant communication with the attendant is required and the entrant must exit the space immediately if so ordered by the attendant.

A Competent person is required for:

- Developing and implementing the confined space entry plan
- Verifying by signature that the entry permit continues to comply with the plan, prior to the start of each shift (and before first, initial entry).

Persons with adequate knowledge, training, and experience are required for:

- Carrying out an adequate assessment of the hazards in the confined space before any worker enters the confined space
- Signing and dating the assessment and providing it to the employer
- Conducting the training of workers before they are allowed to enter the confined space
- Inspecting the rescue equipment to ensure it is in good working order
- Performing adequate tests as often as necessary, to ensure that acceptable atmospheric levels are maintained in the confined space, in accordance with the relevant plan
- Inspecting the personal protective equipment used by an entrant.

Environmental Health and Safety (EHS)

The Office of Environmental Health and Safety will provide:

- Maintain, review and update the program as needed
- Hazard identification and recognition of confined spaces
- Other advice and consultation as required by the situation
- Generic confined space training to University employees
 - Departments are responsible for providing site-specific training to their staff (e.g. Entry Plan training, rescue equipment training).

Contractors

Overall responsibility for safety of workers entering the confined space falls onto the Constructor in the case of a project or to the UofT hiring department as the “lead employer” for work that is not considered a project.

The constructor of a project should follow their own confined space program and procedures. The UofT hiring department is responsible for providing the constructor with a copy of the UofT Confined Space Program (required by regulation). The Constructor’s Confined Space Program should meet or exceed the requirements of Ontario Regulation 632/05 and UofT Confined Space Program.

Where the University of Toronto is acting as the “lead employer”:

- 1) Before authorizing work in a confined space, the department retaining the contractor shall provide a report to the prospective contractor as part of the work specification. The report shall contain the hazard assessment of the area. The contractor will review the hazard assessment and co-sign that the assessment is adequate.
- 2) All contractors must be fully familiar with and be able to demonstrate compliance with the Occupational Health and Safety Act, the Confined Space Regulation O.Reg. 632/05, and the U of T Confined Space Program.
- 3) Contractors should follow the UofT Confined Space Program. Alternatively, if the contractor has their own program, the contractor must provide a copy of their own Confined Space Program and related documents for review by the hiring department to ensure they are adequate. The hiring department would be considered to be the lead employer and, as such, is responsible for the overall health and safety of the contractor. Therefore the hiring department must review the entry and emergency plans to ensure that they are adequate, prior to the commencement of the job.
- 4) The contractor must also provide written evidence that their workers have received appropriate training.
- 5) When there are workers from multiple employers (e.g. contractors + UofT employees or contractors from more than 1 company) a Co-ordination document must be completed. It will be prepared by the U of T hiring department (as the Lead employer) and will be signed by representatives of both the University and the contractor(s) prior to entry. In these cases, the U of T program and documents will be used.

Joint Health and Safety Committee (JHSC)

Under Ontario Regulation 632/05, the appropriate UofT JHSC will be:

- Provided a copy of the UofT Confined Space Program
- Provided a copy of the Co-ordination document (where applicable)
- Consulted with the development and maintenance of the Program and on general confined space training requirements
- If requested, be provided with a copy of the Hazard Assessment and the qualifications of the person performing the Hazard Assessment.

4.0 IDENTIFICATION / CLASSIFICATION / INVENTORY OF CONFINED SPACES (Appendix A)

Identification and classification of all potential confined spaces will be done by the Facilities and Services, and Facilities Management/Resources departments, with the assistance of EHS, where necessary. If the space is already listed on the inventory and/or a sign is posted, then it is a Confined Space and all requirements of the program must be followed.

If the space is not listed on the inventory and there is no sign posted, then the **Confined Space Identification/Classification Guide (Appendix A)** may be used to determine if the space meets the requirements of the definition and, if so, what the classification is, based on the work to be done. It should be noted that classifications might change depending on the work to be done in the confined space. Even if a space is not a confined space under the regulations, every precaution reasonable in the circumstances must be taken to protect workers entering the space.

The University program defines two types of Confined Spaces, and also Restricted Spaces. Example signs are provided in the Appendices.

