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Health, Safety & Wellness Services

# CONFINED SPACE ENTRY Code of Practice

**HSW 2.0 – DOC 001 – REV6**

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*Purpose*

Entering and working in confined spaces is an integral part of daily activities of employees, contractors, faculty, and students at SAIT. This document has been developed to ensure the safety of personnel required to enter and conduct work in confined spaces. The program contained herein describes reasonable and necessary policies and procedures for any and all facilities, departments, and individuals who are associated with confined space entry operations. This program and all parts of the Alberta Occupational Health and Safety Act, Regulation and Code must apply to all confined space entry operations.

*POLICY AND SCOPE*

The policy of the Board of Governors is to commit to health, safety, and environmental protection for the benefit of its staff, students, property, other workers who enter onto the property of the Institute and the general public. In the attainment of this policy, SAIT has implemented a Confined Space Program.

In the ongoing control of injuries and illness that may occur from improper entry into confined spaces, the primary objectives of SAIT is to reduce the number of confined spaces (when feasible), limit the number of confined spaces entries, eliminate potential hazards within the confined spaces before entry and protect personnel from recognized and potential hazards when they must enter a confined space.

A sound and effective Confined Space Program is an essential aspect in ensuring that personnel required to enter and work in confined spaces are properly trained and protected from associated health hazards.

It is the intent of SAIT to comply with all applicable legislation by ensuring any confined space entry follows the “Confined Space Entry Program”.

*REGISTER OF REVISIONS*

| ISSUE | DATE | REVISIONS |
|---|---|---|
| Revision 1.0 | December, 2002 | Draft release, limited circulation for SAIT approval. |
| Revision 2.1 | February, 2003 | Final Revisions of draft prior to release. |
| Revision 3.0 | July 18, 2006 | Review and updates |
| Revision 4.0 | August 5, 2008 | Design Change to fit standard format. |
| Revision 5.0 | April 28, 2010 | Design Change to fit standard format. |
| Revision 6.0 | June 21, 2010 | Draft revisions reflecting the definition changes in the AOHS Code 2009. |

Table 1: Record of revisions

*REFERENCES*

The latest versions were used for all of the following references:


1. Alberta Occupational Health and Safety Code (2009), Part 5, Confined Spaces Section 44-58
2. WorkSafe Alberta Guideline for Developing a Code of Practice for Confined Space Entry, June 2009

*DEFINITIONS*

Authorized Entrant - A competent worker who is authorized by SAIT to perform a specific type of task or to be at a specific location at the job site

Competent worker - A worker, who is adequately qualified, suitably trained and with sufficient experienced to perform the work without supervision or with a minimal degree of supervision.

Confined Space – 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.

Entry - The action by which a person passes through an opening into a confined or restricted space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as the worker's breathing zone crosses the plane of the confined space access.

Entry Permit - The printed document that is provided by the employer to allow and control entry into a confined space and that contains the information specified in this program.

Entry Supervisor - The supervisor responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required by this program.

Hot Work - Any work involving burning, welding or similar fire-producing operations also, involving any work that produces a source of ignition, such as grinding, drilling, or heating.

Immediately Dangerous to Life or Health (IDLH) - An atmosphere that poses an immediate threat of loss of life. It may result in irreversible and/or immediately severe health effects or other conditions that could impair escape from a confined space.

Injurious Atmosphere - An atmosphere that may pose a health or safety hazard to workers due to one or more of the following:

a) Flammable gas, vapours, or mists in excess of 10% of its lower explosive limit (LEL).

b) Atmospheric oxygen concentration below 19.5% or above 23%.

c) Atmospheric concentration of any substance that exceeds the Occupational Exposure Limit (OEL) published in Schedule 1 of the Alberta Occupational Health and Safety Code.

d) Any other atmospheric condition that is immediately dangerous to life or health.

Lower Explosive Limit (LEL) - The minimum concentration of a combustible gas or vapour in air that will ignite if an ignition source is introduced.

Non-Entry Rescue - Rescue that doesn't involve entry into a confined space using lifelines or tripod hoists

OEL - Occupational Exposure Limit - The concentration of a substance to which a worker may be exposed to over an 8 hour period without adverse health effects. The OELs are published in Schedule 1 of the Alberta Occupational Health and Safety Code.

Oxygen-Deficient Atmosphere - An atmosphere that contains an oxygen concentration of less than 19.5% by volume

Oxygen-Enriched Atmosphere - An atmosphere that contains an oxygen concentration greater than 23% by volume

PPE - Personal Protective Equipment - Any devices or clothing worn by the worker to protect against hazards in the environment Examples are respirators, gloves, and chemical splash goggles.

Purging - The removal of gases or vapours from a confined space by the process of displacement.

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

Tending Worker – a competent worker who is in constant communication with workers in the confined or restricted space, has a suitable system for summoning assistance in case of emergency and is not permitted to leave the confined or restricted space work area until all workers have left the confined or restricted space or he/she has been relieved by another tending worker.

*Responsibilities/ Training*

Everyone involved in a confined-space entry project has assigned responsibilities and is required to complete confined space entry training. This section outlines the responsibilities and training requirements of each individual involved in a project.

*Responsibilities of Health, Safety and Wellness services*

- Review and update the Confined Space Entry Program to conform to current legislative requirements.
- Ensure compliance with standards set forth in the program by periodic inspection of entry sites. Where unsafe conditions are present, stop work.
- Assisting Managers and Supervisors with:
    - Providing training as set forth in the program
    - Identification of confined spaces
- Perform an annual review covering all entries performed to ensure employees participating in entry operations are protected from the hazards and place controls if necessary.

*Responsibilities of Manger/ Supervisor*

- Inform employee/ contractors that the space is a confined space and that entry into a confined space is allowed only through compliance with the SAIT confined space permit program.
    - Issue Contractor a Confined Space Entry Permit (See Appendix A)
- Inform employee/ contractor of the hazards associated with the particular confined spaces.
    - Issue contractor a Confined Space Hazard Assessment (See Appendix C)
- Maintain a Records file of all confined space documents including completed Entry Permits for a minimum of three (3) years.
- Ensure all workers and contractors who are to work in a confined space are adequately trained to do so. Ensure Entry Supervisors are adequately trained to supervise the entry.

