Health and Safety

Code of Practice for Confined Space

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The Canadian Association of Petroleum Producers (CAPP) represents companies, large and small, that explore for, develop and produce natural gas and crude oil throughout Canada. CAPP’s member companies produce about 80 per cent of Canada’s natural gas and crude oil. CAPP’s associate members provide a wide range of services that support the upstream crude oil and natural gas industry. Together CAPP’s members and associate members are an important part of a national industry with revenues from crude oil and natural gas production of about $110 billion a year. CAPP’s mission, on behalf of the Canadian upstream crude oil and natural gas industry, is to advocate for and enable economic competitiveness and safe, environmentally and socially responsible performance.
Overview

Working in or around a confined space is a high-risk activity. Across Canada, a significant number of people are killed or seriously injured in confined spaces each year. This happens in a wide range of industries, from those involving complex plants to simple storage vessels. Those affected include people working in the confined space and those who try to rescue them, often without appropriate training and equipment.

The regulations governing confined space activities vary significantly from one jurisdiction to the next. This Code of Practice for Confined Space was developed by the upstream oil and gas industry to provide Canadian regulators with a recommendation for the harmonization of Federal, Provincial and Territorial confined space regulatory requirements.
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1 Introduction

Confined space regulations vary from province to province complicating compliance. This code of practice provides a practical guide to achieve the standards of worker health and safety required under Canadian Federal and Provincial Occupational Health and Safety (OHS) Regulations. The document applies to anyone who has a duty of care in the circumstances described in the guidance.

Like regulations, codes of practice deal with particular issues and do not cover all hazards or risks that may arise. The health and safety duties require duty holders to consider all risks associated with the work, not only those for which regulations and codes of practice exist.

**Codes of Practice set out industry standards of conduct and provide guidance to employers, supervisors, contractors and workers that can be used to meet the requirements of OHS legislation.**

Codes of practice are admissible in court proceedings under the OHS Act and Regulations. Courts may regard a code of practice as evidence of what is known about a hazard, risk or control and may rely on the code in determining what is reasonably practicable in the circumstances to which the code relates.

Compliance with the OHS Act and Regulations may be achieved by following methods beyond those recommended in this guidance document, such as a technical or an industry standard, if it provides an equivalent or higher standard of work health and safety than the code.

A government inspector may refer to an approved code of practice when issuing an improvement or compliance notice.

As a national baseline, this code of practice also serves as CAPP’s recommended regulatory framework for the future evolution of confined space regulations across the country. Harmonizing regulations around this code of practice would reduce confusion, simplify training and improve compliance while retaining the highest level of safety. Specific recommendations are provided in Appendix A.

1.1 A Harmonized Approach to Confined Space Regulations

The fundamental objectives of a harmonized approach to OHS regulation and operation:

(a) enables the development of uniform, equitable and effective safety standards and protections for all Canadian workers;
(b) addresses the compliance and regulatory burdens for employers with operations in more than one jurisdiction;
(c) creates efficiencies for governments in the provision of OHS regulatory and support services; and
(d) achieves significant and continual reductions in the incidence of death, injury and disease in the workplace.
This code of practice was the result of a detailed cross-jurisdictional review of existing Canadian confined space entry regulations including:

- Alberta: OHS Code Part 5 - Confined Spaces
- British Columbia: OHS Regulations Part 9 - Confined Spaces
- Saskatchewan: OHS Regulation Part XVIII - Confined Space Entry
- Manitoba; WHS Regulation Part 15 - Confined Space
- Federal: Canada OHS Regulations Part XI - Confined Spaces

The review included an assessment of the underlying principles and merits of each regulation identifying similarities, differences and “best-in-class” confined space entry practices. Focus was on the Western Canadian provinces where the majority of oil and gas activity occurs.

The analysis of the cross-jurisdictional review concluded that it was not possible, even with major changes, to develop a single harmonized confined space regulation that would meet the requirements in each jurisdiction. As a result, a recommended confined space regulatory framework was initiated to achieve the identified safe work objectives.

The results of this review were:

- The development of a confined space entry framework consisting of ten primary work objectives required to manage and execute a comprehensive and effective confined space entry program. The recommended framework is summarized in Figure 1.1.
- The development of a recommendation of a harmonized “ideal” confined space entry regulation was developed based on the wording form existing Canadian confined space regulations that is best suited for achieving the identified safe work objectives. The recommended regulation is included in Appendix A.
- The supporting guidelines were developed based on a detailed review and analysis of available confined space entry recommended practices. Relevant documents reviewed included:
  - CSA Z1006-16 Management of Work in Confined Spaces (2015 Draft)
  - Safe Work Australia: Confined Spaces Code of Practice (2014)
  - UK Health & Safety Executive: Safe Work in Confined Spaces (2014)
  - Oil Sands Safety Association: Confined Space Regional Code of Practice (RCOP 2010-Rev 01)
1.2  Recommended Framework for Confined Space Regulations

Objective 1. Confirm Scope, Application and Definitions
- Provide definitions for "confined space", "entry", "specified risk", "external service provider"
- Need to consider criteria for enclosed spaces that have the potential to become a confined space.
- Need to give consideration to "Duty Holders". Consider: Owner, Prime Contractor and Employers.

Objective 2. Develop a Confined Space Code of Practice
- Establish requirement for organizations with regulatory CSE roles and responsibilities to develop a written Confined Space Code of Practice.
- Include strategies for eliminating the need for confined space entry.
- Identify design and procurement considerations.
- Address management of external service providers.

Objective 3. Identify the Confined Spaces at a Worksite
- Establish requirement to identify each type of confined space at a workplace and determine whether any such space will require entry by a Worker.
- Address permanent vs temporary worksites.
- Establish requirement against unauthorized entry.
- Maintain an inventory of confined spaces.

Objective 4. Identify Hazards and Assess Risk of Identified Confined Spaces
- Establish requirement to complete a risk assessment of each confined space or group of confined spaces which share similar characteristics.
- Identify conditions that could lead to conversion of an enclosed space to a confined space.
- Also biological, chemical, physical and configuration hazards.
- Need to identify emergency response limitations.

Objective 5. Prepare a Confined Space Entry Plan Prior to Opening & Entry
- Establish requirements to prepare a written confined space entry plan.
- Need to give consideration to corporate communications, operational readiness ("Prior to Entry" assessment), and management of change.
- Process for managing external service providers.

Figure 1.1  Management of Confined Space Program
Objective 6. Confirm Competence & Capability of Duty Holders

- Establish requirements to identify personnel to be involved with the entry of a confined space. (See Section 2.4)
- Provide assurance that workers are competent and capable of performing assigned responsibilities.
- Needs to address management of external services.

Objective 7. Review Confined Space Entry Plan & Confirm Controls

- Establish requirement to review and confirm the confined space entry plan with workers.
- Identify the potential for CSE conditions to change.
- Establish the requirements specific to confined space entry permit system.
- Verify who’s COP will be applied to planned work.

Objective 8. Monitor and Control Hazards and Changing Conditions

- Need to address CSE precautions and procedures not adequately addressed by the general provisions in other sections of OHS regulations. (See Section 5.3)
- Target changing hazardous atmospheric conditions and hazards not present at time of initial entry.

Objective 9. Confirm Emergency Response & Rescue Plan

- Need to address those unique confined space entry emergency response and rescue plan requirements not adequately addressed by the general provisions in other sections of OHS regulations. (See Section 5.4)

Objective 10. Maintain Records and Documentation

- Establish requirements for audits of the confined spaces program and CSE work.
- Document protocols for incident reporting & investigations involving confined space activities.
- Establish requirement for maintaining records related to confined space entry work.

Figure 1.2 Execution of Confined Space Entry Operations
1.3 Acknowledgements and Credits

This document was a result of the collaboration between the following upstream oil and gas industry associations:

- Canadian Association of Drilling Contractors (CAODC)
- Canadian Association of Geophysical Contractors (CAGC)
- Canadian Association of Petroleum Producers (CAPP)
- Explorers and Producers of Canada (EPAC)
- Energy Safety Canada (formerly Enform)
- Petroleum Services Association of Canada (PSAC)

In preparing this code of practice, there was significant reliance on both existing Canadian regulation and international confined space entry guidance. In particular, the following organizations and deserve mention.

Canadian Standards Association

*CSAZ1006-16 Management of Work in Confined Spaces* is an important reference tool to achieving the goals of a safer workplace in Canada. We were careful to include appropriate referencing and tried not to infringe on CSA’s copyright restrictions.

Work Safe Australia

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2 Confined Space Definitions

Confined spaces pose unique dangers because they are usually not designed to be areas where people work. Confined spaces often have poor ventilation which allows hazardous atmospheres to quickly develop, especially if the space is small. The hazards are not always obvious and may change from one entry to the next.

Prior to introducing its standards on confined spaces, OSHA reviewed industry incidents and statistics to determine what was needed to develop standards. What the agency found when studying confined space fatalities was that:

- 89% of fatalities occurred with jobs authorized by supervisors.
- 80% of fatalities happened in locations that had been previously entered by the same person who later died.
- In 40% of fatal atmospheric accidents, the hazard was not present at the time of initial entry.
- 35% of those who died were supervisors.

These statistics highlight risks of working in a confined space which include:

- loss of consciousness, impairment, illness or injury or death due to the immediate effects of airborne contaminants
- fire or explosion from the ignition of flammable contaminants
- difficulty rescuing and treating an injured or unconscious person
- asphyxiation resulting from oxygen deficiency or immersion in a free-flowing material, such as grain, sand, fertiliser, water or other liquids.
2.1 What is a confined space?

A confined space is determined by the hazards associated with a set of specific circumstances, and not just because work is performed in a small space.

Confined spaces are commonly found in vats, tanks, pits, pipes, ducts, flues, chimneys, silos, containers, pressure vessels, underground sewers, wet or dry wells, shafts, trenches, tunnels or other similar space in which, by virtue of its enclosed nature, there arises a reasonably foreseeable specified risk.¹

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("Confined space" means an enclosed or partially enclosed space that:
(a) is not designed or intended for continuous human occupancy; and
(b) is, or is designed or intended to be, at normal atmospheric pressure while any person is in the space; and
(c) has limited or restricted access or egress, or an internal configuration that can complicate first aid, evacuation, rescue, or other emergency response services, and
(d) which by virtue of its enclosed nature, there arises a reasonably foreseeable risk to health and safety. Specified risks include:
   (i) an atmosphere that does not have a safe oxygen level, or
   (ii) an atmosphere that contains contaminants, including airborne gases, vapours and dusts, that may cause injury from fire or explosion, chemicals or biological substances or
   (iii) an atmosphere that contains harmful concentrations of any airborne contaminants, that may cause impairment, illness or injury, or
   (iv) engulfment or drowning in a liquid or free flowing solid.

(e) but does not include a mine shaft or the workings of a mine.
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In other words, a confined space is a restricted space which “may become hazardous to a worker entering it”. "Thus, confined spaces are a specific type of restricted space, one in which the potential hazards within the space pose dangers above and beyond the mere difficulty of entering or leaving the space.” These hazards can emerge from atmosphere, circumstance or activity. Atmospheric hazards can be due to an absence or overabundance of oxygen, flammable or explosive gases or particles or toxic substances in the atmosphere.