5.1 Class 1 Confined Space:

This is a confined space, for which, because of the nature of the hazard(s) or the location of the space, under some circumstances based on hazard assessment, it is **not feasible or possible to render the space safe to enter without proper respiratory protection**. In such cases, personnel entering this type of space must wear appropriate respiratory equipment, usually Self Contained Breathing Apparatus (SCBA) or Supplied Air Respirators (SAR). U of T staff will not be entering these spaces if SCBAs or SARs are required and the work will be contracted out to those with the appropriate capabilities.

5.2 Class 2 Confined Space:

This is a confined space, which, due to the nature of the potential hazard(s) or the location of the space, in some circumstances based on risk assessment, it **can be rendered safe for an employee to enter without wearing respiratory protection**. This can be accomplished through work practices such as continuous ventilation and air monitoring of the space.

5.3. Restricted Space (U of T):

This is a space which is fully or partially enclosed, that is not both designed and constructed for continuous human occupancy, **but in which atmospheric hazards are neither present nor likely to occur**. Though no permit is required for these spaces, access or egress to and from the space may be limited and movement inside the space may be awkward or difficult so other procedures must be in place. Please see the U of T Restricted Spaces Standard (Revision 2007) for more information.

Classification Guide

The classification associated with each group of confined spaces indicated in the table below, is intended as a guide only. Classification also depends on the work being performed and the materials and processes that are brought into the space. For example, in circumstances where the work to be performed, in what is usually a Class 2 space, is such that respiratory protection (SCBA or SAR) will be required (this may include activities such as hot work, painting, coating, using solvents, sandblasting etc.) then it may be necessary to reclassify it as a Class 1 Confined Space. Likewise, if work or materials that create an atmospheric hazard are introduced into a Restricted Space, it may become a Confined Space.

GROUP	TYPES OF SPACES	CLASSIFICATION
A. PITS / SERVICE CHAMBERS	1) Sewage pit	Class 1
	2) Non-sewage pit	Class 2
	3) Electrical service chamber	Class 2
	4) Mechanical service chamber	Class 2
B. TANKS <i>Note: Designation of tanks as "open" or "closed" is based on entry for maintenance work.</i>	1) Open* tanks (e.g. neutralizing, de-gasifier, de-chlorinator, etc.) <small>*Open - entry into these tanks is accomplished after the removal of a relatively large lid</small>	Class 2
	2) Closed** tanks (e.g. condensate, expansion, compressor, receiver, domestic hot water, etc.) <small>**Closed- entry into these tanks is accomplished through a relatively small entry port</small>	Class 2
C. COOLING TOWER BASINS		Restricted Space
D. BOILERS		Class 2
E. CRAWLSPACES	Including areas with the probability of exposure to asbestos.	Restricted Space

Inventories

The Facilities and Services, or Facilities Resources/Management departments will maintain the inventories of all confined spaces on each campus. EHS will also keep a copy. It is anticipated that these will be available on-line in the future.

Any new confined spaces that are discovered, or spaces that have been eliminated, should be reported to Facilities and Services or Facilities Management/Resources and to EHS immediately, so the inventory can be updated.

Signage

Once a confined space has been identified, it must be properly signed, to warn against unauthorized entry and work. The sign will also bear the unique identification number for the confined space as recorded in the inventory. The **unique identification number** will incorporate information from the table above where possible. The identification number will be comprised of: **building number - class - group/type - number**. For example, a mechanical service chamber in the Sidney Smith Building (Building 033) would be classified as 033 - II - A4 - 001.

5.0 A BASIC PROCESS FOR WORKING IN POTENTIAL CONFINED SPACES

Follow the steps outlined in Table 1 for planning and executing confined space entries. EHS may be contacted during any of these steps for consultation. ALL documents outlined in this process must be completed prior to any entry into a confined space.