**Note: "Manager/ Supervisor" oversees SAIT employees entering confined spaces including anyone who is responsible for the hiring or coordination of contractor duties at SAIT. For example: Project Manager, Work Control Coordinator, etc.**

*Responsibilities of the Entry Supervisor*

- Ensure that the required atmospheric tests are performed at the confined space and results recorded on the permit prior to entry authorization.
- Conduct Pre entry meetings as needed.
- Authorize entry by signing the entry authorization space on the permit after all conditions for a safe entry has been met.
- Cancel the permit when a condition that is not allowed under the entry permit arises in or near the permit space.
- Cancel the permit when entry operations covered by the entry permit have been completed.
- Submit all completed documents including entry permits to Manger/Supervisor.

*Responsibilities and Training Requirements of Tending Workers*

- Obtain and maintain all equipment necessary to complete the confined-space entry project.
- Complete a permit including the entry supervisor's authorization prior to entry.
- Be aware of the hazards that may be faced during entry, including information on the signs or symptoms, and consequences of exposure.
- Continuously maintain an accurate count of authorized entrants in the confined space and ensures that the means used to identify authorized entrants accurately identifies who is in the confined space.
- Remain outside the confined space during entry operations until relieved by another trained and authorized Tending Worker.
- Communicate with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the space when conditions warrant.
- Monitor activities inside and outside the space to determine if it is safe for entrants to remain in the space and ordering the authorized entrants to evacuate the confined space immediately under any of the following conditions:
    - If the Tending Worker detects a prohibited condition.
    - If the Tending Worker detects the behavioural effects of hazard exposure in an authorized entrant.
    - If the Tending Worker detects a situation outside the space that could endanger the authorized entrants.
- Attempt a non-entry rescue if proper equipment is in place and the rescue attempt will not present further damages.
- Summoning rescue and other emergency services as soon as the Tending Worker determines that authorized entrants may need assistance to escape from confined space hazards.

*Responsibilities and Training Requirements of Authorized Entrants*

- Entrants must be in good health with no known medical conditions that may affect the health or safety of the entry.
- Be aware of hazards that may be faced during entry, including the signs or symptoms, and consequences of the exposure.
- Proper use of equipment, which includes:
    - Atmospheric testing and monitoring equipment.
    - Ventilating equipment needed to obtain acceptable entry conditions.
    - Communication equipment necessary to maintain contact with the Tending Worker.
    - Personal protective equipment as needed.
    - Lighting equipment as needed.
    - Equipment, such as ladders, needed for safe access and egress.
    - Rescue and emergency equipment as needed.
    - Any other equipment necessary for safe entry into and rescue from confined spaces.
- Communication with the Tending Worker as necessary to enable the Tending Worker to monitor entrant status and to enable the attendant to alert entrants of the need to evacuate the space if required.
- Alert the Tending Worker whenever:
    - There is any warning sign or symptom of exposure to a dangerous situation, or a prohibited condition.
- Exiting the space as quickly as possible whenever:
    - An order to evacuate has been given by the Tending Worker or the entry supervisor;
    - The entrant recognizes any warning sign or symptom of exposure to a dangerous situation;
    - The entrant detects a prohibited condition; or
    - An evacuation alarm is activated.

*Additional Rights, Responsibilities and Training Requirements for Contractors*

When a contractor is engaged in confined or restricted space activities at SAIT, the contractor must comply with the SAIT Confined Space Program.

*Rights of Contractors*

- Be informed that the space is a confined space and that entry into such a space is allowed only through compliance with the SAIT confined space permit program;

- Obtain a copy of the SAIT Confined Space Hazard Assessment prior to conducting work in confined areas.

*Responsibilities of Contractors*

- Provide SAIT a copy of the contractor's confined space entry program if requested.

- Contractors authorized to enter confined or restricted spaces at SAIT must follow all of the requirements and responsibilities set forth in the Responsibilities of the Entry Supervisor, Tending Worker, and the Entrant.

- Maintain a Records file of all confined space documents including completed Entry Checklists for a minimum of three (3) years.

    - Provide a copy of the finished Entry permit if required by SAIT's Health, Safety, and Wellness office.

- Provide any of the necessary confined space entry equipment required for the entry.

*Training*

All contractors who will be conducting work in confined spaces must provide their employees with accredited confined space entry training.

*IDENTIFICATION of CONFINED and RESTRICTED SPACES*

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

A *Confined Space* is 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.

**Note: for those spaces that are not included in the Hazard Assessment Database**

**It may be determined that a space presents no real danger for workers. However, until the space has been evaluated and tested, it is assumed to be potentially dangerous. Once a space has been evaluated, it will be determined, by a qualified person, whether the space is a confined space or a restricted space.**

*Identification and EVALUATION OF HAZARDS*

Once a space has been identified as confined, the hazards that may be present within the confined space must be identified and evaluated. The trained and authorized tending worker or entry supervisor will determine if atmospheric hazards, flammable gas content, toxicity, and any other mechanical or physical hazards exist.

*Hazardous Atmospheres*

A. Oxygen-Deficient Atmospheres

The normal atmosphere is composed of approximately 21% oxygen. An atmosphere containing less than 19.5% oxygen is considered oxygen-deficient. The oxygen level inside a confined space may be decreased as the result of either consumption or displacement.

There are a number of processes that consume oxygen in a confined space. Oxygen is consumed during combustion of flammable materials, as in welding, torch cutting, or brazing. A more subtle consumption of oxygen occurs during bacterial action, as in the fermentation process. Oxygen can also be consumed during chemical reactions such as in the formation of rust on the exposed surfaces. The number of people working in a confined space and the amount of physical activity can influence oxygen consumption. Other gases such as carbon monoxide, carbon dioxide, methane, and welding shield gases can also reduce oxygen levels by displacing oxygen.

| | |
|---|---|
| More than 23.5% $O_2$ | Oxygen Enriched |
| Approximately 20.8% $O_2$ | Normal Air |
| Less than 19.5% $O_2$ | Oxygen Deficient |
| 16.0-12.0% $O_2$ | Loss of Peripheral vision, accelerated heart rate |
| 12.0-10% $O_2$ | Faulty judgment, poor muscle coordination |
| 10.0-6.0% $O_2$ | Nausea, unconsciousness |
| 6.0% or less $O_2$ | Spasmodic breathing, convulsion, death |

Table 2: Oxygen Levels

### Oxygen Gas Testing

- Oxygen levels must be tested before entering a confined space. A competent tester must test the oxygen level approved gas monitor.

- Oxygen levels below 19.5% (oxygen deficient) must be ventilated until the levels exceed 19.5%. If this is not possible a supplied air respirator must be worn.

- No hot work may be performed if the oxygen levels exceed 23%.