Circumstantial hazards cover a wide variety of actual and potential threats posed by the nature or contents of a space. A good example would be massed particulate matter which can suddenly shift and engulf a worker in the confined space. Finally, activity-related hazards are those which result from an activity performed within the space, such as welding or the use of chemical cleaners.

¹ UK Health and Safety Executive, Confined Spaces Regulations 1997, Regulation 1 Citation, commencement and interpretation
Confined spaces are subject to more stringent regulation than restricted spaces. In particular and in addition to the requirements for restricted spaces, duty holders are required to provide a code of practice governing how workers enter and work in a confined space, an entry permit system controlling entry, atmospheric monitoring if required, and a tending worker (one trained in emergency evacuation procedures) near the entrance of the confined space, again if required.

2.2 **What is not a confined space for the purposes of OHS regulation?**

A confined space does not include a mine shaft or the workings of a mine which are dealt with separately in most jurisdictions.

The following kinds of workplaces are also generally not confined spaces:

- Places intended for human occupancy and have adequate ventilation, lighting and safe means of entry and exit, such as offices and workshops.
- Some enclosed or partially enclosed spaces that at particular times have harmful airborne contaminants but are designed for a person to occupy, for example abrasive blasting or spray painting booths.
- Enclosed or partially enclosed spaces that are designed to be occasionally occupied by a person if the space has a readily and conveniently accessible means of entry and exit via a doorway at ground level. For example:
  - A warehouse accessed by a propane fueled forklift to move stock – although the use of a propane fueled forklift in a warehouse can be hazardous, the door at ground level means that once the alarm is raised, escape and rescue can happen quickly.
  - A fumigated shipping container with a large ground level opening will facilitate easy escape and rescue.

Trenches are not considered confined spaces based solely on the risk of structural collapse alone, but can become confined spaces if they potentially contain concentrations of airborne contaminants that may cause impairment, loss of consciousness, asphyxiation, illness or injury.

2.3 **What is required to manage the specified risks?**

When managing the specified risks associated with a confined space, including risks when entering, working in, on or near a confined space, as well as inadvertent entry, it is important to ensure, so far as is reasonably practicable, that a worker does not enter a confined space until all the duties in relation to the confined space have been complied with (e.g. entry permit requirements).
The OHS Regulations also set out requirements for specific controls measures including communication and safety monitoring, signs, isolation of connected plant and services, and controls to maintain a safe atmosphere within the confined space. With this in mind, it important to identify high, moderate and low risk atmospheres.

Once a confined space is identified, its atmosphere must be assessed and hazard-rated as HIGH, MODERATE, or LOW as summarized in Figure 1.3.
ASSESSMENT OF HAZARDOUS ATMOSPHERES

**High-Hazard Atmosphere**
A high hazard atmosphere is one where a hazardous atmosphere does exist i.e., a Confined Space which cannot be ventilated to provide and maintain a safe atmosphere, and in which there now exists or is likely to exist:

- A hazardous gas, vapour, dust or fumes;
- Or
- An oxygen content of less than 19.5% or more than 23%.

This is a type of space that, due to the unique circumstances of the particular space, the atmosphere cannot be purged and/or ventilated adequately to provide a safe breathable atmosphere. It could also be a situation where the atmosphere may be a completely unknown or the space be compromised by the ambient working environment. Therefore, it is considered to be a High-Hazard Atmosphere confined space.

**Moderate-Hazard Atmosphere**
A moderate-hazard atmosphere is one where there is the potential for a hazardous atmosphere to exist i.e., a Confined Space which has been purged and ventilated and steps have been taken to provide and maintain a safe atmosphere and there has existed or was likely to have existed:

- A hazardous gas, vapour, dust or fumes;
- Or
- An unsafe oxygen content less than 19.5% or more than 23% by volume could develop if circumstances change.

These types of spaces have been known to have potentially hazardous atmospheres either before or during the work. An example could be a vessel containing a product. After isolation, cleaning, purging, ventilation, the fact it had something hazardous in there to begin with leads to a potential that an atmosphere could exist if something were done incorrectly or if other equipment fails (ex: ventilation fan). Hence, a Moderate-Hazard Atmosphere confined space.

**Low-Hazard Atmosphere**
A low-hazard atmosphere is one where a hazardous atmosphere is not likely to exist i.e., a Confined Space in which there does not exist and there is not likely to exist either:

- A hazardous gas, vapour, dust or fumes could develop in extreme circumstances but is not anticipated; or
- An unsafe oxygen content less than 19.5% or more than 23% by volume could develop if circumstances change.

Typically the risks are more associated with aspects such as the physical configuration of the space, access/egress, etc. Under normal conditions, it is anticipated that this atmosphere may change. An example could be a trench or excavation whereby the largest risk may be related to the structural integrity of the space – therefore a Low-Hazard Atmosphere confined space. Please note this does not mean that all trenches/excavations always have safe atmospheres.

**Figure 2.1** Assessment of Hazardous Atmospheres
The atmosphere in a confined space may be hazardous for several reasons. The air may have too little or too much oxygen. The atmosphere may be toxic or explosive. Confined spaces with hazardous atmospheres may have other physical hazards. The potential for the space to be compromised by the ambient working environment must also be considered.

The hazard rating of a confined space must be determined by a competent person after considering the design, construction, and use of the confined space, the work activities to be performed, and all required controls.²

Managing risk also requires that first aid and rescue procedures be prepared and followed in the event of an emergency in the confined space.

2.4 Who has health and safety duties in relation to a confined space?

Regardless of jurisdiction, each person conducting a business or undertaking has a duty of care responsibility under the OHS Act to ensure, so far as is reasonably practicable, that workers and other persons are not exposed to health and safety risks arising from the business or undertaking.

"Duty Holder" means an organization or person(s) who have a duty to ensure health and safety to 'manage risks' of the confined space entry by eliminating health and safety risks so far as is reasonably practicable, and if it is not reasonably practicable to do so, to minimise those risks so far as is reasonably practicable.

The OHS Regulations include specific obligations on a person conducting a business or undertaking who has management or control of a confined space.

**Designers, manufacturers and suppliers** of plant or structures that include a space that is intended, or is likely to become, a confined space must eliminate the need for any person to enter a confined space and eliminate the risk of inadvertent entry or, if this is not reasonably practicable, ensure safe means of entry and exit and minimize risks to any person who enters the confined space.

**Owners and Prime Contractors** each have a duty to exercise due diligence to ensure that the business or undertaking complies with the OHS Act and Regulations. This includes taking reasonable steps to eliminate or minimise risks that arise from entry into confined spaces. Owners and Prime Contractors are the primary duty holders.

**Employers and Workers** must take reasonable care for their own health and safety and that their work does not adversely affect the health and safety of other persons. Workers must comply with any reasonable instructions given relating to confined space entry permits, risk control measures and emergency procedures, and should carry out

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² WorkSafeBC, Hazards of Confined Spaces (BK80, 2008)
work in a confined space in accordance with any relevant information and training provided to them.\(^3\)

**External Service Providers** are often used to perform work in and around confined spaces and need to be specifically recognized.

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**“External Service Provider” (ESP) means**

(a) *an organization or person, including a self-employed person, who provides services to an organization in accordance with agreed-upon specifications, terms, and conditions.*

(b) *a worker employed by or under the control of an external service provider (ESP) employer.*

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An ESP employer should establish a confined space management program or confined space entry procedures. Where an ESP employer has established its own confined space management program or confined space entry procedures, the Owner and / or Prime Contractor may allow the ESP employer to perform its work in accordance with the ESP employer’s program or procedures, provided that the ESP employer’s program or procedures comply with the requirements of this Standard.

In these cases, the Owner and / or Prime Contractor is still responsible to

- evaluate and select competent external service providers (ESPs);
- ensure that the ESPs has developed and implemented a confined space entry code of practice that meet or exceed the requirements outlined in this guide;
- ensure the ESP is competent to identify hazards, assess risks, and eliminate or control hazards and risks related to the activities, equipment, and materials of the organization and of ESPs and others that enter into contracts with the Owner and / or Prime Contractor; and
- inform the ESP employer about the confined space, including
  - the characteristics of the space;
  - hazards and operations in and near the space; and
  - the precautions or procedures that the organization has implemented for the protection of workers in or near the confined space.\(^4\)

Emergency service workers may not be required to comply with some requirements for entering confined spaces when either rescuing a person or providing first aid to a person in the space.

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\(^3\) Safe Work Australia, Confined Spaces Code of Practice, Feb. 2014. See Section 1.2, Page 5.

2.5 How to determine if an area is a confined space?

The following is included to assist with the decision-making process. It describes the specified risks – there must be at least one of these present or reasonably foreseeable to make any enclosed space a confined space with this Code of Practice.\(^5\)

\[\text{Is the space substantially or totally enclosed?}
\]

\[\begin{align*}
\text{YES} & \quad \text{This space is not a confined space under this Code of Practice} \\
\text{NO} & \\
\text{Is there a risk of one or more of the following?} \\
\text{(a) Serious injury due to fire or explosion} \\
\text{(b) Loss of consciousness arising from increased body temperature} \\
\text{(c) Loss of consciousness or asphyxiation arising from illness or injury, gas, fume, vapour, or lack of oxygen} \\
\text{(d) Drowning from and/or increase in the level of a liquid} \\
\text{(e) Asphyxiation arising from a free-flowing solid or being unable to reach a respirable environment due to being trapped by such a free-flowing solid} \\
\text{YES} & \quad \text{This space is a confined space and subject to this Code of Practice} \\
\text{NO} & \\
\text{Will the work to be done in the space introduce one or more of those risks?} \\
\text{Can the space be compromised by the ambient working environment?} \\
\text{YES} & \quad \text{This space is a confined space and subject to this Code of Practice as long as this work is being carried out and any residual risk remains} \\
\text{NO} & \\
\text{This space is not a confined space under this Code of Practice}
\]

Figure 2.2 Identification of Confined Space Flowchart

3 Design of Confined Spaces

One of the best ways to prevent and control occupational injuries and illnesses and fatalities is to design out or minimize hazards in the design phase. Confined spaces are an example of a hazard that can often be eliminated in the design or redesign phase. Intentionally or not, confined spaces are typically the result of the design process; they do not occur randomly. When confined spaces are built, unnecessary risks to workers can result.  

3.1 Eliminating Confined Space or Minimizing the Need to Enter

By definition, confined spaces are not designed for human occupancy, but people often have to enter them for maintenance, inspection, cleaning, repair, and other reasons. With thoughtful planning, many of these confined spaces—and the need to enter them—could be eliminated entirely. If it is not possible to eliminate a confined space, good design can minimize the hazards within the spaces and allow for the safe, non-entry rescue of workers.

Engineering contracts should contain language requiring confined space hazards to be “designed out” whenever possible. A safety professional should review all plans before final approval and the start of construction to ensure that confined space hazards are eliminated or minimized.

A designer, manufacturer, importer or supplier of a plant or structure, and a person who installs or constructs a plant or structure must, when reasonably practicable, eliminate the need to enter a confined space for maintenance, inspection cleaning or other purposes and eliminate inadvertent entry.