Table 1: Steps for Planning and Executing Confined Space Entries (non-Projects)

Step	Purpose	Actions
1	Determine if the space is a confined space (or possibly a restricted space)	<ol style="list-style-type: none"> 1. Consult confined space inventory 2. Check for signage 3. If still unsure, use Decision Tree (Appendix A) 4. Contact EHS for consultation if required 5. If this is a NEW confined space, contact EHS to document in the Confined Space Inventory
2	Determine if there is a Standard Operating Procedure (SOP) already available: <ul style="list-style-type: none"> • SOP #1A, Cable Chamber Entry • SOP #1B, Cable Chamber Entry (Hot Work) • SOP #2, Boiler Drum Entry • SOP #3, Sump Pit Entry • SOP #4, Tank Entry The SOPs include the Hazard Plan (Form A) and Entry & On-Site Rescue Plan (Form B).	<ol style="list-style-type: none"> 1. Review entire SOP and implement procedures outlined in the SOP. 2. Revise to meet current conditions if necessary.
3	If Step 2 is not applicable (no SOP relevant to current work), complete a Hazard assessment and Entry & On-site rescue plan.	<ol style="list-style-type: none"> 1. Complete Form A Hazard Assessment. 2. Then, based on the Hazard Assessment, complete Form B Entry & On-Site Rescue Plan.
4	If workers from multiple employers enter the confined space for related work, the lead employer must make sure the conditions are safe for ALL workers.	<ol style="list-style-type: none"> 1. Complete Form C Coordination Document. 2. Provide copy to applicable JHSC
5	When the site is ready to begin work, entry plan is fully implemented and the space is safe for all workers prior to entry : all relevant equipment, training and procedures (including attendant, air monitoring) are in place.	<ol style="list-style-type: none"> 1. Complete Entry Permit 2. Proceed with work when all of the above is complete
6	Meet regulatory requirements for recordkeeping.	<ol style="list-style-type: none"> 1. See Section 18 Record Keeping for record retention (required by law).

In some cases, the owner of the confined space and the employer/supervisor of the entrants may not be the same. Table 2 outlines responsibilities for document preparation between various parties:

Table 2: Document Preparation Responsibilities

Owner:	Step (Refer to Table 1)	Utilities (U) Confined Spaces	Utilities Confined Spaces	Utilities Confined Spaces	Other U of T Owner (O) (e.g. departments.)
Work By:		Utilities Staff	Trades Staff (T)	Contractor(s) (C)	Contractor(s) (U, T, or contractor)
DOCUMENT:					
SOP	2	U	U, co-signed by Trades	U, co-signed by Contractor(s)	O, co-signed by Contractor
Form A: Hazard Assessment	3	U	U, co-signed by Trades	U, co-signed by Contractor(s)	O, co-signed by Contractor
Form B: Entry & On- site rescue plans	4	U	T	C	C
Form C: Co-ordination document	5	NA	NA	U (lead) & C	O (lead) & C (Except T&U)
Entry permit (including permit authorization)	6	U	T	C	C

6.0 STANDARD OPERATING PROCEDURES (SOPs) (Appendices C, D, E, F G)

Standard Operating Procedures have been developed for the five most common Confined Space Entries at U of T. These are Cable Chamber Entry, Cable Chamber Entry - Hot Work, Boiler Drum Entry, Sump Pit Entry and Tank Entry. More SOPs will be developed, as needed.

The SOPs include a baseline hazard assessment of a typical space, an entry plan, and an on-site rescue plan, as well as specific procedures to be followed. Immediately prior to an entry, it is mandatory that the entire SOP be thoroughly reviewed and revised as necessary, to ensure that no new hazards have developed since the SOP was written. In addition, different work activities could result in different hazards.

All parties involved must sign the form indicating that they agree that the SOP is adequate for the work to be done.

In addition to the SOP, an Entry Permit and a Form C Co-ordination document (where necessary) must be completed before work can begin.

7.0 HAZARD ASSESSMENT (Form A, Appendix H)

Before any worker enters a confined space, the supervisor shall ensure that an adequate written assessment of the hazards related to the confined space has been completed. The hazard assessment must be completed by a person (supervisor, foreperson, lead hand, or other worker) with adequate knowledge, training and experience to be able to perform the assessment. The supervisor must maintain a record containing details of the person's knowledge, training and experience.

The purpose of the hazard assessment is to identify all the existing hazards of an individual confined space, and also the hazards that may develop during the planned work activity inside the confined space. In addition to assessing the atmospheric hazards, the general safety and health hazards present in the space must also be considered. Examples of hazards include oxygen deficiency, flammable vapours, toxics, general safety hazards, means of access/egress, temperature extremes, asbestos and noise.