### B. Flammable Atmospheres

Flammable atmospheres are generally the result of flammable gas, vapours, and dust mixed in certain concentrations with air, or an oxygen-enriched atmosphere containing an oxygen concentration greater than 23%. For a fire or an explosion to occur, three components must be present at the same time: a fuel (such as flammable gas), oxygen, and a source of heat (spark or flame). The specific mixture of fuel and oxygen that will ignite or explode varies with each flammable gas. At any point if one of the three components is in excess the likelihood of a fire or explosion will increase. This point is illustrated in figures 1, 2, and 3.

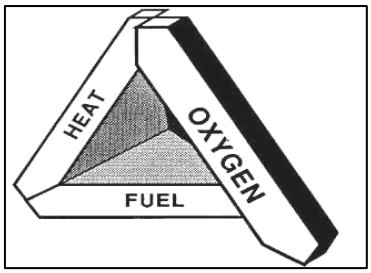


Figure 1

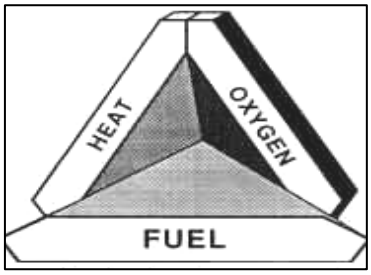


Figure 2

Combustible gases or vapours can accumulate within a confined space when there is inadequate ventilation. The critical point is defined as the range between the Lower Flammable Limit (LFL) and the Upper Flammable Limit (UFL) (Table 3). If the gas/oxygen mixture is below the LFL for that gas, a fire or explosion cannot occur. The mixture is "too lean" to burn. A fire or explosion will not occur if the gas/oxygen mixture is above the UFL because the mixture is "too rich" to burn.

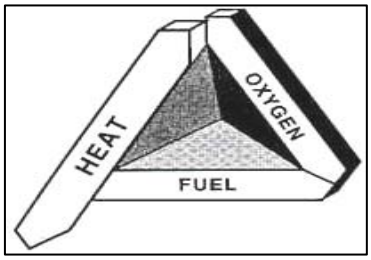


Figure 3

### i. Flammable gases

When a flammable gas concentration rises above the UFL
(See Table 3), the atmosphere is not considered safe. A high gas concentration can be diluted under the flammable range by the introduction of air from outside the confined space.

### ii. Flammable Gas Testing

Flammable gas testing is required whenever there is a possibility of a flammable gas leak. When entering confined spaces you must conduct atmospheric tests near the bottom, in the middle and near the top of all confined spaces to ensure concentrations are within the acceptable range. A competent tester must test continuously test when there is: hot work near or around piping containing flammable gases, flammable chemicals in containers, or flammable chemicals being used within an area.

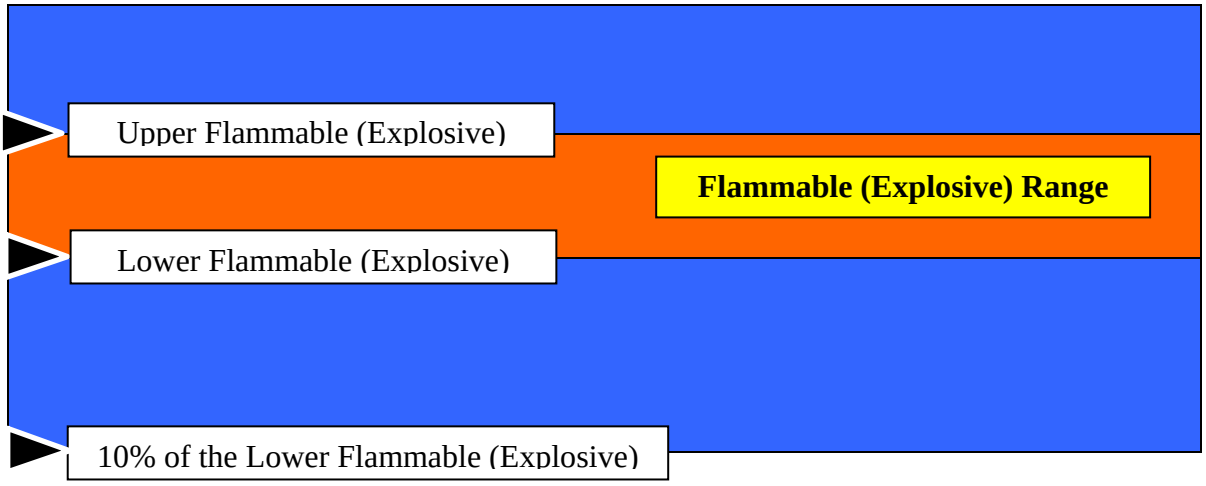



Table 3: Flammable (Explosive Range)

## C. Toxic atmospheres

Toxic atmospheres may be present within a confined space as the result of one or more of the following:

- When a product is stored or used during a process in a confined space, the product can give off toxic gasses, vapours, etc. into the atmosphere.

- Toxic atmospheres can be generated as the result of work being conducted inside the confined space.
  - Examples of such work include: Welding or brazing with metals capable of producing toxic fumes, painting, scraping, sanding, cleaning, etc.

- Toxic gasses produced by processes near the confined space may enter and accumulate in the confined space. Examples include parking lots, and other machinery running near confined spaces openings.

### i. Toxic Gases or Vapours

Toxic gases or vapours could include:

- Carbon monoxide or carbon dioxide (colourless and odourless)
- Solvents (flammable and narcotic)
- Acids and caustics (corrosive)
- Paints, sealants, preservatives (could be flammable, narcotic and/or toxic).

If a toxic substance is suspected to be in the confined space during testing by the tending worker, the manager/supervisor of the area must be contacted to assist in obtaining a Material Safety Data Sheet or other chemical information to determine the exposure potential and the type of protective equipment required to safely conduct the work.

### ii. Toxic Gas Testing

Health, Safety and Wellness services can provide information on which gas-measuring instrument would be required for a given situation.

## D. General Atmospheric Testing

### Instrument Calibration

A competent worker must calibrate instruments. Gas monitors must be zeroed in a clean air atmosphere. The instrument must be calibrated on a regular schedule and recorded into a calibration and maintenance log book.

### Maintenance of Instrumentation

Gas monitoring equipment must be kept in a ready condition. The dealer or manufacturer should check the gas sensors within the monitor on a yearly basis to determine their sensitivity and accuracy.

