Confined Space Atmospheric Hazards & Ventilation Requirements – Know The Laws of Your Province

Enclosed or partially enclosed spaces not intended for continuous human occupancy and with limited access or exit, aka, "confined spaces" are extremely dangerous to work in. One of the greatest dangers is the risk of hazardous atmospheres, including:

- Oxygen deficiency—oxygen levels below 19.5%
- Oxygen enrichment—oxygen levels above 23%
- Toxic gases and vapours such as hydrogen sulfide, carbon monoxide, and ammonia, at concentrations above occupational exposure limits (OELs).
- Vapours, gases, or combustible dusts at concentrations above their lower explosive limit (LEL).

Hazardous atmospheres may also be hard to detect and may develop rapidly after workers have entered a confined space based on initial atmospheric testing. That's why air monitoring is necessary not just before but continuously during entry.

Occupational Health and Safety regulations require employers to implement engineering systems, including ventilation,

purging, and inerting, to control atmospheric hazards and ensure that the air inside confined spaces is safe to breathe and work in. Here's a look at the actual confined spaces atmospheric hazards and ventilation requirements in each part of Canada.

FEDERAL

- Before granting a person access to a hazardous confined space, an employer must appoint a qualified person to verify, via tests and continuous monitoring, that the following atmosphere conditions may be achieved while the person is inside the hazardous confined space:
    - The concentration of any chemical agent or combination of chemical agents to which the person is likely to be exposed:
        - Won’t exceed the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) for that chemical agent(s), or
        - Will be 50% of the lower explosive limit of the chemical agent(s) or, where a source of ignition may ignite the airborne chemical agent(s) in the hazardous confined space, its concentration won’t exce ed 10% of the chemical agent(s)’ lower explosive limit.
    - The concentration of any airborne hazardous substance, other than a chemical agent, that a person may be exposed to in the hazardous confined space is not hazardous to the person’s health or safety, and
    - The percentage of oxygen in the air in the hazardous confined space is not less than 19.5% by volume and not more than 23% by volume, at normal

atmospheric pressure (COHS Regs, Sec. 11.05(1)(a)).

- If ventilation equipment is used to maintain the atmospheric conditions referred to above, the employer must not grant access to the hazardous confined space unless:
    - The ventilation equipment is:
        - Equipped with an alarm that will, if the equipment fails, be activated automatically and be audible or visible to every person in the hazardous confined space, or
        - Monitored by an employee who's in constant attendance at the equipment and in communication with any person in the hazardous confined space; and
    - If the ventilation equipment fails, the person will have enough time to escape from the hazardous confined space before the atmospheric conditions exceed the limits referred to in the bulleted items of #1 above (COHS Regs, Sec. 11.11(1)).

- If the ventilation equipment fails, the employee serving in constant attendance referred to in item (a)(ii) above must immediately inform any person in the hazardous confined space of the equipment's failure (COHS Regs, Sec. 11.11(2)).
- If the hazard assessment report determines that a hazardous confined space requires continuous ventilation, the employer must ensure continuous atmospheric monitoring while the hazardous confined space is occupied (COHS Regs, Sec. 11.11(3)).

ALBERTA

- Before a worker enters a confined space, an employer

must ensure that the atmosphere in the confined space is tested by a competent worker to:
    - Verify that the oxygen content is between 19.5% and 23.0% by volume, and
    - Identify the amount of toxic, flammable or explosive substance that may be present (OHS Code, Sec. 52(1)).
- The employer must ensure that the atmosphere is continuously monitored if there's a potential for the atmosphere to change unpredictably after a worker enters the confined space (OHS Code, Sec. 52(3.1)).
- If required atmospheric testing finds the existence or likely existence of a hazardous atmosphere in a confined space, the employer must ensure that the confined space is ventilated, purged or both before a worker enters it (OHS Code, Sec. 53(1)).
- If ventilating or purging a confined space is impractical or ineffective in eliminating a hazardous atmosphere, the employer must ensure that a worker who enters the confined space uses PPE appropriate for the conditions inside (OHS Code, Sec. 53(2)).
- If mechanical ventilation is needed to maintain a safe atmosphere in a confined space during the work process, an employer must ensure it's provided and operated as needed (OHS Code, Sec. 53(3)).
- If mechanical ventilation is required to maintain a safe atmosphere in the confined space, the employer must ensure that:
    - The ventilation system incorporates a method of alerting workers to a failure of the system so that they have sufficient time to safely leave the confined space, and
    - All workers within the confined space have received training in the evacuation procedures to be used in case of a ventilation system failure (OHS Code, Sec. 53(4)).
- All workers must evacuate a confined space or use an

alternative means of protection if a ventilation system fails (OHS Code, Sec. 53(5)).