Up-front safe design is generally recognized to be more cost effective than a retrofit. Prevention through Design concepts can provide a cost-effective means of preventing injuries. Recognized alternatives include:

- **Design the space for continuous human occupancy during normal use.** Some confined spaces, such as utility vaults, only need minor modification to make them much safer and to eliminate classification as confined spaces.

- **Eliminate the need for entry into confined spaces** by modifying equipment and its installation and permit periodic operation, inspection, or maintenance from outside the space so that entry will not be necessary.

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6 American Industrial Hygiene Association, Prevention through Design: Eliminating Confined Spaces and Minimizing Hazards, May 2014.

7 American Industrial Hygiene Association, Prevention through Design: Eliminating Confined Spaces and Minimizing Hazards, May 2014.
Make the confined space entry too small to bodily enter. While this principle has limited applicability, the inability to physically enter due to the size of the entry may keep workers out of harm’s way and eliminate most confined space requirements.

If entry into a confined space will never be required, modify the space to make entry impossible. If entry is necessary, identify, eliminate or reduce the health and safety hazards at the design stage.

3.2 Design of Confined Space for Rescue

If confined spaces cannot be eliminated, the space should be designed to facilitate non-entry rescue to the extent feasible.

*If this is not reasonably practicable, then:*

(a) the need for any person to enter the space must be minimized so far as is reasonably practicable
(b) the space must be designed with a safe means of entry and exit, and
(c) the risk to the health and safety of any person who enters the space must be eliminated or minimized as far as is reasonably practicable.

Considerations for the design of entry and exit points include:

- Provide unrestricted access and egress to allow workers to enter without having to contort their bodies, crawl, or use their hands to climb in or out.
- Provide large access openings, such as standard doorways, through which workers can pass easily and quickly while wearing SCBA and egress systems. Provide standard overhead clearances so that workers can stand in the space whenever possible.
- Install standard steps with handrails in lieu of ladders or spiral staircases. Steps allow safer, unrestricted entry and exit from the space.
- Provide sufficient aisle clearances within the space and provide clear access to openings and exits. Locate pipes, ducts and other equipment so that workers do not have to climb over, under or around them.
- Provide multiple access openings at regular intervals in long spaces, such as crawl spaces and tunnels, to ensure that employees’ ability to exit the space is not restricted by distance.
- House equipment in buildings above ground with a standard doorway for access rather than placing equipment in a vault below grade.

Considerations for the design to ensure the ability of rescue include:

- Provide access platforms of sufficient size to accommodate entry and potential rescue when access openings are elevated above floor level.
• Provide multiple access openings into the space, preferably at different locations for better access to all areas of the space.

• Ensure openings are at least 24 inches wide or in diameter.

• Ensure adequate overhead clearance for use of a tripod or davit arm retrieval system during vertical entries. If there is not sufficient clearance, install a permanent anchor point (with at least 5,000 pounds static load capacity) above the opening to which a pulley or winch can be attached.

• Employ a pulley system or install regular access points for rescue from spaces where a horizontal entry is used.

• Install large release hatches at the bottoms of sloped hoppers and silos that can be opened to empty the structures quickly in case of engulfment.

3.3 Modifications to a Confined Space

Elimination of hazards at the source can provide the highest degree of risk reduction by removing the likelihood of occurrence or severity of harm.\(^8\)

Modifications to an existing confined space shall not increase the level of risk to workers who might enter the confined space.

When a workspace is redesigned or modified the following shall be considered

• prevent the creation of areas that will be or could become confined spaces;

• when a workspace is modified, the priority is to ensure it does not become a confined space as a result of the modifications;

• where a confined space previously existed, design or re-design modifications to eliminate the confined space; and

• if modifications are made to a confined space, ensure efforts are made to eliminate or reduce the hazards and incorporate appropriate controls within the space to mitigate any remaining hazards and their risks.

\(^8\) CSA Z1006-16 Management of Work in Confined Spaces, Public Review Draft. See Section 4.4.4
4 Management of Confined Space Program

Working in a confined space is potentially one of the most dangerous of all workplace hazards. According to the New Zealand Department of Labour, working in a confined space is 150 times more dangerous than doing the same job outside the confined space.\(^9\) Given the potential hazards and the overall risk to workers, all confined space duty holders must establish a code of practice that governs how their specific responsibilities will be managed. This is critically important.

4.1 Requirement for a Code of Practice

Confined spaces have a history of being potentially dangerous places to work as hazards within them are often magnified. Limited access may be combined with poor ventilation, hazardous surroundings or energized equipment. When workers unknowingly enter oxygen deficient or toxic atmospheres, the results can be fatal.\(^10\)

Each duty holder with a responsibility for an aspect of confined space operations as identified in this recommended regulation, including external service providers, must have a written code of practice that addresses the relevant confined space management practices.

The code of practice must

(a) take into account and apply the requirements of this Part;

(b) those sections of the OHS regulations pertaining to harmful substances and flammable atmospheres, and

(c) be maintained and periodically reviewed.

A worker involved in any aspect of a confined space entry must comply with the requirements and procedures in the code of practice.

A confined space policy describes the processes, practices and procedures to be followed to allow workers to safely perform work in a confined space. The procedures must address each applicable element of this recommended regulation. As well, hot work and other relevant sections of the OHS Regulations need to be considered. OHS Regulations require that workers affected be familiar with the requirements relevant to their work before work in the confined space begins.\(^11\)

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IMPORTANT

When more than one organization or person has a duty in relation to confined space operations, each person with a duty must consult, co-operate and co-ordinate activities with all other persons who have a work health or safety duty.

Sometimes more than one duty holder conducting a business or undertaking will each have the responsibilities related to confined space operations. For example, the duty holder who owns the plant or structure that contains the confined space will have a responsibility for the overall management or control of the confined space. An ESP engaged to carry out work in the same space will have management or control of the confined space activities at the time that work is being carried out. In these situations, effective communication, co-operation and co-ordination of activities between duty holders is essential to ensure that risks associated with the confined space are eliminated or minimized as far as is reasonably practicable.\(^{12}\)

Workers should be consulted about the content of the policy and procedures in the pre-planning stage before there is a requirement to perform the work. Workers often have the best understanding of the hazards involved in the work. It may also be necessary to engage the help of safety professionals such as industrial or occupational hygienists or engineers, as some situations may be complex.

The policy and procedures must be maintained and periodically reviewed to ensure that it is up-to-date and continue to reflect the work activities for which they were originally written. The policy and procedures must also 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 safety requirements apply.

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\(^{12}\) Safe Work Australia, Confined Spaces Code of Practice, Feb. 2014.
4.2 Identification of High-Hazard Atmosphere Confined Spaces

An important first step is to evaluate the workplace to determine if any spaces are high-hazard atmosphere confined spaces. In other words – do we have a problem?

A duty holder who owns or is responsible for confined space at a permanent or temporary worksite shall

(a) evaluate its premises and operations to consider all potential confined spaces and prepare an inventory of all high-hazard atmosphere spaces;

(b) determine whether any such space will require entry by a worker, either in scheduled work activities or as a result of foreseeable system failures or other emergencies.

(c) establish a process for reviewing the entire inventory as changes occur or at regular intervals (not to exceed three years).

If the workplace contains high-hazard atmosphere confined spaces, the responsible duty holder shall inform exposed workers, by posting danger signs or by any other equally effective means, of the existence and location of and the danger posed by the confined space.

If a high-hazard atmosphere confined space exists at a workplace but no worker entry is required, the employer must ensure that each point of access to the confined space is secured against inadvertent entry or identified by a sign or other effective means which indicates the nature of the hazard and the prohibition of entry, and that workers are instructed not to enter.

When a high-hazard atmosphere confined space requires entry by a worker, each point of access which is not secured against entry must be identified by a sign or other effective means which indicates the hazard and prohibits entry by unauthorized workers.

All confined spaces are considered hazardous unless a competent person has determined otherwise through a risk assessment.

Conducting an inventory is one way of doing this; however it is not the only way. If a competent worker is intimately familiar with a facility, it might be possible to make a competent evaluation without leaving the office. The priority is to identify those spaces with the potential for a high-risk atmosphere in advance and to prevent inadvertent entry of that space. It is important to emphasize that validation of this work needs to be conducted through a field verification process.

That said, the wording of this requirement is intended to recognize the limitations of a confined space inventory. However useful, it is simply a determination at a particular point in time of which spaces were high-risk atmosphere confined spaces and which were not. It must be recognized that many work spaces are not static environments. It is not always possible for an inventory to anticipate all job-related hazards, such as solvent vapours, which could turn a low or moderate risk atmosphere work area into a high-risk atmosphere confined space.

The wording also recognizes that it is important to identify high-risk atmosphere confined spaces at both permanent and temporary worksites and the unique differences and challenges associated with these sites. Flexibility is required to address the complexities and uncertainties associated with both types of sites.

More importantly, there are other work hazards that may also affect the safety on workers beyond hazardous atmospheres. If a space is not posted as a high-risk atmosphere confined space, workers who enter may not consider these other hazards and the added special precautions or permits necessary to complete work safely.

Once a high-risk atmosphere confined space is identified, this standard emphasize that workers must be informed of the existence, location and danger posed to workers by posting danger signs or other equally effective means. In other words, explain to workers what a high-risk atmosphere confined space is, tell them where those spaces are in the facility and verbally warn them as to the hazards present.\(^\text{14}\)

The whole purpose for posting signage is to notify people who might not otherwise recognize them as confined spaces and enter them inadvertently. Moreover, the standard does not require the posting of every confined space, especially those that can only be accessed by means of tools or keys, provided that the workers who are expected to gain entry into these spaces are trained to recognize the hazards involved. Restricting access to confined spaces in this manner protects workers effectively without the use of signs.

This is not to suggest that signs should not be used. Duty holders should install signs where it is practical and makes sense to do so. In addition, however, they should train workers to recognize confined spaces, especially those with high-risk atmospheres and inform them that the absence of a sign does not mean a hazard does not exist or that an appropriate work permit is not needed. Workers must also know that any time they have doubts they should seek help in making such determinations.\(^\text{15}\)

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\(^{15}\) Confined Spaces Common Misconceptions & Errors in Complying With OSHA’s Standard ([http://www.asse.org/assets/1/7/Taylor_0913.pdf](http://www.asse.org/assets/1/7/Taylor_0913.pdf))
4.3 Confined Space Hazard Assessments

The principal responsibility of every duty holder is to identify the control measures they need to establish to manage risk by conducting a suitable and sufficient assessment of all risks to workers and any others who may be affected by confined space activities. This risk assessment needs to consider the following:

- Whether a space is a confined space under the Regulations, it is important to recognize that some spaces will become confined spaces because of the work to be carried out in them or because of changes in their use or changes to the level of enclosure.

- Identify measures to avoid work in confined spaces.