**Note:**

**In addition to monitoring prior to entry, it is equally important to monitor the atmosphere during entry and as long as workers are in the confined space.**

**Remember to put your trust in a properly calibrated instrument and <u>not your senses</u>. You cannot see or smell many toxic gases/vapours, combustible gases/vapours or determine how much oxygen is present without a reliable instrument.**

### *Atmospheric testing procedure*

Trained entrants, tending workers or entry supervisors must perform atmospheric testing prior to entering.

1. Determine the type of atmospheric monitoring that will be needed. Can processes taking place inside or near the confined space generate air contaminants? Can the air be tested at all depths prior to entry? Does the space have mechanical ventilation and is it operating?

2. Obtain suitable air-monitoring instrumentation for the type of hazards present. Ensure it has a current calibration date and has the necessary detection functions for the confined space in question. If needed, obtain accessory devices such as remote sampling pumps and extra lengths of tubing. You may need a spare set of batteries if the instrument will be on continuously for several hours. Request assistance for use of instruments with which you are unfamiliar.

**Note for contractors: Air monitoring equipment is considered a "tool" to be used when entering confined spaces. It is the responsibility of contractors to provide any of the necessary confined space entry equipment required for the entry.**

**Note for SAIT staff: Air monitoring equipment is considered a "tool" to be used when entering confined spaces. It is the responsibility of each school and/or department to provide any of the necessary confined space entry equipment required for the entry.**

3. Turn on the instrument in an open area (uncontaminated air), and allow it to perform its self-diagnostics. Ensure there is ample reserve battery power. Make certain that everyone who will use or rely on the instrument understands its display and audible alert(s). All functions must operate normally. If a detector cell fails, obtain another instrument.

4. In order to assess "worst-case" conditions, it is best to test before ventilating or otherwise disturbing the air within the space. Record the results on the entry permit. Ensure entrants have the opportunity to witness the testing, and discuss the safety implications of the results with all those affected.

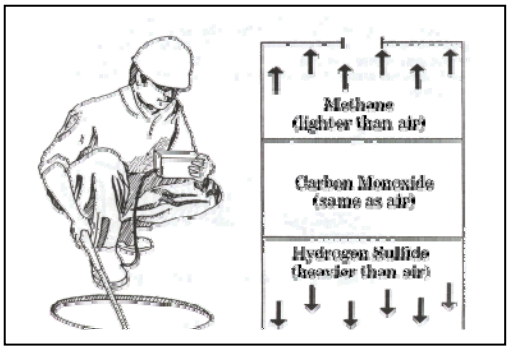
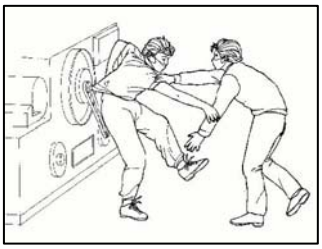


**Figure 4**

5. Test air at 3 or more elevations: top, mid-point, and bottom. Contaminants may stratify (See figure 4). Allow sufficient time for sampled air to move through tubing. 5 seconds/meter is a good rule of thumb when using powered pumps. If the confined space contains liquids, avoid drawing it up the sampling hose.

6. The order of testing is as follows: test for oxygen is first because most combustible gas meters are oxygen dependent and will not provide reliable readings in an oxygen deficient atmosphere. Combustible gases are tested for next because the threat of fire or explosion is both more immediate and more life threatening, in most cases, than exposure to toxic gases and vapours. If tests for toxic gases and vapours are necessary, they are performed last.

*Physical and Energy Hazards*



The Tending worker or Entry Supervisor should list all physical items and energy sources that will require controls on the confined space entry permit. Every item identified must be controlled prior to entry into the confined space.

Problems such as rotating or moving parts as well as energy sources can create hazards within a confined space. All moving equipment such as pumps, lines, electrical sources, etc., within a confined space must be identified and controlled prior to entering the confined spaces. Physical factors such as temperature, noise, vibration, insects/animals, poor lighting, liquids, biohazards, and trip/fall hazards can contribute to incidents and must also have control measures placed.

**Example of Physical Hazards in Confined Spaces**

- corrosives such as acids or alkaline substances
- slip/ trip/ fall from wet, icy, or poor housekeeping conditions
- vermin or animals including snakes, insects, rodents, etc
- limited egress in the case of an emergency
- excessive noise or vibration
- structural collapse where a worker can be trapped
- small internal size where a worker can be trapped
- poor visual conditions and lack of lighting
- processed piping/ plumbing lines containing fluids
- heating ventilation and air conditioning systems
- pressurized equipment and piping
- mechanical contact such as moving equipment or pinch points
- biohazards such as human waste or mouse droppings
- electrical hazards
- temperature extremes
- etc.

*CONTROLLING CONFINED SPACE Hazards*

*Preventing Unauthorized Entry*
All employees and contractors must be made aware of confined spaces through training, signage and/or instruction provided by SAIT. All employees and contractors must be instructed that entry, or certain types of work in a confined space is prohibited without an authorized permit.

> *Placement of Warning Signs*
> If the confined space will be left open for any length of time, warning signs and barriers will be required.

*The Permit System*
When entering a confined space a permit must be completed by the confined space tending worker and authorized by the entry supervisor prior to entry. This permit serves as certification that the space is safe for entry.

A permit must not be authorized until all applicable conditions of the permit have been met. The permit to be used by SAIT personnel and contractors can be found in Appendix A.

- *Gathering General Data*- Identify the confined space. Give the name, location and confined space number of the particular space. Give the reason for entering the confined space. Be specific. Also, identify the type of work that will be done.

- *Planning the Entry*- The first step towards conducting a confined-space entry is to plan the entry. This will allow for the identification of hazards, and for the determination of all equipment necessary, to complete the project.

- *Identifying Personnel*- All workers (Entrants) that will be required to enter the confined space must be identified on the confined space entry permit before entering.

- *Identifying Necessary Equipment*- All equipment that will be necessary to complete the project must be checked off on the confined space entry permit and obtained prior to the entry supervisor's approval.

*Ventilation and Purging of the Confined Space*
If toxic gases/vapours, combustible gases/vapours, oxygen deficiency/enrichment, or any other contaminant is discovered, the confined space must be ventilated or purged then retested before any entry is permitted. When ventilation cannot be accomplished, workers must use other precautions such as personal protection if entry is required for emergency situations.

> ***Purging*** means the initial displacement of hazardous gases and vapours by air, steam or an inert gas forced deep into the space. Inert gases such as nitrogen, carbon dioxide and argon are frequently used to purge spaces of flammable atmospheres, while steam and air are used to remove toxic air contaminants.
> ***Ventilating*** is the process of continuously moving fresh air through the space. Ventilating helps maintain an adequate level of oxygen in the space, it dilutes or removes toxic air contaminants that may be found or generated in the space and it also improves comfort levels by controlling temperature, humidity and nuisance odours.