- An employer must ensure that a confined space is inerted if it's not reasonably practicable to eliminate an explosive or flammable atmosphere within the confined space through another means (OHS Code, Sec. 54(1)).
- If a confined space is inerted, an employer must ensure that:
    - Every worker entering the confined space is equipped with supplied air respiratory protective equipment that complies with Part 18 of the OHS Code.
    - All ignition sources are controlled.
    - The atmosphere within the confined space stays inerted while workers are inside (OHS Code, Sec. 54(2)).

BRITISH COLUMBIA

- When practicable, the employer must ensure that a confined space to be entered contains clean respirable air (OHS Regs, Sec. 9.27(1)).
- If a confined space is known, or shown by pre-entry testing, to contain other than clean respirable air, the hazard must be controlled by cleaning, purging, or venting the space and the atmosphere must be retested before a worker enters the space (OHS Regs, Sec. 9.27(2)).
- The employer must notify the Board in writing, and submit a copy of the proposed work procedures, at least 7 days before a worker enters a confined space which has been inerted (OHS Regs, Sec. 9.29(1)).
- The employer must follow any additional precautions that are prescribed by the Board after review of the notification (OHS Regs, Sec. 9.29(2)).

- If a confined space has been inerted:
    - All 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 a supplied-air respirator meeting the requirements of Part 8 of the Regulations.
    - All ignition sources must be controlled.
    - The atmosphere inside the confined space must remain inerted while workers are inside (OHS Regs, Sec. 9.29(3)).
- Every confined space must be ventilated continuously while a worker is inside the space, except in:
    - An atmosphere intentionally inerted in accordance with the above.
    - A low hazard atmosphere that's properly controlled.
    - An emergency rescue, if ventilation is not practicable (OHS Regs, Sec. 9.30).
- The employer must ensure that a minimum of 85 m3/hr (50 cfm) of clean respirable air is supplied for each worker inside a confined space with a low hazard atmosphere, except as permitted in Item #8 below (OHS Regs, Sec. 9.31(1)).
- Continuous ventilation is not required in a confined space which has a low hazard atmosphere, if:
    - The atmosphere is continuously monitored and shown to contain clean respirable air, and
    - The space has an internal volume greater than 1.8 m3 (64 cu ft) per occupant, is occupied for less than 15 minutes, and the work inside the space generates no contaminants other than exhaled air (OHS Regs, Sec. 9.31(2)).
- A ventilation system for control of airborne contaminants in a confined space must be designed, installed, and maintained in accordance with established engineering principles and also be specified in the

written procedures (OHS Regs, Sec. 9.32(1)).

- Ventilation equipment must be located and arranged so as to adequately ventilate every occupied area inside the confined space (OHS Regs, Sec. 9.32(2)).
- If a contaminant is produced in a confined space, it must be controlled at the source by a local exhaust ventilation system if practicable, by general (dilution) ventilation, or a combination of both (OHS Regs, Sec. 9.32(3)).
- If practicable, a mechanical ventilation system for a confined space must be sufficient to maintain concentrations of airborne contaminants below the applicable exposure limits (OHS Regs, Sec. 9.32(4)).
- If natural ventilation is relied upon for the control of airborne contaminants in a confined space, the rate of airflow through the space must be monitored and sufficient to maintain concentrations of airborne contaminants below the applicable exposure limits (OHS Regs, Sec. 9.33(1)).
- Natural ventilation must not be used to ventilate a confined space that has a high hazard atmosphere, or if such ventilation could draw air other than clean respirable air into the confined space (OHS Regs, Sec. 9.34(2)).
- If a worker enters a confined space which contains a low hazard atmosphere person must visually observe or otherwise check the well-being of the worker(s) person must have a means to immediately summon rescue personnel.

