Workplace Health and Safety Bulletin

WORK SAFE ALBERTA

Guideline for Developing a Code of Practice for Confined Space Entry

Introduction

Part 5 of Alberta's Occupational Health and Safety (OHS) Code requires an employer to have a written Code of Practice for the procedures to be followed when a worker enters a confined space.

This Bulletin provides guidance to employers, supervisors, contractors and workers about how to prepare a code of practice for confined space entry to meet the requirements of the OHS legislation. This Bulletin does not provide procedures for confined space entry. Resources are provided at the end of this Bulletin to assist with this.

What is a "Confined Space"?

Alberta's OHS Code defines a confined space as:

"A confined space means a restricted space which may become hazardous to a worker entering it because of

(a) an atmosphere that is or may be injurious by reason of oxygen deficiency or enrichment, flammability, explosivity or toxicity,

(b) a condition or changing set of circumstances within the space that presents a potential for injury or illness, or

(c) the potential or inherent characteristics of an activity which can produce adverse or harmful consequences within the space."

Government of Alberta ■
Employment and Immigration

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

A restricted space can be thought of as a work area in which the only hazard is the difficulty in getting into and out of the space — all other hazards have been eliminated or controlled in accordance with Part 2 of the OHS Code. Examples of restricted spaces may include building attics, below-ground vaults and some crawl spaces in buildings. Keep in mind that a restricted space can become a confined space if conditions or work practices change.

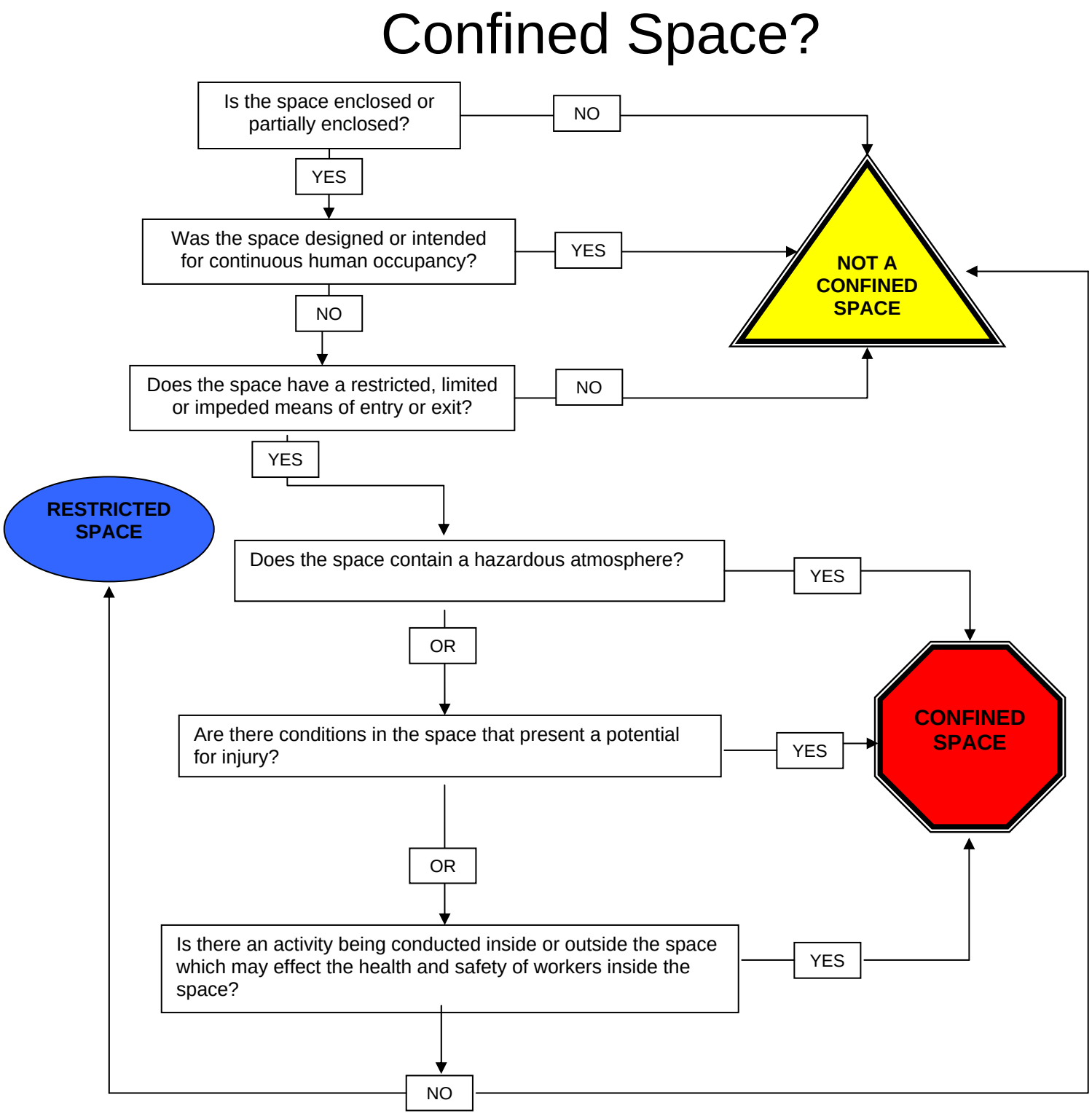
A worker is considered to have "entered" a confined space when his or her breathing zone crosses the plane of the confined space access.