8.0 ENTRY PLAN and ON-SITE RESCUE PLANS (Form B, Appendix I)

Before any worker enters a confined space, the supervisor shall ensure that a **written entry plan and on-site rescue plan** have been prepared specifically for that space and the work to be done in it. The entry plan is a set of measures and procedures to control all hazards identified by the assessment for that confined space to allow workers to enter and work safely. Individual departments are responsible for developing these specific procedures that relate to their work. The Office of Environmental Health and Safety will provide assistance and support, as required.

The **Entry Plan** should include information about the following:

- Duties of workers
- On-site rescue procedures
- Rescue equipment and methods of communication
- Personal protective equipment, clothing and devices,
- Isolation of energy and control of materials movement
- Attendants
- Adequate means for entering and exiting
- Atmospheric testing
- Procedures for working in the presence of explosive or flammable substances,
- Ventilation and purging
- Coordination document (where applicable)

Before any worker enters a confined space, the supervisor shall ensure that a written **on-site rescue plan** has been developed, to effectively and quickly remove a worker from a confined space. The on-site rescue plan must be based on the hazard assessment and must be ready for immediate implementation.

Trained personnel and appropriate equipment must be present and ready for use. Calling 911 as the rescue plan is not considered to be an adequate "on-site rescue plan." Emergency services do not replace the requirement for on-site rescue procedures.

In addition to general confined space training, the employer must ensure that an adequate number of on-site workers are present and have the following training:

- First aid and cardiopulmonary resuscitation;

- On-site rescue procedures in accordance with the relevant plan; and
- Use of the rescue equipment required by the relevant plan.

Rescue equipment must be readily available. The types of rescue required will be depends upon the hazards in the confined space, and the plan. Inspection records of rescue equipment must also be maintained. Examples of equipment include: harnesses and lifelines, hoist/retrieval systems, self-contained breathing apparatus, airline respirators, and other personal protective equipment. The dimensions of the access/egress points to the confined space should be compatible with the dimensions of the rescue equipment and rescue procedures. If entry is required to perform a rescue, rescue personnel must be properly protected and trained.

Where necessary, on-site rescue contractors may be hired to fulfill this function but the UofT hiring department remains responsible for ensuring that the training of the contracted rescue personnel and any equipment is adequate.

9.0 CO-ORDINATION DOCUMENT (See Appendix J)

A written Co-ordination Document is required where workers of more than one employer (e.g. U of T and a contractor) will perform work in the same confined space or *related* work with respect to the same confined space. Workers may be working in the space at the same time, or consecutively. "Related work" is defined as "work that is performed near a confined space in direct support of work inside the confined space".

The intent of the co-ordination document is:

1. To ensure that all employers and their workers are aware of potential or existing hazards that may be introduced by others, and that there is communication between or among the employers in order to ensure worker safety.
2. To reduce duplication with respect to requirements such as assessments plans, and entry permits. This sharing of tasks does not diminish an employer's duties and each employer is still required to ensure compliance with the regulations. The coordination document does not allow for the sharing of responsibilities for general training, personal protective equipment and records.

The co-ordination document must ensure that employer duties are performed in a way that protects the health and safety of ALL workers who perform work in the confined space or related work with respect to the confined space. Copies of the co-ordination document must be provided to each employer and to the JHSC or Representatives of each employer. In most cases, the co-ordination document will be prepared by U of T, as the Lead employer.

If a job is contracted out entirely, and U of T workers will not be involved, then a co-ordination document is not needed. However, as the employer, the person hiring the contractor must ensure that the contractor works in compliance with the legislation and the U of T Program.

10.0 ENTRY PERMITS (Appendix K)

For the purposes of the permit, entry is the action by which a person passes through an opening into a confined space. It is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the confined space.