MANITOBA

- An employer must ensure that a hazardous confined space is purged, ventilated, or both before a worker is required or permitted to enter it in accordance

with the following:

- Where there is or may be a concentration of a flammable or explosive substance present at more than 10% of its lower explosive limit, the space must be purged, ventilated, or both so that the concentration is reduced to less than 10%.
- Where there is or may be an oxygen deficiency – oxygen content less than 19.5% by volume – or oxygen enrichment – oxygen content greater than 23% by volume – the space must be purged, ventilated, or both so that the oxygen content is at least 19.5% but not more than 23%.
- Where there is or may be a chemical or biological substance that creates a risk to the safety or health of the worker, the space must be purged, ventilated, or both to eliminate or reduce the risk associated with the substance, to the extent possible (WSH Regs, Sec. 15.9(1)).

- When a worker occupies a hazardous confined space that has an atmosphere that may create a risk to their safety or health, the employer must ensure:
  - The space is continuously ventilated to maintain a safe atmosphere; and
  - The atmosphere is continuously monitored by a competent person (WSH Regs, Sec. 15.9(2)).

NEW BRUNSWICK

- The atmosphere of a confined space is within acceptable limits if:
  - The percentage of oxygen is not less than 19.5% by volume and not more than 23% by volume.
  - The concentration of an air contaminant doesn’t exceed 50% of the lower explosive limit or lower flammability limit of the

air contaminant when the confined space work is cleaning or inspecting and doesn’t create a source of ignition.

- The concentration of an air contaminant doesn’t exceed 10% of the lower explosive limit or lower flammability limit of the air contaminant when the confined space work is cold work using non-sparking equipment.
- The concentration of an air contaminant doesn’t exceed 5% of the lower explosive limit or lower flammability limit of the air contaminant when the confined space work is riveting, welding, flame cutting, or other fire or spark-producing work.
- The concentration of air contaminants and physical agents meet the requirements of the OHS Regulation.
- The concentration or percentage referred to in paragraphs (a) to (e) can be maintained during the period of proposed occupancy in the confined space.
- Any liquid in which an employee may drown or any free-flowing solid in which an employee may become entrapped has been removed from the confined space.
- The entry of any liquid, free flowing solid or hazardous substance into the confined space in a quantity that could endanger the health or safety of the employee has been prevented by a secure means of disconnecting the pipes adjacent to the confined space or fitting blank flanges or blind flanges to the pipes adjacent to the confined space.
- All electrical or other equipment and machines that present a hazard to an entrant while entering, exiting, or occupying the confined space have been put in a zero-energy state and locked

out in accordance with this Regulation (*OHS General Regs*, Sec. 262.061(1)).

- To bring the atmosphere of a confined space within acceptable limits, an employer must:
  - Ventilate the confined space.
  - Remove air contaminants from the confined space by the displacement of air.
  - Intentionally flood the atmosphere inside the confined space with an inert gas such as nitrogen to eliminate the hazard of ignition of flammable vapours inside the confined space and create an oxygen deficient atmosphere (*OHS General Regs*, Sec. 262.061(2)).
- If ventilation systems are used to limit the concentration of air contaminants or maintain safe levels of oxygen in the atmosphere of the confined space, an employer must ensure that a competent person tests the concentration of air contaminants and oxygen when the ventilation systems are shut down and the ventilation systems are turned on (*OHS General Regs*, Sec. 262.07).
- When the source of air contaminants or oxygen cannot be determined from outside the confined space, an employer must ensure that appropriate hazard control measures are implemented before entry and that the source of air contaminants or oxygen is identified from inside the confined space before other work proceeds (*OHS General Regs*, Sec. 262.072).

NEWFOUNDLAND & LABRADOR

- Appropriate tests for harmful vapours, gasses, fumes, mists, dusts, or explosive substances and oxygen deficiency must be made and recorded:
  - Before entry into the confined space.
  - After an interruption in the work procedures.