A confined space can be found at almost any work site. Crawl spaces, cramped mechanical rooms, mezzanine areas, plumbing or electrical vaults, cargo containers and attic spaces can all fit within the definition of a confined space, depending on the design, access and work activities taking place. Figure 1 can help readers decide if an area meets the definition of a confined space.

Even if confined space entry is done frequently at the work site, confined spaces are not considered sites for ongoing or regular work activities. Confined spaces have a restricted means of entry and exit. Entry and exit points are not usually designed for easy walk in. Other limitations include access by ladders or by stairways that are steep, narrow or very long. Physical obstructions such as bulkheads, piping or machinery may get in the way of exit. Limited means of entry and exit not only make escape or rescue difficult, but can also affect air quality in the confined space.

Confined spaces usually have poor natural ventilation and contain, or may contain, a dangerous atmosphere. Poor ventilation can be the result of unpredictable or limited air movement or air currents that draw contaminated air into the space. Dangerous atmospheres are most often associated with spaces that are fully enclosed such as tanks and vats. However, pits, trenches and vessels that are open topped can also contain a dangerous atmosphere. The dangerous atmosphere can result from the entry of a gas that is heavier than air, the release of gas(es) from wastes at the bottom of the space being disturbed, or the presence of a layer of air above the space that prevents fresh air from moving into it.

Figure 1: Is It a Confined Space?



What is a "Code of Practice"

A code of practice is a document that describes the procedures to be followed to ensure that workers safely perform work in a confined space. Section 33 of the *OHS Act* requires a code of practice to include "*practical guidance on the requirements of the regulations or the adopted code applicable to the work site, safe working procedures in respect of the work site and other matters as required by a Director, the regulations or the adopted code*". Section 8 of the *OHS Regulation* requires that the code of practice be in writing and available to workers at the work site who are affected by it.

Workers should be consulted about the content of the code of practice as they often have the best understanding of the hazards involved in the work. The help of health and safety professionals such as occupational hygienists or engineers is also useful when preparing the code of practice, especially for complex situations. The code of practice must identify all existing and potential confined space work locations at a work site so that workers can be made aware of unexpected hazards and reminded that special health and safety requirements apply. The code of practice must be maintained and periodically reviewed to ensure that its procedures are up-to-date and continues to reflect the work activities for which it was originally written.