- *Exhaust ventilation* draws contaminated air out of an area.
- *Supply ventilation* blows fresh air into the confined space. It is best used to provide fresh air for the occupants and to control low concentrations of materials that are not highly toxic.

*Some additional tips for ventilating a space safely:*

1. With either general or local ventilation, always ventilate with fresh air, never with pure oxygen.
2. Generally, drawing air out of the space (i.e. exhaust ventilation) is better when the atmosphere could be flammable or toxic.
3. All electrical equipment should be grounded.
4. Ventilation equipment should be electrically bonded to the confined space.
5. Ensure that the intake for the air supply is located far away from any flammable or toxic materials.
6. Locate the exhaust outlet so that contaminants won't be drawn back into the confined space.
7. Place the outlet where air currents will disperse the exhaust quickly, without endangering nearby people.
8. If the exhaust could be flammable, remove all ignition sources from the area.

**NOTE: If mechanical ventilation is to be used, it must be classified as Class I, Division 1 (Explosion proof) to prevent possible fires or explosions.**

**If steam or water is to be used, all wastewater must be handled according to Alberta Environmental Regulations. Contact SAIT's Health, Safety and Wellness services for more information.**

*Cleaning the Confined Space*

If chemical cleaners are to be used, the MSDS for the chemical should be consulted prior to use. When introducing a chemical into a confined space, the compatibility of that chemical with the contents of the confined space must be checked. For example cleaning with chlorine based cleanser can release poisonous chlorine gas.

**NOTE: All wastewater must be handled according to Alberta Environmental Regulations. Contact SAIT's Health, Safety and Wellness services for more information.**

*Isolating the Confined Space (Lock out/ Tag out)*
Before a worker enters a confined space, the confined space must be isolated from all sources of danger and all energized systems must be locked out (See figures 6 and 7). Prior to entering the confined space, ensure that all energy sources are completely isolated by attempting to start the equipment. See the SAIT Control of Hazardous Energy
Code of Practice for more information.

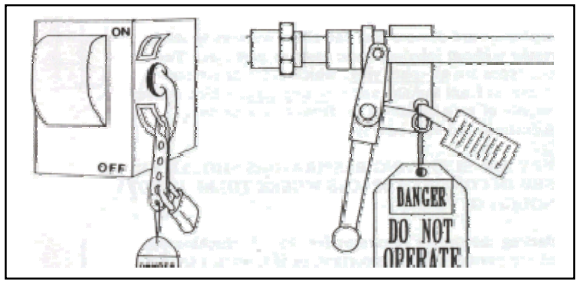


**Figure 6**

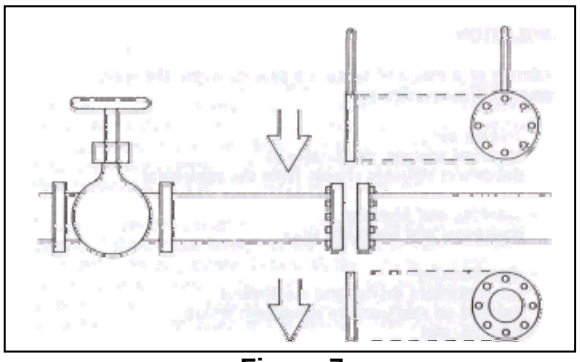


**Figure 7**

*Personal Protective Equipment (PPE)*
The objective of PPE is to protect workers from the risk of injury by creating a barrier, or shielding them against hazards. Personal protective equipment is not a substitute for good engineering or administrative controls, but should be used in conjunction to ensure the safety and health of workers. PPE is the last line of defense. Personal protective equipment will be provided, used, and maintained when it has been determined that its use is required and that such use will lessen the likelihood of occupational injury and/or illness. A PPE program is a school/department responsibility.

*Conducting Pre-Entry Meeting*
Ensure all employees who will be involved in the entry are aware of all associated hazards. The Pre-Entry meeting is to be conducted no earlier than one day before the entry.

The following outline should be used for the meeting:

- Identify the confined space and the reason(s) for entry.
- Assign each worker the job(s) he/she is to perform in the entry project (Entrant, Tending Worker, etc.).
    - Ensure all workers are competent for the job that is going to be performed and to operate the equipment going to be used.
- Inform all personnel that no one is to enter the confined space unless the Tending worker is present at the work site.
- Inform personnel of any access or egress concerns.
- Inform personnel of all equipment that must be locked out or tagged out.
- Inform personnel of all atmospheric levels that must be maintained before entering and while working in the confined space.

*Emergency Procedures*

- Prior to beginning confined space entry and work, review the specific emergency procedures for that space and ensure that all equipment and devices required in the event of an emergency are ready for action.

- If a worker in a confined space begins to feel overcome for any reason, he/she is to exit the space immediately.

- If the tending worker notices that a worker in a confined space starts to behave in a strange or uncharacteristic manner and the worker does not take steps to protect himself/herself, the tending worker orders the confined space worker out of the space.

IN THE EVENT OF A CONFINED SPACE EMERGENCY:

- Do not enter the space for any reason.
  - Perform a Non-Entry rescue if possible.
  - The tending worker may attempt a rescue using the prearranged method of retrieval designated by the SPECIFIC EMERGENCY PROCEDURES FOR THAT SPACE. (See figure 8)
- If the tending worker cannot quickly complete a successful rescue, the tending worker shall notify Calgary EMS by calling 9-1-1 and SAIT security by calling 210-HELP (4-3-5-7) option 1 so that emergency personnel can be brought to the scene.
- Remain at the location maintaining a safe distance.
- Maintain communications with the entrant.

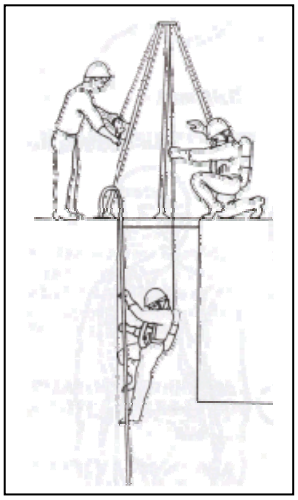


**Figure 8**

THE TENDING WORKER MUST NOT ENTER THE SPACE, nor allow any other would be rescuer to enter the confined space.
Too many confined space rescue attempts claim the lives of unprepared rescuers.