        - At appropriate intervals (OHS Regs, Sec. 512(11)).
- Where a test indicates an unsafe condition, the confined space must be ventilated or cleaned or both and periodically retested to ensure that:
    - The oxygen content is between 20% and 22%.
    - The concentration of flammable substances is maintained below 10% of the lower explosive limit (LEL) of that substance or substances.
    - A worker's exposure to harmful substances is maintained at acceptable levels in accordance the TLVs established by ACGIH (OHS Regs, Sec. 512(12)).
- Where a test under subsection (11) indicates the presence of a harmful or explosive substance and it's not feasible to provide a safe respirable atmosphere, an employer must ensure that:
    - A worker entering the confined space is provided with and wears respiratory and PPE appropriate to the hazards likely to be encountered.
    - Where a flammable or explosive gas or liquid is present all sources of ignition are controlled or eliminated (OHS Regs, Sec. 512(13)).
- A worker must leave the confined space where control measures referred to in Item #3 above can't be implemented (OHS Regs, Sec. 512(14)).
- An employer must ensure that a worker does not enter or remain in a confined space that contains or is likely to contain an explosive or flammable gas or vapour, unless:
    - The worker is performing only inspection, work that does not produce a source of ignition and, in the case of an explosive or flammable gas or vapour, the atmospheric concentration is less than 25% of its lower explosive limit, as determined by a combustible gas measuring instrument.
    - The worker is performing only cold work and, in the case of an explosive or flammable gas or

vapour, the atmospheric concentration is less than 10% of its lower explosive limit as determined by combustible gas instruments.

- The worker is performing hot work and all of the following conditions are satisfied:
    - In the case of an explosive or flammable gas or vapour, the atmospheric concentration is less than 5% of its lower explosive limit, as determined by a combustible gas instrument.
    - The atmosphere in the confined space doesn't contain, and isn't likely to contain while a worker is inside, an oxygen content greater than 23%.
    - The atmosphere in the confined space is monitored continuously.
    - The entry permit includes adequate provisions for hot work and corresponding control measures.
    - An adequate alarm system and exit procedures are provided to ensure that workers have adequate warning and are able to exit the confined space safely where either or both of the following occur, in the case of an explosive or flammable gas or vapour:
        - The atmospheric concentration exceeds 5% of its lower explosive limit, or
        - The oxygen content of the atmosphere exceeds 23% by volume(OHS Regs, Sec. 515).

NOVA SCOTIA

- An employer must designate a competent person to perform a pre-entry confined space hazard assessment that includes:

- Tests to ensure that the level of a chemical substance or mixture of chemical substances that may constitute a hazard in the confined space doesn’t exceed its occupational exposure limit under Part 2 of the Regs. or 50% of its lower explosive limit.
- Tests to ensure that the level of a physical agent that may constitute a hazard in the confined space is not hazardous.
- Tests to ensure that the level of oxygen in the atmosphere in the confined space is not less than 19.5 % and not more than 22.5 %, unless the employer can demonstrate that an unsafe oxygen level is not a possibility in the circumstance.
- A determination of whether the concentrations, levels or percentages referred to in (a), (b), and (c) can be maintained during the period of proposed occupancy of the confined space.
- A confirmation that any liquid in which the person may drown or any free-flowing solid in which a person may become entrapped has been removed from the confined space or that work practices have been established that specifically address the presence of the liquid or solid.
- A confirmation that entry of any liquid, free flowing solid or hazardous substance into the confined space that could endanger the health or safety of a person has been prevented by a secure means of disconnection, the fitting of blank flanges or the implementation of a double block and bleed written procedure established by the employer or similar positive actions.
- Confirmation that a machine, equipment, tool or electrical installation that presents a hazard to a person entering into, exiting from or occupying the confined space has been locked out.
- Confirmation that the opening for entry into and

exit from the confined space is sufficient to allow safe passage of a person using PPE or emergency equipment (Occup Safety Gen Regs, Sec. 130(8)).