Developing a Code of Practice for Confined Space Entry

There are three basic steps in preparing a code of practice for confined space entry:

(1) Identify confined spaces at the work site
(2) Identify hazards in the confined spaces
(3) Develop the code of practice

(1) Identify Confined Spaces at the Work Site

Confined spaces can be found at almost any workplace. The first step to preparing a code of practice for confined space entry is to inspect the workplace and identify all confined spaces that workers may be required to enter for planned or unplanned maintenance or in an emergency. The flowchart shown in Figure 1 can be used as a tool to help decide if the area is a confined space.

(2) Identify Hazards in the Confined Spaces

To prepare a code of practice, the hazards present in the confined spaces must be known. When assessing the hazards that workers are likely to be exposed to in a confined space, the requirements of Part 2 of the OHS Code, *Hazard Assessment, Elimination and Control*, must be met. The hazard assessment needs to be reviewed on a regular basis and revised if conditions change at the work site, when new work processes are introduced or work processes or operations change. The employer must involve workers who may be affected by the hazards in the hazard assessment process.

Hazards in confined spaces generally fall within four categories:
- Atmospheric
- Safety
- Work-related
- Human factors

A work sheet is provided in Appendix 1 that can be used to help conduct the hazard assessment.

Atmospheric hazards

These include:
- explosive gases or vapours,
- toxic gases or vapours,
- oxygen level content,
- fumes,
- dusts,
- mists,
- smoke, or
- biological contaminants (e.g. animal droppings or mould).

For example, oxygen content in the air within the confined space can be reduced by welding or brazing and absorption by grain or soils or bacteria. Inert gases such as carbon dioxide or nitrogen can dilute or displace the air in the confined space. During purging, an inert gas such as nitrogen is deliberately pumped into a confined space to force out (purge) flammable or explosive vapours or gases. The inert gas is usually replaced with fresh air before the space is entered.

Cleaning, painting or welding may produce dangerous vapours or fumes which can be health, fire and explosion hazards. Toxic gases such as hydrogen sulphide may leak into the space from gas pockets underground. Carbon monoxide may be generated or collect in the space due to burning material or the use of an internal combustion engine. Methane may be created by rotting plant material in the space.

Safety Hazards

These are related to:

- Entry/exit points (e.g. very small openings, steep ladders, exits at height that could cause falls, exits into traffic or machinery hazard areas)
- Machinery (the worker may be trapped or crushed by drive belts augers, mixers, agitators, conveyor belts, etc.)
- Piping and distribution systems (e.g. steam lines, liquid distribution lines)
- Residual chemicals (e.g. material in a storage tank that is not completely emptied or purged, dry materials that may remain stuck to surfaces)
- Engulfment (workers can be trapped or buried by dry bulk materials such as grain, sand, flour, fertilizer and sawdust)
- Uncontrolled introduction of steam, water or other gas or liquid
- Electricity (e.g. unguarded energized electrical equipment, motor control centres)
- Visibility (the space may be improperly or inadequately lit.)
- Physical obstacles (e.g. cross bracing, baffle plates, piping)
- Walking or working surfaces (e.g. the surfaces may be hot or slippery)
- Traffic around the confined space
- Temperature extremes (e.g. working in freezers or boilers, areas with steam or heat distribution pipes)
- Humidity

- Vibration (e.g. equipment or tools may cause vibration, such as impact hammers, motors, etc.)
- Radiation (e.g. ultraviolet or infrared sources from welding, cutting or brazing, x-ray systems used for inspection and monitoring)

Work-related hazards

Examples include hot work, use of chemicals such as paints or cleaners, sandblasting, grinding, noise and cutting.

Human factor hazards

Some workers may have phobias (e.g. claustrophobia, fear of heights) that could interfere with their ability to work in a confined space. The use of bulky personal protective equipment (especially respirators) can also cause heat stress and fatigue.

The physical condition of workers may also be a factor in cases where there are temperature extremes or the work is physically demanding. As a result, some workers may not be suited for work in confined spaces. The employer should consider the physical condition of the workers during the hazard assessment process. Fitness-to-work assessments should be done by a qualified professional to ensure it is safe for workers to perform work in a confined space.