- If, in the light of the risks identified, it cannot be considered reasonably practicable to carry out the work without entering the confined space, then the risk assessment needs to identify the necessary controls and precautions to be included in a job-specific confined space entry plan.
If it is not reasonably practicable to avoid the need to work in a confined space, the duty holder must assess the risks connected with entering or working in the space prior to the entry by workers. The assessment should identify the potential hazards to those entering or working there, and also any others, for example other workers including...
contractors and any public in the vicinity who could be affected by the work. The risk assessment must be carried out by someone competent to do so.\textsuperscript{16}

A competent person for these purposes will be someone with the necessary skills, knowledge and experience of, and familiarity with, the relevant processes, plant and equipment so that they understand the risks involved and can devise necessary precautions to meet the requirements of the Confined Spaces Regulations. In complex cases more than one person may be needed to assess the risks relating to specific areas.

Factors to be considered in the assessment include:

- High-hazard atmospheres either as a normal characteristic of the space or as the product of the required work processes to be conducted in the space:
  - Oxygen Deficiency or Enrichment: Oxygen deficiency may be caused by consumption by workers, oxidation (rusting) process, burning, welding, or bacteria, or by the absorption by chemicals or products. Oxygen enrichment may be caused by leaking of oxygen into the space or generation by chemical processes.
  - Asphyxiates: Inert gases can dilute or displace oxygen below a safe level (e.g., methane, carbon monoxide, carbon dioxide, nitrogen) during purging or by leaking into the confined space due to improper isolation and lockout.
  - Toxicity: Gases (\textit{H}_2\textit{S}, Methane, CO, etc.), vapours, dusts, or fumes that have a poisonous effect from operations such as cleaning, painting, coating, etc., or from gases like methane or \textit{H}_2\textit{S} leaking into the confined space. Carbon monoxide may be generated by internal combustion engines within the confined space or running near air intakes for the ventilator in use.
  - Flammable or Explosive Atmospheres: Flammable gases (methane, ethane, etc.), vapours, dust that could be ignited by an uncontrolled ignition source. This risk increases if an oxygen-enriched atmosphere (23\% by volume) is present.
  - Vapours, Mists, or Dusts.

- Harmful energy sources requiring isolation and lockout to ensure they remain in a zero-energy state.

- Uncontrolled introduction of water, liquids, steam, or gases (improper control of water, steam, or pressurized gases introduced during cleaning or surface preparation work).

- Contact with moving parts (being trapped or crushed by moving parts not properly isolated/locked out).

\textsuperscript{16} UK Health & Safety Executive approved Safe Work in Confined Spaces Code of Practice and Guidance - L101 (3rd Edition)
• Crushing/Engulfment or entrapment (risk of becoming trapped or buried by internal components or bulk materials).

• Entry and exit to the confined space sufficient for emergency egress and size adequate to allow personnel wearing respiratory equipment, if required by conditions.

• Other hazards resulting from work or equipment being used, such as:
  – Electrical hazards (including static),
  – Excessive temperatures - heat or cold,
  – Noise,
  – Falls/slips,
  – Radiation,
  – Direct contact with corrosives,
  – Iron sulphide (pyrophoric material), or
  – Biological substances.

• Tools required to be used in the work.

Where a number of confined spaces (i.e. sewers or manholes) are broadly the same, in terms of the conditions and the activities being carried out, and if the risks and measures to deal with them are the same, it may be possible to devise a ‘model’ or generic risk assessment covering them all. Any differences in particular cases that would alter the conclusions of the model risk assessment must be identified. Failure to include relevant information in the risk assessment could lead to inadequate precautions in the subsequent system of work.

Employees and their representatives should be consulted when assessing the risks connected with entering or working in a confined space. Give particular attention to situations where the work circumstances are changing. For example:

• at active construction sites where work spaces change as the work progresses.

• where there are temporary workers who are likely to have limited knowledge of the conditions and dangers in the confined space. In these cases, the risk assessment will be helpful for identifying the correct individual to carry out the work.

• work spaces with low or moderate hazard atmospheres where work activities may create temporary or unexpected high-hazard atmospheres.¹⁷

In all cases, the results of the hazard assessment must be documented. An example of a written hazard assessment is included in Appendix B – Confined Space Entry Worksheet.

4.4 Requirement for a Written Confined Space Entry Plan

A written, job-specific confined space entry plan is an essential requirement of this recommended regulation. One important purpose of the plan is to identify who has specific responsibilities for confined space entry and the safe systems of work required to complete the planned confined space entry safely.

Before a worker is required or permitted to enter a confined space, the organization that is responsible for or conducts confined space operations must prepare and implement a written confined space entry plan which includes

(a) assignment of responsibilities,

(b) a list of each confined space or group of similar spaces to be entered and a hazard assessment of those spaces, and

(c) the confined space entry plan must address, where applicable

(i) identification of the space(s) to be entered,

(ii) confined space entry permitting requirements,

(iii) lockout and isolation,

(iv) verification and testing,

(v) cleaning, purging, venting or inerting,

(vi) ventilation,

(vii) standby persons,

(viii) rescue,

(ix) lifelines, harnesses and lifting equipment,

(x) personal protective equipment and other precautions, and

(xi) coordination of work activities.

The risk assessment is important in that it identifies the precautions required to reduce the risk of worker injury associated with the confined space and the associated hazards. The next step in the process is to ensure that a safe system of work, including the precautions identified, is developed and documented. Everyone involved will need to be properly trained and instructed to make sure they know what to do and how to do it safely.

The following summary highlights many of the important elements needed to prepare an effective confined space entry plan. The specific regulatory requirements related to each of these elements are provided in Section 5 – Execution of Confined Space Operations. An example of a written confined space entry plan is included in Appendix B – Confined Space Pre-Entry Checklist.
**Appointment of a supervisor**

Supervisors should be given responsibility to make sure that the necessary precautions are taken, to check safety at each stage and may need to remain present while work is underway.

**Are people suitable for the work?**

Do they have sufficient experience of the type of work to be carried out, and what training have they received? Where risk assessment highlights exceptional constraints as a result of the physical layout, are individuals of suitable build? The competent person may need to consider other factors, including issues such as; claustrophobia or fitness to wear breathing apparatus, and may need to seek medical advice on an individual’s suitability.

**Isolation**

Mechanical and electrical isolation of equipment is essential if it could otherwise operate, or be operated, inadvertently. If gas, fume or vapour could enter the confined space, you need to isolate the pipe work. In all cases, a check should be made to ensure isolation is effective.

**Cleaning before entry**

This may be necessary to ensure fumes do not develop from residues, etc., while the work is done.

**Check the size of the entrance**

Is it big enough to allow workers wearing all the necessary equipment to climb in and out easily, and provide ready access and exit in an emergency? For example, the size of the opening may mean choosing air-line breathing apparatus in place of self-contained equipment which is more bulky and therefore likely to restrict ready passage.

**Provision of ventilation**

You may be able to increase the number of openings and therefore improve ventilation. Mechanical ventilation may be needed to make sure there is an adequate supply of fresh air. This is essential where portable gas cylinders and diesel-fueled equipment are used inside the space because of the dangers from build-up of engine exhaust. The practice of using portable gas cylinders inside a confined space introduces a potential hazard and should be eliminated whenever possible. Warning: carbon monoxide in the exhaust from petrol-fueled engines is so dangerous that use of such equipment in confined spaces should never be allowed.
Testing the air

Testing the air is necessary to confirm that the atmosphere is free from both toxic and flammable vapours and that it is fit to breathe. Testing should be carried out by a competent person using a suitable gas detector which is correctly calibrated. Where the risk assessment indicates that conditions may change, or as a further precaution, continuous monitoring of the air may be needed.18

Provision of special tools and lighting

Non-sparking tools and specially protected lighting are essential where flammable or potentially explosive atmospheres are likely. In certain confined spaces (i.e. inside metal tanks) suitable precautions to prevent electric shock include use of extra low voltage equipment (typically less than 25 V) and, where necessary, residual current devices (i.e. GFCI).

Provision of breathing apparatus

Breathing apparatus is essential if the air inside the space cannot be made fit to breathe because of gas, fume or vapour present, or lack of oxygen. Never try to ‘sweeten’ the air in a confined space with oxygen as this can greatly increase the risk of a fire or explosion.

Preparation of emergency arrangements

Emergency arrangements will need to cover the necessary equipment, training and practice drills.

Provision of rescue harnesses

Lifelines attached to harnesses should run back to a point outside the confined space.

Communications

An adequate communications system is needed to enable communication between people inside and outside the confined space and to summon help in an emergency.

Check how the alarm is raised

Do you need to position someone outside to keep watch and to communicate with anyone inside, raise the alarm quickly in an emergency, and take charge of the rescue procedures?

18 UK Health & Safety Executive publication Confined Spaces: A brief Guide To Working Safely (2013)
Is a ‘permit-to-work’ necessary?

A permit-to-work ensures a formal check is undertaken to make sure all the elements of a safe system of work are in place before people are allowed to enter or work in the confined space. It is also a means of communication between site management, supervisors, and those carrying out the hazardous work. Essential features of a permit-to-work are:

- clear identification of who may authorize particular jobs (and any limits to their authority) and who is responsible for specifying the necessary precautions (i.e. isolation, air testing, emergency arrangements etc.);
- making sure that contractors engaged to carry out work are included;
- training and instruction in the issue of permits;
- monitoring and auditing to make sure that the system works as intended.

Emergency procedures

When things go wrong, people may be exposed to serious and immediate danger. Effective arrangements for raising the alarm and carrying out rescue operations in an emergency are essential.

Contingency plans will depend on the nature of the confined space, the risks identified and consequently the likely nature of an emergency rescue.

Emergency arrangements will depend on the risks. You should consider communications and rescue and resuscitation equipment.

Communications

How can an emergency be communicated from inside the confined space to people outside so that rescue procedures can start? Don’t forget night and shift work, weekends and times when the premises are closed, i.e. holidays. Also, consider what might happen and how the alarm can be raised.

Rescue and resuscitation equipment

Providing suitable rescue and resuscitation equipment will depend on the likely emergencies identified. Where such equipment is provided for rescuers to use, training in correct operation is essential.

Capabilities of rescuers

Rescuers need to be properly trained, sufficiently fit to carry out their task, ready at hand, and capable of using any equipment provided for rescue, i.e. breathing apparatus, lifelines and fire-fighting equipment. Rescuers also need to be protected against the cause of the emergency.
Shut down

It may be necessary to shut down adjacent plant before attempting emergency rescue.

First-aid procedures

Trained first aiders need to be available to make proper use of any necessary first-aid equipment provided.\(^ {19}\)

Emergency services

How are the emergency services (i.e. Fire and Rescue Service) made aware of an incident? What information about the particular dangers in the confined space is given to them on their arrival?\(^ {20}\)

Detailed work-specific procedures

The plan must also identify those unique circumstances where a detailed confined space entry plan, in combination with completing the work with competent workers may still require a detailed, job-specific, step-by-step work procedure. In these cases, the safety plan needs to identify the availability of all procedures prepared and ensure the procedure is reviewed with workers prior to commencing activities.

5 Execution of Confined Space Operations

The most important step in the risk management process involves controlling risks by eliminating them so far as is reasonably practicable, or if that is not possible, by minimizing the risks so far as is reasonably practicable.

If there is a remaining risk, it must be minimized so far as is reasonably practicable by implementing administrative controls, and if a risk still remains, then suitable personal protective equipment must be provided and used. These two types of control measures, when used on their own, tend to be least effective in minimizing risks because they rely on human behaviour and supervision.\(^ {21}\)

Figure 5.1 provides a summary of the Confined Space Entry Process.