The supervisor must ensure that a written entry permit is issued before work begins in a confined space. The permit must be signed by a competent person and must be posted or otherwise made readily

available to every person involved in the confined space activity. Under the Occupational Health and Safety Act, a 'competent person' is defined as a person who,

- (a) is qualified because of knowledge, training and experience to organize the work and its performance
- (b) is familiar with the OHS Act and the regulations that apply to the work and
- (c) has knowledge of any potential or actual danger to health or safety in the workplace;

In the context of a confined space entry, this is often the supervisor of the workers entering the confined space. This supervisor must meet the definition above, have received training as outlined in Section 11 and must be knowledgeable about the Hazard Assessment and Rescue Plans that have been put in place for that specific entry. At the University of Toronto, the management of confined space entries is often contracted to specialized consultants (e.g. Safety Scope). In those cases, the confined space entry consultants will complete the Hazard Assessment Plan (including the Rescue Plan) and the Entry Permits. The UofT contact (i.e. the person who hires the confined space consultants) should still understand the process and ensure that all necessary paperwork is completed and that they receive copies of the documents and keep them for a minimum of 3 years (see Section 18 on Recordkeeping).

A confined space entry permit system ensures that the potential hazards of a particular confined space have been identified and assessed, that necessary preventive measures are in place, and that workers are aware of and/or are reminded of the correct procedures prior to entry. **The permit is dated and is valid only for the specified time period (usually one shift). Supervisors must review the Hazard Assessment/SOP BEFORE issuing a new permit to ensure that conditions have not changed since the start of work.**

The permit includes the following information:

- o Location of the confined space
- o Description of work to be performed
- o Description of hazards and corresponding control measures
- o Time period for which the permit applies
- o Name of the attendant
- o Records of each worker's entries and exits
- o List of equipment required for entry and rescue and verification that the equipment is in good working order
- o Atmospheric testing results at, time, location, type of work to be done; air monitoring results; name of entrants and attendants and a record of entries, etc.
- o If hot work is performed, adequate provisions for the hot work and corresponding control measures.

11.0 TRAINING

All University employees who are required to perform work in, or related to, confined spaces, as well as those University supervisors who authorize work performed in confined spaces shall receive appropriate training to be able to safely perform their assigned duties. Managers and supervisors are responsible for identifying employees who require training.

Hazard Recognition and other general Training

This training shall include, but is not limited to, the following:

- o The U of T Confined Space Program

- Responsibilities under the Confined Space Program
- Identification and Classification of Confined Spaces at the University
- Recognition and Assessment of Potential Hazards
- Controlling Hazards (Lockout and other methods, Purging and Ventilating; Air Monitoring; Respiratory Protection)
 - UofT are generally not trained in the use of supplied air respirators. If this type of respirator is required, then the work must be conducted by qualified contractors with the training.
- Entry Plans
- Entry Permits
- On-site Rescue plans
- Co-ordination documents

Plan-specific training

Every worker involved in a confined space entry must also be adequately trained in accordance with the plan for that space. This training will usually be conducted by the supervisor immediately prior to entry into the confined space. It should include review of the:

- specific work to be done while in the confined space
- roles of workers
- communication methods
- procedures for entering the confined space
- use of personal protective equipment
- procedures to follow in the event of an emergency

Practical Training

Hands-on training and practice in use of ventilation equipment, air monitors, tripods, winches, harnesses, etc. and training on how to inspect equipment will be arranged as needed and may be provided by outside sources, if necessary. Some departments have contracted out this portion of work to qualified rescue teams.

Rescue Training

The training will be based on the hazards anticipated for each space. On-site rescue procedures should be practiced so as to ensure a high level of proficiency. Some departments have contracted out this portion of work to qualified rescue teams.

Training should include:

- On-site rescue procedures
- First aid and cardiopulmonary resuscitation
- Use of the specific rescue equipment

Not all members of the team might need to have all 3 elements of training, as long as the team as a whole has the adequate training. The amount of training required by each individual member of the team will depend on the particular situation and plan.

12.0 ISOLATION OF ENERGY AND CONTROL OF MATERIALS

MOVEMENT

Supervisors must ensure that workers are fully protected against any hazards associated with the release of stored energy or materials movement. Where possible the confined space should be fully isolated by locking out all sources of energy (including mechanical, electrical, hydraulic, pneumatic, thermal, steam, gravity), protecting against moving or shifting materials, as well as contaminants that could enter the confined space through process lines, drains or vents.