(3) Develop the Code of Practice

A code of practice for confined space entry contains more than just procedures for doing the entry itself. The code of practice must also include the following sections, as appropriate.

- Description of confined space(s) at the work site
- Reasons for work involving entry into confined spaces
- Identification of hazards that may be present in the confined space(s)
- Worker training requirements
- Entry permit system
- Procedures for each type of confined space entry and the work inside the confined space
- Testing the atmosphere
- Ventilation, purging and inerting
- Isolation of hazardous substances and energy
- Emergency response

- Roles and responsibilities of the tending worker
- Recordkeeping requirements

A code of practice worksheet is provided in Appendix 2.

Generally, a code of practice is specific to a particular confined space. However, if the hazards for the confined spaces at the work site are similar and require similar procedures for entry, the employer can develop one generic code of practice that applies to all confined space entries at that workplace. An example of this would be for a tank farm with tanks containing hydrocarbons. If there are a number of different types of confined spaces with different work procedures and hazards, then the employer can either prepare one code of practice that addresses everything, or several shorter codes of practice that address each different type of confined space entry.

Description of confined spaces at the work site

This section includes a complete list of all of the confined spaces at the work site to which the code of practice applies.

Reasons for work involving entry into confined spaces

This section describes the circumstances when confined space entry is required, for example maintenance work or emergency response. The specific tasks that are to be completed are listed and described, the tools and equipment to be used, as well as any chemicals or cleaners that may be required.

Typical reasons for entering a confined space include
- cleaning,
- inspecting process equipment,
- maintenance,
- tapping, coating, wrapping and testing underground piping systems,
- installing, inspecting, repairing, and replacing, valves, piping, pumps, motors, etc. in below ground pits and vaults,
- checking and reading meters, gauges, dials, charts and other measuring instruments, and

- rescuing workers who are injured, incapacitated or overcome while inside a confined space.

Identification of hazards that may be present in the confined space

For every confined space, the employer must evaluate each hazard that workers may be exposed to. For each hazard, the employer must identify the controls used to protect workers. For example, inerting or purging may be used to displace flammable or toxic gases or vapours. Mechanical ventilation may be provided to improve the air quality in the space. Or workers may be required to use particular tools or protective equipment.

Worker training requirements

Confined space work requires an effective training program to ensure that everyone understands the hazards and safe work procedures. Training must be provided for those who supervise workers, those who perform the work, tending workers and rescue personnel. Training may be provided at the work site or in classrooms using in-house or external trainers. The code of practice may contain the specific training requirements for confined space entry work, or it may reference other employer documents that address worker training.

The code of practice should document:

(1) Requirements for trainer competency
Trainers must be "competent" and have a thorough working knowledge in
- the confined space associated with the work activity,
- hazards involved,
- safe work procedures,
- how to test and monitor the atmosphere in the confined space,
- safety equipment required,
- first aid requirements, and
- emergency response and rescue.

(2) Requirements for worker training
This will vary depending on the tasks of different workers, but must at least include
- safe work procedures for entry into the confined space,
- safe work procedures for working inside the confined space,
- hazard recognition,
- content of the entry permit,
- how to properly use the control measures in place to protect workers (engineering controls, administrative controls and personal protective equipment), and
- what to do for first aid and in an emergency.

(3) Requirements for training workers who will administer first aid and conduct emergency response and rescue. The rescue portion of this training can be part of a company overall emergency preparedness and response plan, but must address how to safely remove injured or ill workers from a potentially hazardous confined space.

(4) Requirements for evaluating worker training and follow-up

Entry permit system

A confined space entry permit is a document that sets out the work to be done and the precautions to be taken. It functions as a checklist to ensure that the requirements in the code of practice have been addressed. The code of practice describes the entry permit system that is used at the work site. The employer may use a generic format, if confined spaces are similar and have similar hazards, but a specific separate permit must be issued for each confined space entry. An example of an entry permit is shown in Appendix 3.