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\(^ {19}\) UK Health & Safety Executive publication Confined Spaces: A brief Guide To Working Safely (2013)

\(^ {20}\) UK Health & Safety Executive publication Confined Spaces: A brief Guide To Working Safely (2013)

\(^ {21}\) Safe Work Australia, Confined Spaces Code of Practice, Feb. 2014.
Before beginning any work:

Prepare an inventory of all Confined Spaces. Secure against unplanned entry as required until all pre-entry work is completed.

Prior to entry, complete hazard assessment. (i.e. Prepare a Data Worksheet for each confined space or groupings of similar confined spaces)

Prior to entry, prepare a written plan and assign job specific responsibilities. (i.e. Complete Pre-entry Checklist)

When commencing work:

Review Pre-entry Checklist with all personnel involved in the planned confined space work. Confirm equipment requirements.

Confirm all pre-entry preparations have been completed as planned. Issue and Post Work Permit

Initiate work. Confirm confined space hazards and work procedures.

During entry:

Confirm isolation of confined space. Complete purging, ventilation, inerting and cleaning.

Monitor confined space for changing conditions. Be prepared to remove personnel from space and reassess entry plan.

Maintain stand-by and emergency response personnel along with required safety & rescue equipment while activities inside the space

Figure 5.1   Summary of Confined Space Entry Process
5.1 Confined Space Entry Responsibilities

The responsible supervisor and workers must have the skills and knowledge to understand the hazards associated with working in the confined space, the contents of any confined space entry permit, and the control measures implemented for their protection.\textsuperscript{22}

\begin{center}
\begin{tabular}{|l|
\hline
\textbf{Responsibilities associated with the management and completion of confined space entry may include} \\
\hline
(a) Overall confined space entry program administration; \\
(b) Preparation of confined space hazard assessment and work procedures; \\
(c) Responsible supervisor; \\
(d) Equipment lockout and isolation; \\
(e) Standby or Attending Worker(s) including air supply system attendant; \\
(f) Pre-Entry / re-entry atmospheric testing and atmospheric monitoring; \\
(g) Emergency Response Team including rescuer(s) and rescue system operator; \\
(h) Entry Team: Workers Inside Confined Space; \\
(i) Trainers and instructors; \\
(j) External Service Providers. \\
\hline
\end{tabular}
\end{center}

The duty holder that is responsible for or conducts confined space operations must assign a responsible supervisor to a person who is adequately trained and experienced to supervise the job before a worker enters a confined space.

A competent person is one who has acquired through training, qualification or experience, the knowledge and skills to carry out this task.\textsuperscript{23}

The degree of supervision should be based on the findings of the risk assessment. In some cases an employer might simply instruct an employee how to do the work and then periodically check that all is well, for example if the work is routine, the precautions straightforward, and all the arrangements for safety can be properly controlled by the person carrying out the work.

It is more likely that the risk assessment will identify a level of risk that requires the appointment of a competent person to supervise the work and who may need to remain present while the work is being completed.

\textsuperscript{22} Safe Work Australia, Confined Spaces Code of Practice, Feb. 2014.

\textsuperscript{23} Safe Work Australia, Confined Spaces Code of Practice, Feb. 2014.
It will be the *responsible* supervisor’s role to ensure that a permit-to-work system, is in place, operates properly, the necessary safety precautions are taken, and that anyone in the vicinity of the confined space is informed of the work being done.²⁴

Air quality testing is required before initial entry and any other subsequent entries and at any other required intervals as specified in the confined space entry plan.

**The responsible supervisor must ensure that**

- (a) *pre-entry testing and inspection is conducted based on the confined space entry plan,*
- (b) *the precautions identified in the confined space entry plan and the precautions required by this Regulation or which are otherwise necessary for the health and safety of workers are followed,* and
- (c) *only authorized workers enter a confined space.*

Atmospheric testing must be performed by a competent person and documented. Confined spaces should be considered hazardous until testing results verify the hazard rating of the confined space being entered and the effectiveness of controls.

The responsible supervisor and workers must confirm the hazard rating of the confined space being entered because it affects the control measures selected as well as the confined space roles and responsibilities including: level of standby services, entry permit requirements and rescue.²⁵

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For low-hazard atmospheres:

If a worker enters a confined space which contains a low hazard atmosphere

(a) another worker must be assigned as a standby person,
(b) there must be a continuous means of summoning the standby person,
(c) the standby person must check on the well-being of workers inside the space at least every 20 minutes, and
(d) the standby person must have a means to immediately summon rescue personnel.

For moderate-hazard atmospheres:

If a worker enters a confined space which contains a moderate hazard atmosphere

(a) another worker or workers must be assigned as the standby person(s),
(b) a standby person must be stationed at or near the entrance to the space,
(c) the standby person must visually observe or otherwise check the well-being of the worker(s) inside the space, as often as may be required by the nature of the work to be performed, but at least every 10 minutes,
(d) there must be a continuous means of summoning the standby person from inside the space, and
(e) the standby person must have a means to immediately summon rescue personnel.
For **high-hazard atmospheres** or where there is a risk of engulfment or entrapment, or any other serious health or safety hazard:

If a worker enters a confined space which contains a high hazard atmosphere, a risk of engulfment or entrapment or with any other recognized serious health or safety hazard

(a) another worker or workers must be assigned as the standby person(s),
(b) the standby person(s) must be stationed at the entrance to the space and must continuously attend to the standby duties,
(c) the standby person(s) must visually observe or otherwise continuously monitor the well-being of the worker(s) inside the space,
(d) there must be a continuous means of summoning the standby person(s) from inside the space,
(e) the standby person(s) must be equipped and capable of immediately effecting rescue using lifting equipment if required, or otherwise performing the duties of rescue persons, and
(f) the standby person(s) must prevent the entanglement of lifelines and other equipment.

Workers must take reasonable care for their own health and safety and that their work does not adversely affect the health and safety of other persons. Workers must comply with any reasonable instructions given relating to confined space entry permits, risk control measures and emergency procedures, and should carry out work in a confined space in accordance with any relevant information and training provided to them.\(^26\)

Each worker who is assigned duties or responsibilities related to entry into a confined space must be adequately instructed and trained in

(a) the hazards of the space, and
(b) the precautions identified in the confined space entry plan.

In summary, the confined space entry plan needs to identify who has been assigned responsibilities for confined space being entered. This specific information is necessary to ensure that each worker understands the requirements for entering that confined space.

\(^{26}\) Safe Work Australia, Confined Spaces Code of Practice, Feb. 2014.
5.2 Review the Confined Space Entry Plan and Confirm Hazard Controls

If entering a confined space cannot be avoided, then a safe system for working inside the space must be implemented. The identified hazards will help determine what controls are needed to minimize the risk with work in the confined space.\(^\text{27}\)

Control measures that have been implemented must be reviewed, and if necessary, revised to make sure they work as planned and to maintain, so far as is reasonably practicable, a work environment that is without risks to health and safety. Control measures may be reviewed using the same methods as the initial hazard identification step.\(^\text{28}\)

Before a confined space entry begins, the responsible supervisor must establish an entry permit system for a confined space that

- (a) lists the name of each worker who enters the confined space and the reason for their entry,
- (b) gives the location of the confined space,
- (c) specifies the time during which an entry permit is valid,
- (d) takes into account the work being done in the confined space, and
- (e) takes into account the confined space entry plan requirements including entering, being in and leaving a confined space.

The responsible supervisor must ensure that, before a worker enters a confined space, an entry permit is properly completed, signed by a competent person and a copy kept readily available.

Based on a review of similar confined spaces, the responsible supervisor may issue an entry permit that can be used for a number of similar confined spaces.

A worker must not enter a confined space at a work site without valid entry permit.


In undertaking the review, consult workers involved in the confined space work and their health and safety representatives and consider the following questions:

- Are the control measures working effectively in both their design and operation?
- How effective is the risk assessment process? Are all hazards being identified?
- Are workers actively involved in the risk management process? Are they openly raising health and safety concerns and reporting problems promptly?
- Have new work methods or new equipment made the job safer?
- Are safety procedures being followed?
- Has instruction and training provided to workers been successful?
- If new legislation or new information becomes available, does it indicate current controls may no longer be the most effective?
- Is any change planned to any plant or structure that may create a confined space or change the nature of an existing confined space?
- Has an incident occurred as a result of work carried out in a confined space?

If problems are found, go back to any point in the risk management process, review the information and revise any decisions about controls measures.  

5.3 Monitor and Control Confined Space Hazards

The precautions required in a safe system of work will depend on the nature of the confined space and the results of the risk assessment. For example, the risks and precautions needed for cleaning car interiors with solvents will be relatively straightforward by comparison with those involved when undertaking welding work inside a chemical reactor vessel, or work in a sewer.  

Safe work systems need to address the following hazards specific to the entry of confined spaces:

Access and Egress Points, Unprotected Openings and Traffic Hazards

A defining characteristic of a confined space is that they have limited or restricted means for entry or egress that may complicate the provision of first aid, evacuation, rescue, or other emergency response service.

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Many workers do not realize they are entering a confined space. It is important to ensure that all workers are informed as to the location of each confined space and requirements for entry into those spaces in their workplace.

When a worker is required to enter a confined space, each point of access that is not secured against entry should be identified by a sign or other effective means to indicate the hazard and prohibit entry by unauthorized workers.

Hazardous Energy Control Including Isolation and Lockout

Physical hazards must be identified and controlled to make sure the space is safe for workers to enter. The confined space entry plan needs to identify the physical hazards in the hazard assessment and will have provided the required precautions and written procedures to control those hazards (including lockout and isolation). The supervisor of the entry must verify that all required precautions are in place before any worker enters a confined space.\(^\text{31}\)

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It is important to remember that there are many types of physical hazards, including crushing hazards, heat and cold stress, radiation, vibration, and noise. Confined spaces with a hazard of entrapment or engulfment and any situations requiring lockout or isolation procedures should be considered a very serious hazard. In these cases, an entry permit is required. A risk of engulfment or entrapment requires the highest level of attention.

Mechanical and electrical isolation of equipment is essential if it could otherwise operate, or be operated, inadvertently. If gas, fume or vapour could enter the confined space, it is important to isolate the pressurized piping. In all cases, a check should be made to ensure isolation is effective.

5.3.1 Purging and Ventilation of Unsafe Atmospheres

Replacing the unsafe atmosphere with clean respirable air before entry is a priority before commencing confined space activities. If the confined space has an oxygen-deficient or toxic atmosphere, then the first control measure is to replace the unsafe air with air that is safe to breathe before any workers enter. The next step, discussed on is to ensure the air remains safe while workers are inside.

Purging is removing the unsafe air from the confined space and replacing it with clean respirable air prior to entry. This is commonly accomplished by blowing air into the confined space using portable mechanical ventilators.

Venting is opening up a confined space to allow clean air to enter and circulate without the use of mechanical ventilation. Use of this method as a means of controlling...
contaminants can be authorized only by the competent person and never for a space with a high-hazard atmosphere. The minimum air flow for low-hazard atmospheres is 85 cubic metres per hour (50 cubic feet per minute) of clean respirable air for each worker in the space.\footnote{34 WorkSafeBC, Confined Space Entry Program: A Reference Manual (BK84), 2007 Edition.}

A common misconception prevails that purging and ventilation are one and the same. The fact is that while the same equipment may be employed, the two processes are distinctly different.