*Confined Space Entry Procedure*

1. Place warning signs or barriers to prevent unauthorized entry and to protect entrants from external hazards.

2. Gather all tools, safety equipment, monitoring equipment, etc., near the confined space.

3. Isolate and control all physical and/or energy sources.

4. The Tending worker tests the atmosphere with ventilation off.

    a. If oxygen content is less than 19.5% or greater than 23%, perform additional ventilation.

    b. If oxygen content is between 19.5% and 23%, continue entry preparation.

5. The Tending worker must test for flammable gas level.

    a. If the meter reading is less than 10% of the lower explosive limit (LEL), continue entry preparations.

    b. If the meter reading is above 10% of the LEL, stop work and continue ventilation of the confined space.

6. The Tending worker will determine the toxicity of the atmosphere.

    a. If a toxic atmosphere is present, no one should enter the confined space at a level exceeding the Occupational Exposure Limit (OEL) without proper Personal Protective Equipment.

    b. If a toxic atmosphere is not present continue entry preparation

7. The Entry Supervisor will then add any needed information, and check to ensure hazards are controlled.

    a. If the hazards are not controlled the Supervisor must ensure controls are placed before authorizing the permit.

8. Conduct pre entry meeting.

9. The Entry Supervisor completes and signs the Entry Permit authorizing work to be conducted in the confined space.

10. The permit is posted at the confined space entrance.

11. The work is completed according to the confined space entry permit.

12. The permit is returned to the Entry Supervisor to be signed after the authorized work has been completed.

**Note: Completed permits are kept on file by the Manager/Supervisor for a minimum of three (3) years and must be made available to SAIT's HS&W services upon request.**

*Restricted Space Entry Procedure*

1. Place warning signs or barriers to prevent unauthorized entry and to protect entrants from external hazards.

2. Gather all tools, safety equipment, monitoring equipment, etc., near the confined space.

3. Use the SAIT Confined Space Hazard Assessment (See Appendix B) to familiarize yourself with the associated hazards.

4. If the hazard assessment required other special precautions the entrants must employ these precautions before entering the confined space.

    a. The trained entrant must test the atmosphere with ventilation off.

    b. If atmospheric conditions are not acceptable continue with the Confined Space entry procedure.

    c. Isolate and control all physical and/or energy sources. Check to ensure hazards are sufficiently controlled.

5. The work is completed and the area is returned to the original operating conditions.

*APPENDIX A: CONFINED SPACE ENTRY PERMIT*

# Confined Space Entry Checklist and Permit

**In the event of an emergency Call 9-1-1 and Notify SAIT Security at 210- HELP (4-3-5-7) Option #1**

## Section 1

| | |
|---|---|
| Date Permit Issued: | Is this a confined space? Yes ☐ No ☐ (If no, a permit is not required) |
| SAIT Confined Space Identification #: | Location of Confined Space (Building, floor, etc.): |
| Description of confined space: | |
| Description of work to be performed: | |

**Material or Chemicals located and/ or brought into the confined spaces**

| | | | |
|---|---|---|---|
| | MSDS Yes ☐ No ☐ | | MSDS Yes ☐ No ☐ |
| | MSDS Yes ☐ No ☐ | | MSDS Yes ☐ No ☐ |
| | MSDS Yes ☐ No ☐ | | MSDS Yes ☐ No ☐ |

**Air monitoring device information**

| | |
|---|---|
| Make/ Model: | Date of Calibration: |

***Pre-entry Atmospheric monitoring results***

| | | | |
|---|---|---|---|
| Oxygen (19.5%-23%) _____% | Carbon monoxide (< 25PPM) _____PPM | Flammables (<10% of LEL) _____ % | Other _____ |

## Section 2

**Other potential hazards**

| *N/A* | *Yes* | |
|---|---|---|
| ☐ | ☐ | Chemical exposures |
| ☐ | ☐ | Corrosive Substances |
| ☐ | ☐ | Carbon Monoxide |
| ☐ | ☐ | Potential Flammable/ Explosive Dust |
| ☐ | ☐ | $O_2$ Deficient |
| ☐ | ☐ | $O_2$ Enriched |
| ☐ | ☐ | Flammable Gas |
| ☐ | ☐ | Temperature Extremes |
| ☐ | ☐ | Slip/ Trip/ Fall |
| ☐ | ☐ | Vermin/ Animal |
| ☐ | ☐ | Limited Egress |
| ☐ | ☐ | Noise/ Vibration |
| ☐ | ☐ | Structural Collapse |
| ☐ | ☐ | Small Internal Size |
| ☐ | ☐ | Visual/ Lighting |
| ☐ | ☐ | Plumbing Lines |
| ☐ | ☐ | HVAC (Heating, Ventilation and Air conditioning) |
| ☐ | ☐ | Radiation (ionizing or non ionizing) |
| ☐ | ☐ | Pressurized Equipment |
| ☐ | ☐ | Mechanical Equipment |
| ☐ | ☐ | Electrical Hazards |
| ☐ | ☐ | Biohazards |
| ☐ | ☐ | Asbestos |
| ☐ | ☐ | other: _____ |

**Controls needed for hazards**

| *N/A* | *Yes* | |
|---|---|---|
| ☐ | ☐ | Barricade/ Signs |
| ☐ | ☐ | Lock out/ Tag out |
| ☐ | ☐ | Double block and bleed |
| ☐ | ☐ | Lighting |
| ☐ | ☐ | Air purifying respirator |
| ☐ | ☐ | Supplied Air Respirator/ SCBA |
| ☐ | ☐ | Hearing Protection |
| ☐ | ☐ | Mechanical fresh air ventilation |
| ☐ | ☐ | Natural Ventilation |
| ☐ | ☐ | Communication devices (horns, phones etc.) |
| ☐ | ☐ | Protective clothing |
| ☐ | ☐ | Safety Glasses/ Face shield |
| ☐ | ☐ | Hard hat/ head protection |
| ☐ | ☐ | Ground fault interrupter (GFI) |
| ☐ | ☐ | Harness/ Life lines/ Tripod |
| ☐ | ☐ | Gloves |
| ☐ | ☐ | Continuous air monitoring |
| ☐ | ☐ | Fire extinguisher. Type: _____ |
| ☐ | ☐ | Two way communication equipment |
| ☐ | ☐ | Eye wash/ Emergency Shower |
| ☐ | ☐ | SAIT Hot work Permit |
| ☐ | ☐ | other: _____ |
| ☐ | ☐ | other: _____ |
| ☐ | ☐ | other: _____ |