The entry permit must contain at a minimum
- a list naming each worker who enters the confined space and the reason for their entry,
- the location of the confined space,
- the time period for which the entry permit is valid,
- the work being done in the confined space,
- the safety precautions that must be taken,
- the code of practice requirements for entering, being in and leaving the confined space, and
- the signature of a competent person.

Work procedures for confined space entry

This section includes a detailed description of the work procedures to be used for each type of confined space entry.

Testing the atmosphere

This section details who may test the atmosphere prior to entry of a confined space and the detailed procedures to be used (substances to be checked for, circumstances when continuous monitoring is required, instruments to be used, calibration of the instruments, how often measurements are to be taken and recordkeeping).

Ventilation, purging and inerting

The code of practice must contain a description of when ventilation, purging or inerting are required and the specific procedures and materials to be used. If ventilation is to be used, the code of practice must describe how workers will be alerted should the system fail.

Isolation

It is important to ensure, as much as possible, that the confined space is isolated prior to entry. This is done to prevent materials from coming into the space via pipelines or vents and to ensure that equipment inside the space does not start up while the worker is inside e.g. locked out. Requirements in Part 15 of the OHS Code, *Managing the Control of Hazardous Energy*, must be met. The code of practice must include a detailed description of the procedures to be followed to isolate the confined space.

Emergency response

The OHS Code requires that a worker not enter a confined space unless an effective rescue can be carried out. These rescue procedures are specific to what must be done in the event of an emergency in a confined space (e.g. responding to a spill in a confined space, fire or rescue of an injured worker). Using a 9-1-1 service by itself is not enough to meet this requirement. A list of the rescue equipment (including protective equipment) for first aiders and rescue workers, should be detailed. Part 7 of the OHS Code requires that workers who

are assigned to rescue and evacuation are properly trained and this training must include simulation of potential emergencies.

Tending worker

The role of the tending worker is to monitor the safety of the person(s) working inside the confined space and to take action if an emergency arises. The code of practice must describe when a tending worker is required and the duties of that worker during the confined space entry. The code of practice must also detail the actions the tending worker will take in the event of an emergency.

Record keeping

Employers must keep records for work in confined spaces, including entry permits and test results. The code of practice should indicate which records are to be kept, how long records are to be retained and when follow-up activities are required.

Resources

http://industry.alberta.ca/whs-ohs
Alberta Occupational Health and Safety Legislation

www.osh.govt.nz/order/catalogue/pdf/confined.pdf
Safe Working in a Confined Space

www.orosha.org/pdf/pubs/2864.pdf
They're Not Designed to be Occupied!

http://employment.alberta.ca/documents/WHS/WHS-PUB_ch037.pdf
Sewer Entry Guidelines

http://www.worksafebc.com/publications/health_and_safety/by_topic/assets/pdf/confined_space_entry_bk84.pdf
Confined Space Entry Program, A Reference Manual

http://www.gov.mb.ca/labour/safety/pdf/codes/confinedspaceentry.pdf
Code of Practice for Confined Space Entry Work

Rekus JF. *Complete Confined Spaces Handbook*. National Safety Council, Lewis Publishers, Ann Arbor; 1994.

Appendix 1

Confined Space Hazards Assessment Work Sheet

Location of work: _____

Description of tasks to be completed: _____

_____

_____

_____

Entry date: _____

	Yes	No
Atmospheric Hazards		
Explosive atmosphere (gases, vapours, fine dusts)	❑	❑
Oxygen deficiency	❑	❑
Oxygen enrichment	❑	❑
Toxic gases or vapours	❑	❑
Dusts, mists, fumes	❑	❑
Smoke	❑	❑
Biological agents	❑	❑
Other	❑	❑