Purging: Purging takes place before you enter a space. Purging simply displaces one atmosphere with another. Purging may be done with steam, air, water, or an inert gas.

Ventilation: Keeps hazards away after purging has removed them. Ventilation continues to circulate fresh air through the space while people are inside. Ventilation must be done with fresh or breathable quality air. Ventilation must be verified, by testing, to ensure that the space is safe to enter.
In addition to the requirements of the OHS regulation pertaining to Flammable or explosive substance in atmosphere, where a concentration of a toxic, flammable or explosive substance is present or an oxygen enrichment or deficiency exists in a hazardous confined space, an employer shall ensure that the hazardous confined space is:

(a) purged and ventilated before a worker is allowed to enter the space, so that:
   i. any hazard associated with the toxic, flammable or explosive substance is reduced to the extent that is possible or eliminated; and
   ii. an oxygen content of not less than 19.5% and not more than 23% is ensured; and

(b) continuously ventilated at all times during which the worker occupies the hazardous confined space, to maintain a safe atmosphere.

Where ventilation is used to reduce or eliminate a hazard pursuant to subsection (1), an employer shall ensure that a competent person tests the atmosphere to determine that the confined space is safe for entry by a worker:

(a) before a worker enters the confined space;
(b) where all workers have vacated the confined space, before any worker re-enters the confined space;
(c) on the request of a worker who is required or permitted to enter the confined space; and
(d) continuously where any condition in the confined space may change and put the worker’s health or safety at risk.

Where a hazardous confined space cannot be purged and ventilated to provide a safe atmosphere or a safe atmosphere cannot be maintained pursuant to 9.3(1) and 9.3(2), an employer shall ensure that no work is carried on in the confined space except in accordance with the requirements of this section and regulatory requirements pertaining to flammable atmospheres.

Ideally the confined space is cleaned prior to entry to ensure fumes do not develop from residues while work is done. Where cleaning is not possible, inerting may be used to eliminate confined space hazards such as chemical reactions, flammable vapours, and the possibility of explosions. It is also used to prevent oxidation (rusting) of equipment or the walls of the confined space. In these cases it is important to remember that a confined space with an inert gas is deadly.
The following considerations are essential:

- Entry precautions for high-hazard atmospheres must be followed, except the requirement for continuous ventilation.
- Every worker entering the confined space must be equipped with an SCBA or a supplied-air respirator equipped with an escape bottle.
- The atmosphere inside the confined space must remain inerted while workers are inside.
- In the event the inert blanket is inadvertently lost, all ignition sources must be controlled.
- Escaping inert gas must not cause a hazard outside the confined space.

Atmospheric Testing and Retesting

Testing and monitoring the atmosphere in a confined space is a routine part of determining appropriate control measures.
Any air monitoring in a confined space should be carried out by a competent person using a suitable, correctly calibrated gas detector. It may be necessary to test the atmosphere for:

- oxygen content
- airborne concentration of flammable contaminants
- airborne concentration of potentially harmful contaminants (For example, hydrogen sulphide and carbon monoxide).
A person’s senses should never be used to determine if the air in a confined space is safe. Many toxic or flammable gases and unsafe oxygen levels cannot be detected using one’s senses.

Initial testing should be done from outside the confined space by inserting a sample probe and/or portable gas detection device at appropriately selected access holes, nozzles and openings. Because contaminants can settle at different levels, each part of the confined space should be tested – side to side and top to bottom.

For example, some gases (such as hydrogen sulfide) are heavier than air and in unventilated areas may settle to the bottom of the space, while other gases (such as methane) are lighter than air and will collect at the top of the space. Testing should be carried out on a sufficient number of points to accurately reflect areas of the space that is likely to be accessed.

**Important confined space entry statistics to consider:**

- OSHA reported that between 1992 and 2005, atmospheric hazards (toxic gases or oxygen deficiency) accounted for 431 of 530 US fatalities.
- In 40% of the fatal atmospheric accidents, the hazard was not present at the time of initial entry.

Monitoring of a confined space risk needs to recognize conditions may change, converting safe work space into a highly dangerous confined space. These include changes in configuration, environment, or operation of the structure or its surroundings. The transition can be slow and steady or can be sudden and dramatic depending on the presence of elements that increase the possibility of an atmospheric hazard. This confined space risk has the potential to vary in a fuzzy and perhaps, unexpected way rather than in a crisp, predictable fashion.\(^\text{35}\)

### 5.4 Confirm Emergency Response Plan and Rescue Procedures

A person conducting a business or undertaking must establish first aid and rescue procedures to be followed in an emergency and ensure those procedures are practiced as necessary to ensure that they are efficient and effective. First aid and rescue procedures must be initiated from outside the confined space as soon as practicable in an emergency.\(^\text{36}\)

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Many workers are injured or killed each year while working in confined spaces. An estimated 60% of the fatalities have been among the would-be rescuers.

The bottom line: When things go wrong in a confined space, people may be exposed to serious and immediate danger. Effective arrangements for raising the alarm and carrying out rescue operations in an emergency are essential.
The responsible supervisor must ensure that a worker does not enter or remain in a confined space unless an effective rescue can be carried out.

The responsible supervisor must ensure that the emergency response plan includes the emergency procedures to be followed if there is an accident or other emergency, including procedures in place to evacuate the confined space or restricted space immediately:

(a) when an alarm is activated,

(b) if the concentration of oxygen inside the confined space drops below 19.5 percent by volume or exceeds 23.0 percent by volume, or

(c) if there is a significant change in the amount of hazardous substances inside the confined space.

The responsible supervisor must ensure that

(a) if a lifeline is required in a confined space or a restricted space, it is used in a manner that does not create an additional hazard,

(b) the safety and personal protective equipment required under this Regulation is available to workers entering a confined space or restricted space,

(c) a worker who enters, occupies or leaves a confined space or restricted space uses the safety and personal protective equipment,

(d) the personal protective equipment and emergency equipment required under this Regulation is available to workers undertaking rescue operations in a confined space or restricted space,

(e) equipment appropriate to the confined space or restricted space, including personal protective equipment, is available to perform a timely schedule, and

(f) a communication system is established that is readily available to workers in a confined space or a restricted space and is appropriate to the hazards.

The responsible supervisor must ensure that all personal protective equipment and emergency rescue equipment required for use in a confined space or a restricted space is inspected by a competent person to ensure the equipment is in good working order before workers enter the confined space or the restricted space.

A worker must not enter or stay in a confined space or restricted space unless an effective rescue can be carried out.
When establishing emergency procedures, the following factors must be taken into account to manage risks associated with confined spaces:

- Whether the work can be carried out without entering the confined space.
- The nature of the confined space.
- Any changes in hazards associated with the concentration of oxygen or the concentration of airborne contaminants in the confined space.
- The work to be carried out in the confined space, the range of methods by which the work can be carried out and the proposed method of working.
- The type of emergency and rescue procedures required.

The person conducting a business or undertaking must also ensure that openings for entry and exit are of a sufficient size to allow emergency access; openings are not obstructed; and any plant, equipment and personal protective equipment provided for first aid or emergency rescue are maintained in good working order. ³⁷

Relevant considerations for developing a confined space entry emergency response plan are listed on the following table.

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### Table 5.1 Other considerations for confined entry planning

<table>
<thead>
<tr>
<th>Considerations</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location of the confined space</td>
<td>What is the geographic location of the space, how accessible is it in an emergency and how far away is it from appropriate medical facilities?</td>
</tr>
<tr>
<td>Communications</td>
<td>How can workers working inside the space communicate to people outside in an emergency? Exactely how will the alarm be raised and by whom? Planning needs to ensure that rescue and emergency personnel can access the workplace during night shift, weekends and holiday periods.</td>
</tr>
<tr>
<td>Rescue and resuscitation equipment</td>
<td>What kinds of emergencies are contemplated? The provision of suitable rescue and resuscitation equipment will depend on the potential emergencies identified. Selected rescue equipment should be kept in close proximity to the confined space so that it can be used immediately.</td>
</tr>
<tr>
<td>Capabilities of rescuers</td>
<td>Are rescuers properly trained, sufficiently fit to carry out their task and capable of using any equipment provided for rescue (e.g. breathing apparatus, lifelines and fire-fighting equipment)? How will rescuers be protected during the emergency operation?</td>
</tr>
<tr>
<td>First aid</td>
<td>Is appropriate first aid available for immediate use? Are trained first aid personnel available to make proper use of any necessary first aid equipment?</td>
</tr>
<tr>
<td>Emergency services</td>
<td>What emergency services are available if an incident occurs? What information about the particular dangers in the confined space will be given to them on their arrival? Have arrangements been made with emergency services to ensure they are able to respond in a reasonable time? Will specialized confined space retrieval equipment be required and is it readily available?</td>
</tr>
</tbody>
</table>
5.5 Maintain Records and Documentation

To demonstrate their due diligence, it is important for duty holders to maintain records that provide evidence of conformity to program requirements and of the effective operation of the program.\(^{38}\)

Duty holders responsible for or conducting confined space operations, including external service providers, shall create and maintain the documents and records specified by its confined space code of practice, including

(a) documents assigning roles and responsibilities for implementing the program;
(b) supporting procedural and other documents required by the confined space plans; and
(c) any other documents or records required by this Part, including those needed to prove compliance with legal requirements.

The records specified shall include:

(a) confined space entry code of practice
(b) an inventory of confined spaces;
(c) records identifying confined space hazards;
(d) a record of confined space risk assessments;
(e) confined space entry plans completed under the code of practice;
(f) records of training;
(g) entry permits to document controls and equipment used in a confined space;
(h) results of atmospheric testing; and,
(i) records of incidents involving near-misses, injuries, and illnesses resulting from work in a confined space including those reported by external service providers.

Duty holders responsible for or conducting confined space operations, including external service providers, shall maintain records that provide evidence of conformity to program requirements and of the effective operation of the program. The records shall be legible, readily identifiable, and retrievable. Procedures shall be established to provide the controls needed for the identification, secure storage, protection, retrieval, retention, and disposal of records. Procedures shall be established for the security of personal information in accordance with the privacy act of the authority having jurisdiction.

Duty holders responsible for or conducting confined space operations, including external service providers, must ensure that all records respecting entry and work in a confined space, including entry permits and testing under this Part, are retained for not less than

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

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Potential confined space entry records include:

- A log of injuries and illnesses experienced by ESP workers (CSA Z1006-16, Clause 5.4.2(f));
- An inventory of confined spaces (CSA Z1006-16, Clause 4.3.2);
- Records identifying confined space hazards (CSA Z1006-16, Clause 6.1.3);
- A record of confined space risk assessments (CSA Z1006-16, Clause 6.2.3);
- Emergency response plans created for the confined space (CSA Z1006-16, Clause 6.4.2);
- Clearances for capability to work in a confined space (CSA Z1006-16, Clause 6.5);
- Records of training (CSA Z1006-16, Clause 7.5);
- Entry permits to document controls and equipment used in a confined space (CSA Z1006-16, Clause 8.1.5);
- Results of atmospheric testing (CSA Z1006-16, Clause 8.2.8);
- An atmospheric testing equipment calibration and maintenance log (CSA Z1006-16, Clause 8.1.8.12);
- Other equipment inspection and maintenance records (CSA Z1006-16, Clause 8.1.11);
- Records of incidents involving near-misses, injuries, and illnesses resulting from work in a confined space (CSA Z1006-16, Clause 9.1); and
- Records required to meet site, organizational, or jurisdictional requirements.