- Items (a), (b), and (c) don't apply if there's no possibility that the hazard mentioned in the item may occur (Occup Safety Gen Regs, Sec. 130(9)).
- Where the tests required in Items #1 (a), (b), and (c) indicate that the concentration level or percentage referred to in those clauses can't be complied with, an employer must:
    - Ensure that, where reasonably practicable, the confined space is purged until concentrations are below the hazards referred to in Item #1(a) to (d); and
    - After the purging, ensure that the tests required under Item #1 are conducted again (Occup Safety Gen Regs, Sec. 132).
- An employer must ensure that no person enters or remains in a confined space where the tests conducted under Item #1(a) indicate that a concentration of a chemical substance or mixture of chemical substances in the confined space equals or exceeds 50% of the lower explosive limit of the chemical substance or mixture of chemical substances (subject to the exception in Item #6 below) (Occup Safety Gen Regs, Sec. 133(1)).
- Where the concentration of a chemical substance or mixture of chemical substances may cause a flammable or explosive hazard, and where the tests conducted under Item #1(a) indicate that the concentration of the substance or substances in a confined space is between 10% and 50% of the lower explosive limit, an employer must:
    - Provide explosion-proof lighting and ensure that it's used where necessary; and
    - Ensure that the only work performed in the confined space is cleaning or inspecting and is

of such a nature that it doesn't create any source of ignition (Occup Safety Gen Regs, Sec. 133(2)).
    - Where the level of oxygen in a confined space is more than 22.5% and a person is to work in the confined space, an employer must ensure that the confined space does not contain any substance which would be classified as flammable and combustible material or as dangerously reactive material under the Controlled Products Regulations made under the Hazardous Products Act (Canada) (Occup Safety Gen Regs, Sec. 133(3)).
- Despite Item #4 above, where the tests conducted under Item #1(a) indicate that the concentration of a chemical substance or mixture of chemical substances in the confined space exceeds, or is likely to exceed, 50% of the lower explosive limit, measured at atmospheric conditions containing 20.9% oxygen, of the chemical substance or mixture of chemical substances and can't be lowered below that prescribed threshold level, a person may enter the confined space if the employer ensures that:
    - The atmosphere is confirmed inert by a competent person after the performance of appropriate tests; and
    - The person is using appropriate protective equipment when working in the confined space (Occup Safety Gen Regs, Sec. 133(4)).

NORTHWEST TERRITORIES

- Before a worker is required or permitted to enter a hazardous confined space, an employer must appoint a competent individual to assess the hazards and if a potentially hazardous atmosphere has been identified, to test the atmosphere of the hazardous confined space for:

- Oxygen enrichment or deficiency.
- The presence of flammable or explosive substances, and (iii) the presence and concentration of hazardous airborne chemical substances.
- To determine whether:
    - Work activities or processes will result in the release of toxic, flammable, or explosive concentrations of substances during the worker's occupation of the confined space.
    - Measures have been taken to ensure that the worker will not drown or become entrapped in liquid or free-flowing solid present in the confined space.
    - The entry of liquid, free-flowing solid or hazardous substance into the confined space in a quantity that could endanger the health or safety of the worker has been prevented.
    - All energy sources that present a hazard to the worker entering into, exiting from or occupying the confined space have been locked out, with the energy sources being put in a zero energy state.
    - Any hazards from biological substances are present in the confined space, and (vi) the opening for entry into and exit from the confined space is sufficient to allow safe passage of the worker using required PPE (*OHS Regs*, Sec. 277(1)).
- If 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 must ensure that the hazardous confined space is:
    - Purged and ventilated before a worker is required or permitted to enter the space so that.

        - Any hazard associated with a toxic, flammable or explosive substance is reduced to the extent that is possible or eliminated, and
        - An oxygen content of between 19.5% and 23% is assured; and
    - Continuously ventilated while the worker occupies the hazardous confined space, to maintain a safe atmosphere (*OHS Regs*, Sec. 280(1)).
- If ventilation is used to reduce or eliminate a hazard under Item #2, an employer must ensure that a competent individual tests the atmosphere to determine that the confined space is safe for entry by workers:
    - Before workers enter the confined space.
    - If all workers have vacated the confined space, before any worker re-enters the confined space.
    - On the request of a worker required or permitted to enter the confined space.
    - Continuously if a condition in the confined space could change and put the workers' health or safety at risk (*OHS Regs*, Sec. 280(2)).
- If a hazardous confined space can't be purged and ventilated to provide a safe atmosphere or a safe atmosphere can't be maintained in accordance with Items #2 and #3, an employer must ensure that work isn't carried out in the confined space unless it's carried out in accordance with the requirements listed in Items #5 to #9 below (*OHS Regs*, Sec. 281(1)).
- An employer must ensure that a competent individual continuously monitors the atmosphere in a hazardous confined space (*OHS Regs*, Sec. 281(2)).
- An employer must ensure that a worker is provided with and required to use a respiratory protective device that meets the requirements of Part 7 of the Regs. if:
    - The airborne concentration for a substance meets or exceeds the permissible contamination limit set