If yes to 1 or more of the above, specify atmospheric hazards

_____

_____

_____

Safety Hazards		
Entry/Exit		
▪ Small/narrow openings	❑	❑
▪ Steep openings	❑	❑
▪ Entry/Exit at height	❑	❑
▪ Angled openings	❑	❑
▪ Exits into traffic or machinery	❑	❑
Machinery/mechanical equipment	❑	❑
Piping and distribution systems	❑	❑
Residual chemicals or materials	❑	❑
Pressure systems	❑	❑
Electrical hazards	❑	❑
Poor Visibility	❑	❑
Physical obstacles	❑	❑
Walking/working surfaces	❑	❑
Temperature extremes		
▪ Heat stress	❑	❑
▪ Cold stress	❑	❑
Humidity	❑	❑
Noise	❑	❑

	Yes	No
Vibration	❑	❑
Radiation	❑	❑
Type: _____		
Other	❑	❑
Type: _____		

Work Related Hazards

Hot work	❑	❑
▪ Type: _____		
Sandblasting	❑	❑
Bonding operations	❑	❑
Grinding	❑	❑
Cutting	❑	❑
Use of solvents, corrosive chemicals or cleaners	❑	❑
Use of paint/spray painting	❑	❑
Repairs	❑	❑

If yes, describe

_____

_____

Installation	❑	❑

If yes, describe

_____

_____

Inspection	❑	❑

If yes, describe

_____

_____

Emergency rescue/first aid	❑	❑
Other	❑	❑
Type: _____		

Human Factors

Comments:

_____

_____

_____

_____

_____

Appendix 2

Code of Practice Work Sheet

Date: _____

Company Name: _____

Work Site: _____

Confined Space Location: _____

Confined Space Identification Number: _____

Code of Practice Prepared By: _____

Name: _____ Telephone Number: _____

Description of the Confined Space:
Task to be Completed in the Confined Space:
Description of Hazards: Atmospheric: _____ Safety: _____ Work Procedures: _____ Human Factors: _____

Worker Training Requirements

How many workers are required to complete the work: _____

Describe worker training requirements/ courses: _____

_____

_____

_____

_____

Entry Permit

Attach sample form.

Work Procedures

1. Testing the atmosphere
   Test for: _____
   Equipment: _____
   Equipment calibration: _____
   Test frequency:
      Before entry _____
      During entry _____
      After entry _____
   Other : _____
   _____
   _____
   _____

2. Entry into the confined space

   Who is authorized to enter?

   _____
   _____
   _____
   _____

Entry/exit procedure:

3. Description of work to be done in confined space:

4. List of required tools and equipment:

5. Required personal protective equipment:

Respiratory Protective Equipment	❑	Type _____
Protective Clothing	❑	Type _____
Footwear	❑	Type _____
Headwear	❑	Type _____
Protective Eyewear	❑	Type _____
Gloves	❑	Type _____
Other	❑	

If other describe:

_____

_____

_____

_____

6. Traffic hazards

	Yes	No
Are there any traffic hazards related to this confined space entry?	❑	❑

If yes, describe controls:

_____

_____

_____

_____

Ventilation, Purging, Inerting, Isolation

	Yes	No
Ventilation	❑	❑

If yes, describe procedures to be used:

	Yes	No
Purging	❑	❑

If yes, describe procedures to be used:

	Yes	No
Inerting	❑	❑

If yes, describe procedures to be used:

	Yes	No
Isolation	❑	❑

If yes, describe procedures to be used:

Tending Worker

	Yes	No
Is a tending worker required to be physically present?	❑	❑

If no, who has the responsibility to be in communication with the workers in the confined space?

What are the duties of the tending worker(s)?

What actions do the tending worker(s) take in an emergency?

Describe communication procedures:

Emergency Response Procedures:

Emergency Contact Numbers:

_____ _____

_____ _____

Describe emergency procedures:

List of rescue equipment (include personal protective equipment for rescue workers):

Required training and recordkeeping procedures:

Recordkeeping:

Code of Practice reviewed by: _____

Code of Practice update frequency: _____

When is the confined space entry done? _____ Frequency: _____

Describe incidents that have occurred in connection with this confined space entry:

Has emergency rescue been required during an entry?

Actions taken to prevent future incidents:

Other comments:

Glossary of Terms

Dust - Solid particles in the air. Dusts can be created by the grinding or crushing of hard materials or the dispersion of powders in the air.