It is important for records to be legible, readily identifiable, and retrievable. Procedures shall be established to provide the controls needed for the identification, secure storage, protection, retrieval, retention, and disposal of records.

Consideration needs to be given to the security of personal information in accordance with the privacy act of the authority having jurisdiction.
Appendix A. Regulatory Recommendation
A.1 Definitions

1 Definitions relevant to confined space entry

1(1) Confined space means an enclosed or partially enclosed space that:
   (a) is not designed or intended for continuous human occupancy; and
   (b) is, or is designed or intended to be, at normal atmospheric pressure while any person is in
       the space; and
   (c) has limited or restricted access or egress, or an internal configuration that can complicate
       first aid, evacuation, rescue, or other emergency response services, and
   (d) which by virtue of its enclosed nature, there arises a reasonably foreseeable specified risk to
       health and safety of the person entering the space. Specified risks include:
       (i) an atmosphere that does not have a safe oxygen level, or
       (ii) an atmosphere that contains contaminants, including airborne gases, vapours and dusts,
           that may cause injury from fire or explosion, or
       (iii) an atmosphere that contains harmful concentrations of any airborne contaminants, that
           may cause impairment, illness or injury, or
       (iv) engulfment or drowning in a liquid or free flowing solid.
       but does not include a mine shaft or the workings of a mine.

1(2) High hazard atmosphere means an atmosphere that may expose a worker to risk of death,
     incapacitation, injury, acute illness or otherwise impair the ability of the worker to escape unaided
     from a confined space, in the event of a failure of the ventilation system or respirator.

1(3) Moderate hazard atmosphere means an atmosphere that is not clean respirable air but is not likely
     to impair the ability of the worker to escape unaided from a confined space, in the event of a
     failure of the ventilation system or respirator.

1(3) Low hazard atmosphere means an atmosphere which is shown by pre-entry testing or otherwise
     known to contain clean respirable air immediately prior to entry to a confined space and which is
     not likely to change during the work activity, as determined by a qualified person after
     consideration of the design, construction and use of the confined space, the work activities to be
     performed, and all engineering controls required by this Regulation.

1(5) Entry means the action by which a person passes into a confined space. Entry includes ensuing
     work or rescue activities in the confined space and is considered to occur when the entrant’s
     breathing zone crosses the plane of an opening into the confined space.

1(6) Duty Holder means an organization or person(s) who have a duty to ensure health and safety to
     ‘manage risks’ of the confined space entry by eliminating health and safety risks so far as is
     reasonably practicable, and if it is not reasonably practicable to do so, to minimise those risks so far
     as is reasonably practicable.
1(7) External service provider (ESP) means
   (a) an organization or person, including a self-employed person, who acts as or provides
       services to a duty holder in accordance with agreed-upon specifications, terms, and
       conditions.
   (b) a worker employed by or under the control of an external service provider (ESP) employer.

A.2 Design of Confined Spaces

2 Eliminating or Minimizing the Need to Enter a Confined Space

2(1) A designer, manufacturer, importer or supplier of a plant or structure, and a person who installs or
     constructs a plant or structure must, when reasonably practicable, eliminate the need to enter a
     confined space for maintenance, inspection cleaning or other purposes and eliminate the risk of
     inadvertent entry.

2(2) If this is not reasonably practicable, then:
      (a) the need for any person enter the space must be minimised so far as is reasonably
          practicable
      (b) the space must be designed with a safe means of entry and exit, and
      (c) the risk to the health and safety of any person who enters the space must be eliminated or
          minimised as far as is reasonably practicable.

2(3) Modifications to an existing confined space shall not increase the level of risk to workers who
     might enter the confined space.

A.3 Management of Confined Space Program

3 Requirement for Code of Practice

3(1) Each duty holder with a responsibly for an aspect of confined space operations as identified in this
     recommended regulation, including external service providers, must have a written code of
     practice that addresses the relevant confined space management practices.

3(2) The code of practice must
      (a) take into account and apply the requirements of this Part;
      (b) those sections of the OHS regulations pertaining to harmful substances and flammable
          atmospheres, and
      (c) be maintained and periodically reviewed.

3(3) A worker involved in any aspect of a confined space entry must comply with the requirements and
     procedures in the code of practice.

4 Identification of High-Hazard Atmosphere Confined Spaces

4(1) A duty holder who owns or is responsible for confined spaces at a permanent or temporary
     worksite shall
      (a) evaluate its premises and operations to consider all potential confined spaces and prepare
          an inventory of all high-hazard atmosphere spaces;
      (b) determine whether any such space will require entry by a worker, either in scheduled work
          activities or as a result of foreseeable system failures or other emergencies.
      (c) BC OHS Regulation 9.2
      (d) establish a process for reviewing the entire inventory as changes occur or at regular intervals
          (not to exceed three years).
4(2) If the workplace contains high-hazard atmosphere confined spaces, the responsible duty holder shall inform exposed workers, by posting danger signs or by any other equally effective means, of the existence and location of and the danger posed by the confined space.

OSHA 29 CFR 1910.146(c)(1)

4(3) If a high-hazard atmosphere confined space exists at a workplace but no worker entry is required, the employer must ensure that each point of access to the confined space is secured against inadvertent entry or identified by a sign or other effective means which indicates the nature of the hazard and the prohibition of entry, and that workers are instructed not to enter.

BC OHS Regulation 9.3

4(4) When a high-hazard atmosphere confined space requires entry by a worker, each point of access which is not secured against entry must be identified by a sign or other effective means which indicates the hazard and prohibits entry by unauthorized workers.

BC OHS Regulation 9.12

4(5) All confined spaces are considered hazardous unless a competent person has determined otherwise through a risk assessment.

CSA Z1006-16 – 3.1

5 Confined Space Hazard Assessments

5(1) Before a confined space is constructed, installed, or modified, the workspace design process shall
   (a) include hazard identification and risk assessment for any anticipated work inside the confined space, including a consideration of factors outside the confined space that could present a hazard to workers.
   (b) the design of confined spaces should attempt to eliminate the need to enter such spaces for maintenance, inspection, cleaning, or other purposes.
   (c) Modifications to an existing confined space shall not increase the level of risk to workers who might enter the confined space.

CSA Z1006-16 - 4.4.4

5(2) A written hazard assessment must be conducted for each
   (a) existing high-hazard atmosphere confined space, or each group of high-hazard atmosphere confined spaces which share similar characteristics, and
   (b) work activity, or group of work activities which present similar hazards, to be performed inside a high-hazard atmosphere confined space.

BC OHS Regulation 9.9(1)

5(3) The hazard assessment required by subsection 4(2) must consider specified risks including
   (a) the conditions which may exist prior to entry due to the confined space’s design, location or use, or which may develop during work activity inside the space, and
   (b) the potential for oxygen enrichment and deficiency, flammable gas, vapour or mist, combustible dust, other hazardous atmospheres, harmful substances requiring lockout and isolation, engulfment and entrapment, physical and configuration hazards, emergency response limitations, and other hazardous conditions.

BC OHS Regulation 9.9(2)

5(4) The hazard assessment and written confined space entry plan must be prepared by a qualified person who has adequate training and experience in the recognition, evaluation and control of confined space hazards.

BC OHS Regulation 9.11
6 Requirement for a Written Confined Space Entry Plan

6(1) Before a worker is required or permitted to enter a confined space, the duty holder that is responsible for or conducts confined space operations must prepare and implement a written confined space entry plan which includes
   (a) assignment of responsibilities,
   (b) a list of each confined space or group of similar spaces to be entered and a hazard assessment of those spaces, and
   (c) the confined space entry plan must address, where applicable
      i. identification of the space(s) to be entered
      ii. confined space entry permitting requirements,
      iii. lockout and isolation,
      iv. verification and testing,
      v. cleaning, purging, venting or inerting,
      vi. ventilation,
      vii. standby persons,
      viii. rescue,
      ix. lifelines, harnesses and lifting equipment,
      x. personal protective equipment and other precautions, and
      xi. coordination of work activities.

A.4 Execution of Confined Space Entry Operations

7 Confined Space Entry Responsibilities

7(1) Responsibilities associated with the management and completion of confined space entry may include
   (a) Overall confined space entry program administration;
   (b) Preparation of confined space hazard assessment and work procedures;
   (c) Responsible supervisor;
   (d) Equipment lockout and isolation;
   (e) Standby or Attending Worker(s) including air supply system attendant;
   (f) Pre-Entry / re-entry atmospheric testing and atmospheric monitoring;
   (g) Emergency Response Team including rescuer(s) and rescue system operator;
   (h) Entry Team: Workers Inside Confined Space;
   (i) Trainers and instructors;
   (j) External Service Providers.

7(2) The duty holder that is responsible for or conducts confined space operations must assign a responsible supervisor to a person who is adequately trained and experienced to supervise the job before any worker enters a confined space.
7(3) The responsible supervisor must ensure that
(a) pre-entry testing and inspection is conducted based on the confined space entry plan,
(b) the precautions identified in the confined space entry plan and the precautions required by
   this Regulation or which are otherwise necessary for the health and safety of workers are
   followed, and
(c) only authorized workers enter a confined space.

7(4) If a worker enters a confined space which contains a low hazard atmosphere
(a) another worker must be assigned as a standby person,
(b) there must be a continuous means of summoning the standby person,
(c) the standby person must check on the well-being of workers inside the space at least every
   20 minutes, and
(d) the standby person must have a means to immediately summon rescue personnel.

7(5) If a worker enters a confined space which contains a moderate hazard atmosphere
(a) another worker or workers must be assigned as the standby person(s),
(b) a standby person must be stationed at or near the entrance to the space,
(c) the standby person must visually observe or otherwise check the well-being of the worker(s)
   inside the space, as often as may be required by the nature of the work to be performed, but
   at least every 20 minutes,
(d) there must be a continuous means of summoning the standby person from inside the space,
   and
(e) the standby person must have a means to immediately summon rescue personnel.

7(6) If a worker enters a confined space which contains a high hazard atmosphere, a risk of engulfment
    or entrapment or with any other recognized serious health or safety hazard
(a) another worker or workers must be assigned as the standby person(s),
(b) the standby person(s) must be stationed at the entrance to the space and must continuously
    attend to the standby duties,
(c) the standby person(s) must visually observe or otherwise continuously monitor the well-
    being of the worker(s) inside the space,
(d) there must be a continuous means of summoning the standby person(s) from inside the
    space,
(e) the standby person(s) must be equipped and capable of immediately effecting rescue using
    lifting equipment if required, or otherwise performing the duties of rescue persons, and
(f) the standby person(s) must prevent the entanglement of lifelines and other equipment.