This can be accomplished by ensuring that all systems are de-energized or otherwise controlled as per the U of T General Lockout Procedures and CSA Standard Z460 Control of Hazardous Energy – Lockout & Other Methods

Only equipment that could endanger a worker, such as unguarded equipment, or equipment that may have exposed moving parts or that may create a pinch point, requires de-energizing or blocking to prevent movement. For example, a properly guarded pump or fan would generally not need to be de-energized. However, in a confined space in which flammable, combustible or explosive agents might accumulate, the same equipment would be de-energized or designed so that it does not create a spark.

13.0 ATMOSPHERIC TESTING

Atmospheric testing is required when the assessment determines that the confined space may contain atmospheric hazards. The atmospheric hazards of concern include:

- Oxygen content outside the acceptable range of 19.5 to 23%,
- The potential accumulation of flammable, combustible, or explosive agents or
- The accumulation of atmospheric contaminants.

The testing must be done as often as necessary, before and while a worker is in a confined space, to ensure that acceptable atmospheric levels are maintained. The testing must be done by a person with adequate knowledge, training and experience and all results must be recorded. Sampling should take into consideration the presence of stratified atmospheres and pockets of contaminated air within the confined space. The instruments used must be calibrated, in good working order and appropriate to the hazards identified. Results should be made recorded and available to all entrants.

If the confined space has been both unoccupied or unattended, tests shall be performed before allowing workers to re-enter. Whenever practical, continuous monitoring should be considered. Continuous monitoring is required:

- When performing hot work in a confined space that contains or is likely to contain an explosive or flammable gas or vapour.
- When the atmosphere in the confined space has been rendered inert, or
- As otherwise set out in the confined space plan.

14.0 VENTILATION AND PURGING

Where an atmospheric hazard exists or is likely to exist in a confined space, the space must be purged and/or ventilated to ensure acceptable atmospheric levels, before any worker enters and during the time that the worker is in the space. However, since this would not *eliminate* the possibility of a potential atmospheric hazard, the space would still be considered a confined space.

To ensure adequate ventilation, the points of air supply and exhaust should be separated as far as possible. Openings must be provided for the entry of clean replacement air and/or to allow air to be exhausted. Pure oxygen must not be used to ventilate a confined space.

If mechanical ventilation is required to maintain acceptable atmospheric levels, an adequate warning system and exit procedure must be established in case of ventilation failure. An adequate warning system could be an audible or visual alarm, or both, that indicates that the ventilation has failed. The alarm should be activated by a flow or pressure switch in the air stream rather than by electrical failure or other motive power failure. A pressure or flow switch would ensure that, for example, if the fan belt fails, or the airflow is somehow blocked, the alarm is activated. In lieu of an alarm, a procedure for communicating the ventilation failure to the entrants must be established such that they have adequate time to exit safely.

In situations where purging and/or ventilating are not adequate to maintain acceptable atmospheric levels, appropriate respiratory protective equipment (Supplied Air Respirators or Self Contained Breathing Apparatus) must be used. Currently, this work would have to be contracted out to those with appropriate training and equipment as UofT staff are not trained on supplied air or self-contained breathing apparatus.

15.0 EXPLOSIVE and FLAMMABLE SUBSTANCES / HOT WORK

“Hot work” is work that could produce a source of ignition, such as a spark or open flame. Examples of hot work include welding, soldering, cutting, grinding or using non-explosion-proof electrical equipment. “Cold work” is work that cannot produce a source of ignition including sparks. Examples of cold work include valve adjustment and brush painting.

ALL cutting and welding operations on the St. George Campus must be approved by Fire Prevention prior to the commencement of work. Hot Work Permits are issued on a 'per job' basis, with the exception of U of T personnel carrying out routine maintenance in designated 'Permanent Permit' areas such as workshops. The permit process helps to reduce the risk of fire, as well as the chance of nuisance fire alarms that result from smoke generated.

Hot Work Permits must be arranged by U of T personnel (UofT hiring department must request for their contractors), by calling Fire Prevention. A minimum of 24 hours' notice is required, prior to the commencement of work.