Fume - A fume is created by a material that is solid at room temperature. It is a suspension of very fine particles of the solid, produced by condensation from the air which is super-saturated by vapour from the material. Most commonly, fumes are produced in the air above molten metal, and can be found when metal is welded, ground or cut.

Inerting - Process of introducing a substance into a confined space, usually an inert gas, such as nitrogen, to render the contaminants present non-reactive, preventing fire or explosion hazards.

Mist - Formed from a material that is a liquid at room temperature; it is a suspension of the liquid's droplets in air. Mists are created by bubbling, boiling, spraying, splashing or otherwise disturbing a liquid.

Purging - Method of removing contaminants from a confined space by using liquids (water) or non-flammable gases (carbon dioxide or nitrogen)

Oxygen Deficiency - Air containing less than 19.5% oxygen by volume

Oxygen Enrichment - Air containing more than 23% oxygen by volume

Vapour - Formed from a material that is normally a liquid at room temperature. Most solvents form vapours, the amount of vapour formed depends on how volatile the substance is.

Ventilation - Method of forcing air into a confined space using a mechanical device.

Appendix 3

CONFINED SPACE ENTRY PERMIT

Permit number _____ Date: _____

Location and Description of Confined Spaces

_____

_____

Purpose of Entry

_____

_____

Scheduled Start _____ a.m. p.m.	Scheduled Start _____ a.m. p.m.
Day Date Time	Day Date Time

Worker(s) in charge of entry:

Entrants

_____

_____

Attendants

_____

_____

Pre-Entry Authorization (Check those items below which are applicable to your confined space entry permit)

- ☐ Oxygen-Deficient Atmosphere
- ☐ Oxygen-Enriched Atmosphere
- ☐ Welding/cutting
- ☐ Engulfment
- ☐ Toxic Atmosphere
- ☐ Flammable Atmosphere
- ☐ Energized Electric Equipment
- ☐ Entrapment
- ☐ Hazardous Chemical

SAFETY PRECAUTIONS

- ☐ Self-Contained Breathing Apparatus
- ☐ Air-Line Respirator
- ☐ Flame Resistant Clothing
- ☐ Ventilation
- ☐ Protective Gloves
- ☐ Linelines
- ☐ Respirators
- ☐ Lockout/Tagout
- ☐ Fire Extinguishers
- ☐ Barricade Job Area
- ☐ Signs Posted
- ☐ Clearance Secured
- ☐ Lighting
- ☐ Ground Fault Interrupter
- ☐ Remarks _____

ENVIRONMENTAL CONDITIONS

Tests to be taken	Date/Time	Re-Testing	Date/Time
Oxygen _____ %	_____a/p	Oxygen _____%	_____ a/p
Lower Explosive Limit _____%	_____a/p	Lower Explosive Limit _____%	_____ a/p
Toxic Atmosphere _____		Toxic Atmosphere _____	
Instruments Used _____		Instruments Used _____	

Worker conducting safety checks **signature** _____

Remarks on the overall condition of the confined space: _____

☐ **ENTRY AUTHORIZATION** – All actions and/or conditions for safe entry have been performed

Person in charge of entry _____
Please print

☐ **ENTRY CANCELLATION** – Entry has been completed and all entrants have left the space

Person in charge of entry _____
Please print

Contact us:

Province-Wide Contact Centre

Edmonton & surrounding area:
(780) 415-8690

Throughout Alberta:
1-866-415-8690

Deaf or hearing impaired
- In Edmonton: **(780) 427-9999**

or
- **1-800-232-7215** throughout Alberta

Web Site

www.worksafely.org

Getting copies of OHS Act, Regulation & Code:

Queen's Printer

www.qp.gov.ab.ca

Edmonton (780) 427-4952

Workplace Health and Safety

http://industry.alberta.ca/whs-ohs

Call any Government of Alberta office toll-free
Dial 310-0000, then the area code and telephone number you want to reach