7(7) Each worker who is assigned duties or responsibilities related to entry into a confined space must
    be adequately instructed and trained in
(a) the hazards of the space, and
(b) the precautions identified in the confined space entry plan.
8 Confined Space Entry Operations

8(1) Before a confined space entry begins, the responsible supervisor must establish an entry permit system for a confined space that
   (a) lists the name of each worker who enters the confined space and the reason for their entry,
   (b) gives the location of the confined space,
   (c) specifies the time during which an entry permit is valid,
   (d) takes into account the work being done in the confined space, and
   (e) takes into account the confined space entry plan requirements including entering, being in and leaving a confined space.

8(2) The responsible supervisor must ensure that, before a worker enters a confined space, an entry permit is properly completed, signed by a competent person and a copy kept readily available.

8(3) Based on a review of similar confined spaces, the responsible supervisor may issue an entry permit that can be used for a number of similar confined spaces.

8(4) A worker must not enter a confined space at a work site without valid entry permit.

9 Monitoring and Control of Confined Space Hazards

Safe work systems need to address the following confined space hazards.

9.1 Access and egress points, unprotected openings and traffic hazards

9.1(1) Each access and egress point shall be evaluated by a competent person to determine the most effective methods and equipment for enabling personnel to safely enter and exit the confined space. Means of safe access and egress shall be provided.

9.1(2) Warning systems or barricades shall be employed at the locations where a potential exists for persons or objects to fall into an opening of a confined space. This protection should not interfere with ventilation or egress from the confined space.

9.1(3) Workers in a confined space or a restricted space are protected from hazards created by traffic in the vicinity of the confined space or restricted space.

9.2 Hazardous energy control isolation and lockout

9.2(1) All sources of hazardous energy, including, but not limited to, electrical, mechanical, hydraulic, pneumatic, thermal, radioactive, and gravitational, shall be isolated and locked out or otherwise controlled in a way that eliminates or minimizes worker exposure to the hazards before personnel are permitted to enter the confined space.

9.2(2) It is important to ensure that any method of control other than isolation and lockout is evaluated and its effectiveness for controlling the hazardous energy can be demonstrated. Before adopting a method of control other than isolation and lockout, a risk assessment that demonstrates the adequacy of the evaluation and effectiveness of the method shall be conducted or a prescribed method recognized by CSA-Z460 shall be used.

9.2(3) Locking and tagging of equipment, systems, and processes or other methods of controlling hazardous energy shall be verified by a competent person before entry into the confined space is permitted.
9.3 Purging and ventilation of unsafe atmospheres

9.3(1) In addition to the requirements of the OHS regulation pertaining to Flammable or explosive substance in atmosphere, where a concentration of a toxic, flammable or explosive substance is present or an oxygen enrichment or deficiency exists in a hazardous confined space, an employer shall ensure that the hazardous confined space is:
   (a) purged and ventilated before a worker is allowed to enter the space, so that:
   (b) any hazard associated with the toxic, flammable or explosive substance is reduced to the extent that is possible or eliminated; and
   (c) an oxygen content of not less than 19.5% and not more than 23% is ensured; and
   (d) continuously ventilated at all times during which the worker occupies the hazardous confined space, to maintain a safe atmosphere.

Saskatchewan OHS Regulations 273(1)

9.3(2) Where ventilation is used to reduce or eliminate a hazard pursuant to subsection (1), an employer shall ensure that a competent person tests the atmosphere to determine that the confined space is safe for entry by a worker:
   (a) before a worker enters the confined space;
   (b) where all workers have vacated the confined space, before any worker re-enters the confined space;
   (c) on the request of a worker who is required or permitted to enter the confined space; and
   (d) continuously where any condition in the confined space may change and put the worker’s health or safety at risk.

Saskatchewan OHS Regulations 273(2)

9.3(3) Where a hazardous confined space cannot be purged and ventilated to provide a safe atmosphere or a safe atmosphere cannot be maintained pursuant to 9.3(1) and 9.3(2) an employer shall ensure that no work is carried on in the confined space except in accordance with the requirements of this section and regulatory requirements pertaining to flammable atmospheres.

Saskatchewan OHS Regulations 274(1)

9.4 Atmospheric Testing and Retesting

9.4(1) If the hazard assessment identifies a potential atmospheric hazard and a worker is required or authorized to enter the confined space, the responsible supervisor must ensure that a competent worker performs a pre-entry atmospheric test of the confined space to
   (a) verify that the oxygen content is between 19.5 percent and 23.0 percent by volume, and
   (b) identify the amount of toxic, flammable or explosive substance that may be present.

9.4(2) The responsible supervisor must ensure that the testing required by subsection (1) is performed using calibrated test instruments appropriate for the atmosphere being tested and the instruments are used in accordance with the manufacturer’s specifications.

9.4(3) The responsible supervisor must ensure that as often as necessary after the first time a worker enters the confined space, a competent worker
   (a) performs the tests specified in subsection (1), and
   (b) identifies and records any additional hazards.

9.4(4) The responsible supervisor must ensure that if there is a potential for the atmosphere to change unpredictably after a worker enters the confined space, the atmosphere is continuously monitored in accordance with subsection (2).

9.4(5) If tests identify additional hazards, the employer must deal with the identified hazards in accordance with this Part.

9.4(6) The responsible supervisor must ensure that the procedures and practices put in place under subsection (5) are included in the code of practice.
9.4(7) The responsible supervisor must ensure that the results of tests required by this section are recorded.

10 Emergency Response and Confined Space Rescue

10(1) The responsible supervisor must ensure that a worker does not enter or remain in a confined space or a restricted space unless an effective rescue can be carried out.

10(2) The responsible supervisor must ensure that the emergency response plan includes the emergency procedures to be followed if there is an accident or other emergency, including procedures in place to evacuate the confined space or restricted space immediately
(a) when an alarm is activated,
(b) if the concentration of oxygen inside the confined space drops below 19.5 percent by volume or exceeds 23.0 percent by volume, or
(c) if there is a significant change in the amount of hazardous substances inside the confined space.

10(3) The responsible supervisor must ensure that
(a) if a lifeline is required in a confined space or a restricted space, it is used in a manner that does not create an additional hazard,
(b) the safety and personal protective equipment required under this Code is available to workers entering a confined space or restricted space,
(c) a worker who enters, occupies or leaves a confined space or restricted space uses the safety and personal protective equipment,
(d) the personal protective equipment and emergency equipment required under this Code is available to workers undertaking rescue operations in a confined space or restricted space,
(e) equipment appropriate to the confined space or restricted space, including personal protective equipment, is available to perform a timely schedule, and
(f) a communication system is established that is readily available to workers in a confined space or a restricted space and is appropriate to the hazards.

10(4) The responsible supervisor must ensure that all personal protective equipment and emergency rescue equipment required for use in a confined space or a restricted space is inspected by a competent person to ensure the equipment is in good working order before workers enter the confined space or the restricted space.

10(5) A worker must not enter or stay in a confined space or restricted space unless an effective rescue can be carried out.

11 Records and Documentation

11(1) Duty holders responsible for or conducting confined space operations, including external service providers, shall create and maintain the documents and records specified by its confined space code of practice, including
(a) documents assigning roles and responsibilities for implementing the program;
(b) supporting procedural and other documents required by the confined space plans; and
(c) any other documents or records required by this part, including those needed to prove compliance with legal requirements.
11(2) The records specified in Clause 10.1 shall include
(a) confined space entry code of practice
(b) an inventory of confined spaces;
(c) records identifying confined space hazards;
(d) a record of confined space risk assessments;
(e) confined space entry plans completed under the code of practice;
(f) records of training;
(g) entry permits to document controls and equipment used in a confined space;
(h) results of atmospheric testing; and,
(i) records of incidents involving near-misses, injuries, and illnesses resulting from work in a confined space including those reported by external service providers.

CSA Z1006–16 – 8.3.2.2

11(3) Duty holders responsible for or conducting confined space operations, including external service providers, shall maintain records that provide evidence of conformity to program requirements and of the effective operation of the program. The records shall be legible, readily identifiable, and retrievable. Procedures shall be established to provide the controls needed for the identification, secure storage, protection, retrieval, retention, and disposal of records. Procedures shall be established for the security of personal information in accordance with the privacy act of the authority having jurisdiction.

CSA Z1006–16 – 8.3.2.1

11(4) Duty holders responsible for or conducting confined space operations, including external service providers, must ensure that all records respecting entry and work in a confined space, including entry permits and testing under this Part, are retained for not less than
(a) one year if no incident or unplanned event occurred during the entry, or
(b) two years if an incident or unplanned event occurred during the entry.

Alberta OHS Code 58
Appendix B. Examples of Confined Space Pre-entry Checklist and Confined Space Data Worksheet
CONFINED SPACE
PRE-ENTRY CHECKLIST

Field Location: ____________________________  Work Permit #: ____________
Description: ________________________________________________________________

☐ Has the confined space location, hazards, and their controls, been reviewed and the confined space to be entered confirmed? Complete/review confined space data worksheet on back.

☐ Have all specific job responsibilities been assigned? (Indicate person responsible)

  Program Responsibility – ____________________________
  Responsible Supervisor – ____________________________
  Equipment Lockout – ____________________________
  Standby Person – ____________________________
  Atmospheric Testing – ____________________________
  Workers Inside Space – ____________________________

  Other Workers – ____________________________

☐ Have all entry points into the confined space been identified and properly secured against unauthorized entry?

☐ Is required monitoring equipment available and calibrated?

☐ Is required rescue equipment available?

☐ Do all personnel have required training? (Including those not entering confined space)

☐ Are all pertinent SDS available and have they been reviewed?

☐ Is Work Permit complete and posted? Attached to the Work Permit the:
  ⇒ Completed Pre-Entry Checklist
  ⇒ Confined Space Data Worksheet

☐ Has the Work Permit, confined space entry procedures, and any vessel specific data been reviewed with personnel prior to commencing work?

I have reviewed and confirmed that all required steps have been satisfactorily completed before commencing the confined space entry work as outlined above and on the Work Permit.

Responsible Supervisor (print) (signature) Date
CONFINED SPACE DATA WORKSHEET

Confined Space Location(s):

______________________________________________________________

Description of Confined Space (type of vessel, # if more than one, PIN / I.D. #, etc.):

______________________________________________________________

Hazards – flammable gas or liquids, rotating equipment, oxygen deficiency, chemicals, etc.:

______________________________________________________________

Risk Ranking of confined space?

☐ High Hazard Atmosphere  ☐ Moderate Hazard Atmosphere  ☐ Low Hazard Atmosphere

Entry points to confined space – how many and their location:

______________________________________________________________

Are entry points secured and/or signed?  ☐ Yes ☐ No

Isolation points and equipment needed to secure – locks, chains, blinds, including rating and size, etc.:

______________________________________________________________

Is venting, cleaning purging, inerting required?  ☐ Yes ☐ No

______________________________________________________________

Are there any ventilation / equipment required? (i.e. air movers, nitrogen purge, etc.)  ☐ Yes ☐ No

______________________________________________________________

Rescue requirements needed – ropes, harnesses, tripods, etc.:

______________________________________________________________

PPE requirements – breathing equipment, safety shields, rubber suits, gloves, etc.:

______________________________________________________________