All efforts should be made via ventilation and purging to render the atmosphere safe for workers to enter. Where a confined space does contain or is likely to contain an explosive or flammable gas or vapour, Ontario Regulation 632/05 does permit **some** types of the work under the following conditions:

- For **inspection work** that does not produce a source of ignition. In the case of an explosive or flammable gas or vapour, the atmospheric concentration is less than 25% of its lower explosive limit, as determined by a combustible gas instrument.
- For **cold work**, in the case of an explosive or flammable gas or vapour, the atmospheric concentration is less than 10% of the lower explosive limit, as determined by a combustible.
- For **hot work** in the presence of an explosive or flammable gas, vapour, combustible dust or mist, the following precautions must be taken:

- The space is purged and continuously ventilated to maintain an atmosphere of less than 5% of the Lower Explosive Limit (LEL)
- The space is purged and continuously ventilated to maintain an oxygen concentration of less than 23%
- The atmosphere in the confined space is continuously monitored;
- The entry permit includes adequate provisions for hot work and details the appropriate measures to be taken
- An alarm system and an exit procedure are in place to provide adequate warning and allow safe escape if the levels above are exceeded. It is good practice to incorporate a safety factor that provides for adequate warning should the levels be approached.
- “Inerting” uses an inert gas such as nitrogen, carbon dioxide and can result in the displacement of oxygen. If inerting is used, see requirements below.

“Inerting” is a method for removing flammable or combustible hazards by using an inert gas such as nitrogen, carbon dioxide and argon. However, this introduces a new hazard (oxygen deficiency). If inerting is used, the following requirements must be met:

- Space is continuously monitored to ensure it remains inert
- Space is continuously monitored for oxygen deficiency (and other hazards if applicable and as identified in the Hazard Assessment)
- Worker entering the confined space uses adequate respiratory protective equipment (must wear supplied air respirators), adequate equipment to allow persons outside the confined space to locate and rescue the worker if necessary
- Any other equipment necessary to ensure the worker’s safety.

16.0 ENTERING AND EXITING

Prior to any worker entering the confined space, the supervisor must ensure that there is an adequate means for both entering and exiting the space. Ladders or other suitable means should be provided where necessary and should be well secured. Doors or hinged covers to confined spaces should be equipped such that they can be locked in the open position.

The size of access and egress areas should be considered when choosing personal protective equipment to be used by the workers, and also when setting up rescue procedures and choosing rescue workers’ personal protective equipment and rescue equipment.

17.0 ACCESS CONTROL

During the work, the attendant is responsible for controlling access to the space. Only those who are listed as entrants on the permit may enter the space. After the work had been completed and all entrants are out of the space, the space must be adequately secured against unauthorized or accidental entry. Methods may include locks, barricades and warning signs.

In some circumstances, use of signs may not be practical, such as for every access hole and grate. A tool is usually required for removal of the cover, and therefore, it would likely be considered secure against entry. However, outside contractors often have the tools to gain access to U of T Confined Spaces where they have equipment installed. They have been known to enter these spaces without contacting U of T therefore we will continue to work towards signing or labelling these by whatever means possible.

Given the nature of the University environment, in some cases it may be preferable that the sign or label be installed inside the access point such that it is visible when the cover is removed rather than on the outside where it may invite exploration by unauthorized individuals.

18.0 RECORD KEEPING

The following records related to Confined Space entry must be kept on file in the individual Department or division for a **minimum of three years** or longer such that at least documentation for the two most recent entries are available. The Office of Environmental Health and Safety will review these on a regular basis.

- **Standard Operating Procedures** (include Hazard Assessment, Entry Plan, On-Site Rescue Plan)
- **Form A: Hazard Assessment**
- **Form B: Entry and On-site Rescue Plans**
- **Form C: Co-ordination documents**
- **Entry permits**
- **Training Records** (e.g. Hazard Awareness and General Training, Air Monitor Training, First Aid/CPR training, Rescue Training and use of rescue equipment)
- **Equipment Inspection Records** (e.g. air monitor calibration, inspection records for rescue equipment such as tripod, harness, winch inspection and other equipment as needed)

19.0 PROGRAM EVALUATION

The Office of Environmental Health and Safety will review and update various components of the Confined Space Program on a regular basis. The audit may consist of, but is not limited to, a review of:

- Program elements against regulatory requirements and best practices
- All documentation above
- Site visits to confirm that workplace practices comply with program requirements