**Additional Information:**

## Section 3

Continuous Atmospheric monitoring results (Tests must be conducted at least once per hour)
Remember to test at different levels (e.g. low, medium, and high) and record worst case readings

| Time | Sampled By (Initials) | $\%0_2$ (19.5-23%) | %LEL (<10%) | CO (PPM) (<10PPM) | Other | Notes: |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

| List of all authorized personnel (Please Print Neatly) | Position Authorized/ Trained (Please Check) | | *Pre Job Meeting Attended* (Worker is to sign below if attended meeting) |
|---|---|---|---|
| | ☐ Tending Worker<br>☐ Entrant | ☐ Trained | |
| | ☐ Tending Worker<br>☐ Entrant | ☐ Trained | |
| | ☐ Tending Worker<br>☐ Entrant | ☐ Trained | |
| | ☐ Tending Worker<br>☐ Entrant | ☐ Trained | |
| | ☐ Tending Worker<br>☐ Entrant | ☐ Trained | |

## Section 4

**Post authorized permit at job site until completed.**

***Qualified Entry Supervisor.***
I certify that all of the requirements of the SAIT confined Space entry program have been met. I have referred to the SAIT confined Space Hazard Assessment for this particular space. I have ensured that all applicable hazards have been identified and sufficiently controlled. I have attended the Mandatory SAIT Entry Supervisor training session.

| ***Permit authorization*** | | ***Time Authorized Between*** (What time is the permit authorized between) |
|---|---|---|
| Name: | Signature: | Start: _____ AM☐ PM☐<br>End: _____ AM☐ PM☐ |
| ***Permit Cancellation*** | | ***Time Cancelled*** |
| Name: | Signature: | Actual Time Cancelled:<br>_____ AM☐ PM☐ |

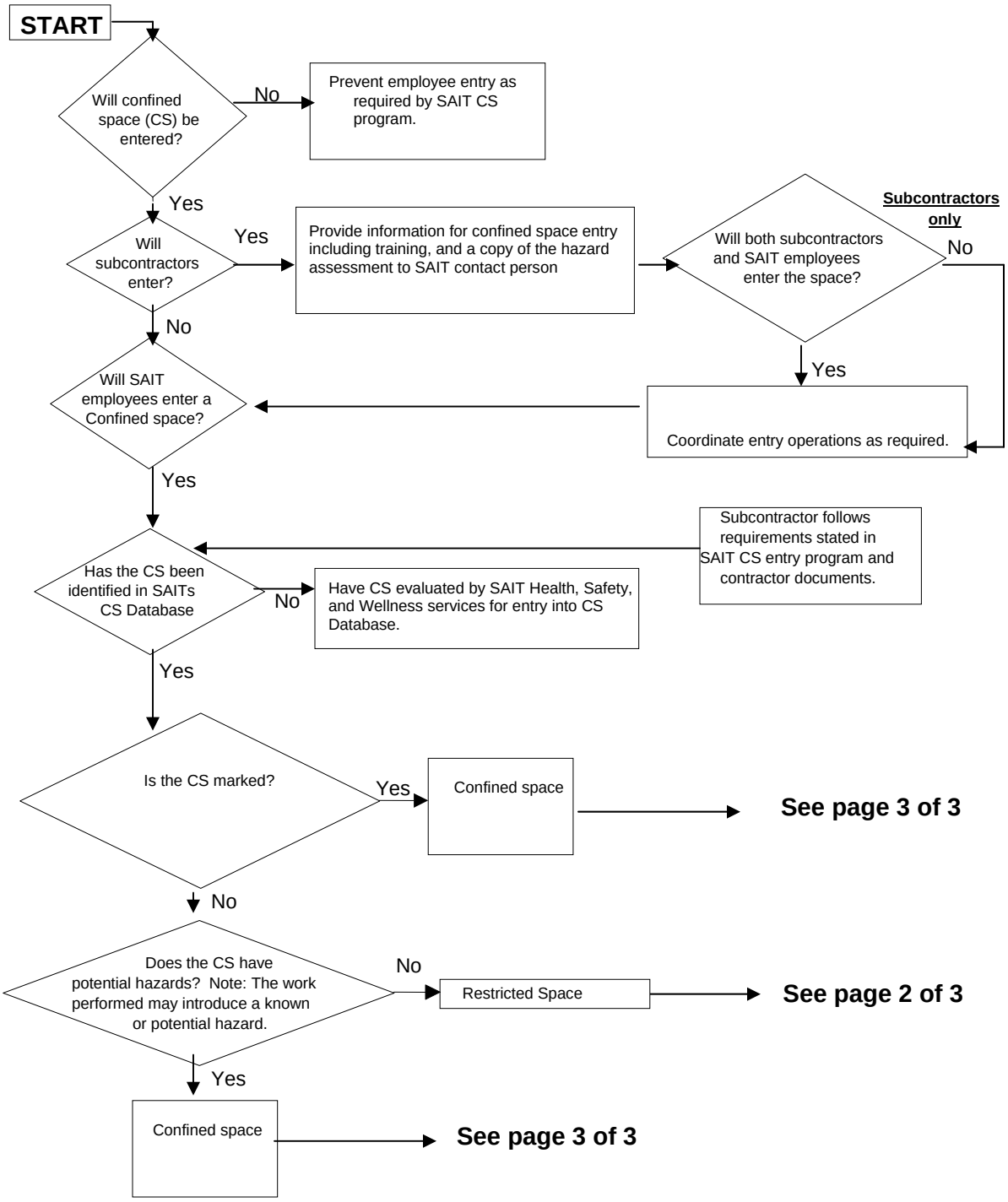
**In the event of an emergency Call 9-1-1 Notify SAIT Security at 210- HELP (4-3-5-7) Option #1**

**The Manager/ Supervisor must keep completed permits on file for a period of three (3) years.**

*APPENDIX B: CONFINED SPACE ENTRY FLOW CHART*

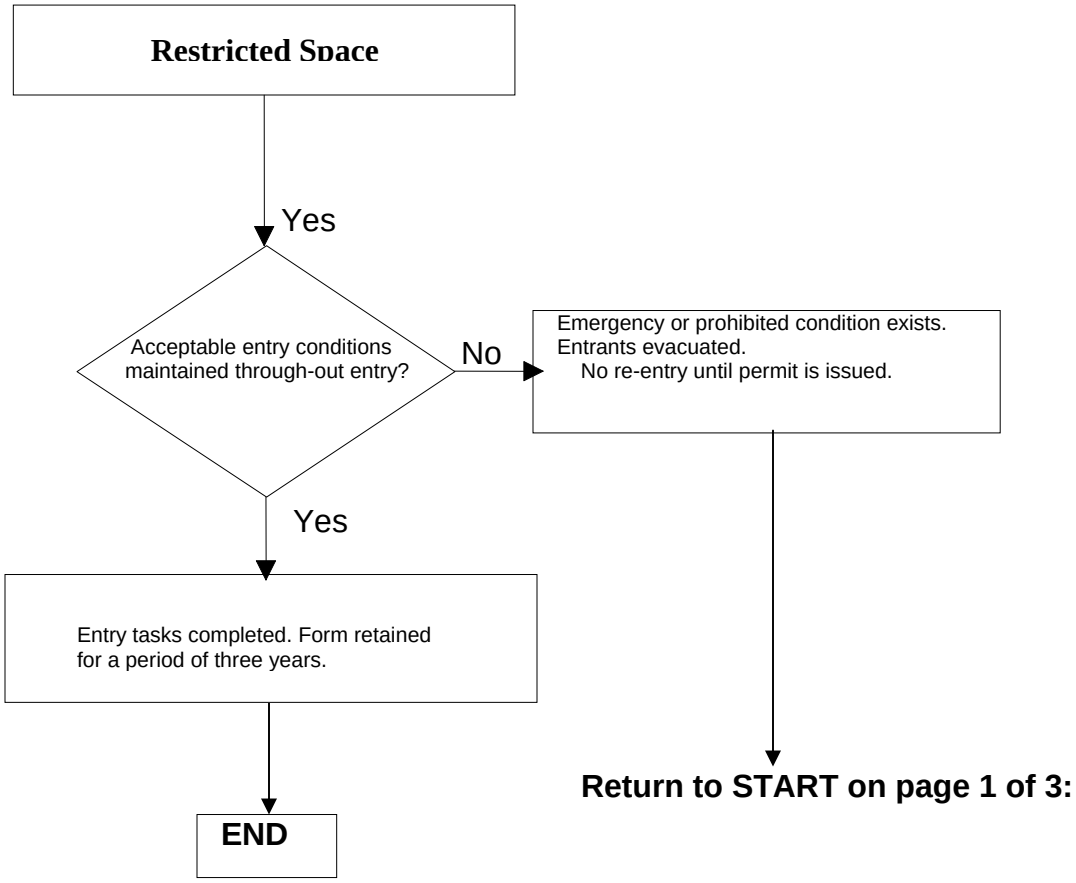
# SAIT Confined Space Decision Flow Chart

**Page 1 of 3**



# SAIT Confined Space Decision Flow Chart

**Page 2 of 3 (Restricted Space)**

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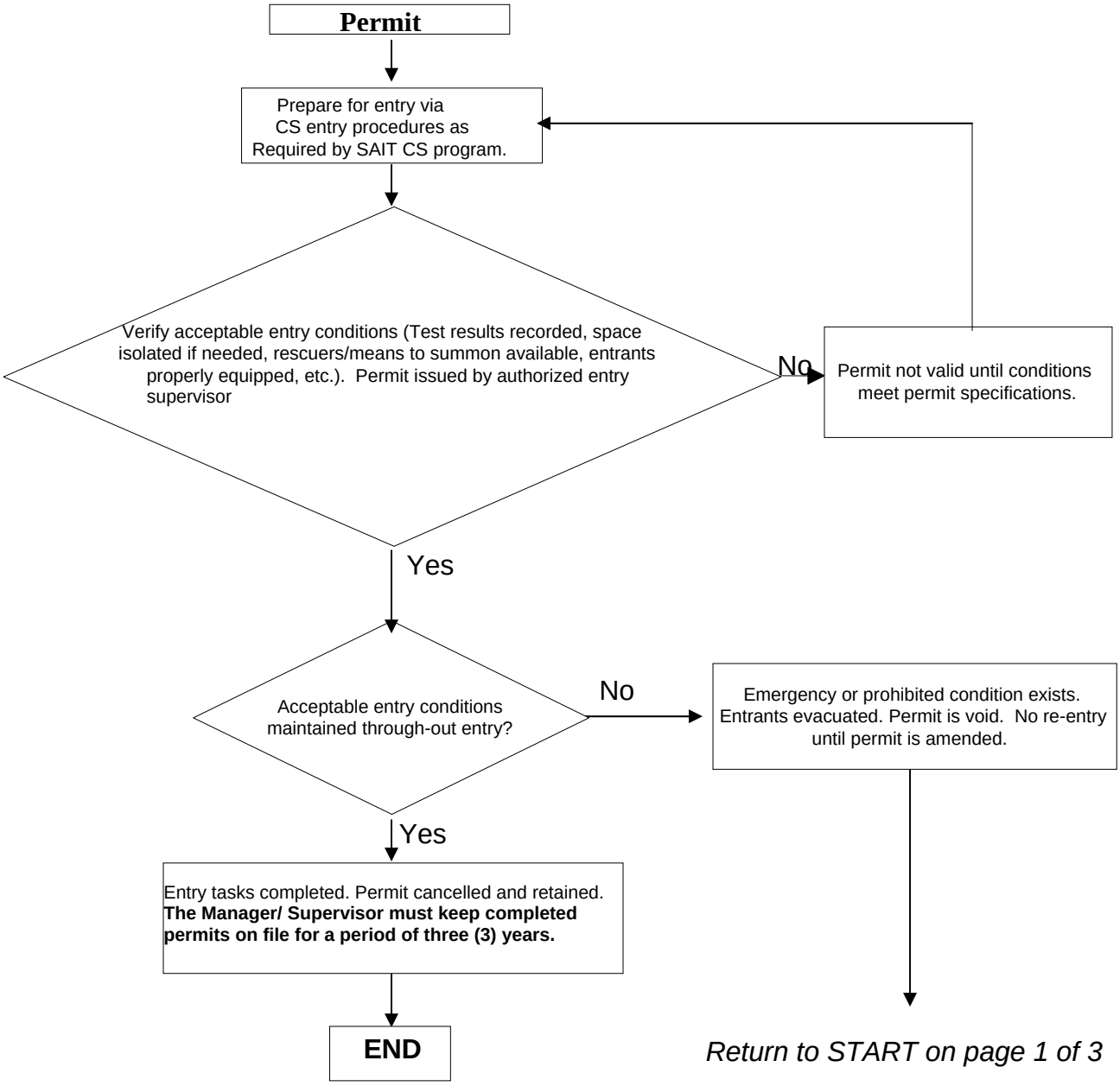
# SAIT Confined Space Decision Flow Chart



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*APPENDIX C: CONFINED SPACE HAZARD ASSESSMENT*