out in Schedule O of the Regulations.
    - Oxygen deficiency or enrichment is detected.
    - The airborne concentration of any other substance could be harmful to the worker (*OHS Regs*, Sec. 281(3)).
- If a flammable or explosive substance is present in the atmosphere of a work site at a level that is more than 20% of the lower explosive limit of that substance, an employer must not require or permit a worker to enter into or work at the work site (*OHS Regs*, Sec. 403(1)).
- Exception: Item #7 doesn't apply to:
    - A properly trained fire fighter; or
    - A competent worker who meets the requirements of Item #9 below and who's acting in an emergency situation at the work site (*OHS Regs*, Sec. 403(2)).
- An employer must ensure that:
    - A competent worker referred to above is trained, equipped, and works according to an approved standard.
    - The training required is provided by a competent person.
    - A written record is kept of that training (*OHS Regs*, Sec. 403(3)).

NUNAVUT

- Before a worker is required or permitted to enter a hazardous confined space, an employer must appoint a competent individual to assess the hazards and if a potentially hazardous atmosphere has been identified, to test the atmosphere of the hazardous confined space for:
    - Oxygen enrichment or deficiency.
    - The presence of flammable or explosive substances, and (iii) the presence and concentration of hazardous airborne chemical substances.

        - To determine whether:
            - Work activities or processes will result in the release of toxic, flammable or explosive concentrations of substances during the worker's occupation of the confined space.
            - Measures have been taken to ensure that the worker will not drown or become entrapped in liquid or free-flowing solid present in the confined space.
            - The entry of liquid, free-flowing solid or hazardous substance into the confined space in a quantity that could endanger the health or safety of the worker has been prevented.
            - All energy sources that present a hazard to the worker entering into, exiting from or occupying the confined space have been locked out, with the energy sources being put in a zero energy state.
            - Any hazards from biological substances are present in the confined space, and (vi) the opening for entry into and exit from the confined space is sufficient to allow safe passage of the worker using required PPE (OHS Regs, Sec. 277(1)).
    - If 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 must ensure that the hazardous confined space is:
        - Purged and ventilated before a worker is required or permitted to enter the space, so that:
            - Any hazard associated with a toxic, flammable or explosive substance is reduced to the extent that is possible or eliminated, and
            - An oxygen content of between 19.5% and 23%

is assured; and
    - Continuously ventilated while the worker occupies the hazardous confined space, to maintain a safe atmosphere (OHS Regs, Sec. 280(1)).
- If ventilation is used to reduce or eliminate a hazard under Item #2, an employer must ensure that a competent individual tests the atmosphere to determine that the confined space is safe for entry by workers:
    - Before workers enter the confined space.
    - If all workers have vacated the confined space, before any worker re-enters the confined space.
    - On the request of a worker required or permitted to enter the confined space.
    - Continuously if a condition in the confined space could change and put the workers' health or safety at risk (OHS Regs, Sec. 280(2)).
- If a hazardous confined space can't be purged and ventilated to provide a safe atmosphere or a safe atmosphere can't be maintained in accordance with Items #2 and #3, an employer must ensure that work isn't carried out in the confined space unless it's carried out in accordance with the requirements listed in Items #5 to #9 below (OHS Regs, Sec. 281(1)).
- An employer must ensure that a competent individual continuously monitors the atmosphere in a hazardous confined space (OHS Regs, Sec. 281(2)).
- An employer must ensure that a worker is provided with and required to use a respiratory protective device that meets the requirements of Part 7 of the Regs. if:
    - The airborne concentration for a substance meets or exceeds the permissible contamination limit set out in Schedule O of the Regulations.
    - Oxygen deficiency or enrichment is detected.
    - The airborne concentration of any other substance could be harmful to the worker (OHS Regs, Sec. 281(3)).

- If a flammable or explosive substance is present in the atmosphere of a work site at a level that is more than 20% of the lower explosive limit of that substance, an employer must not require or permit a worker to enter into or work at the work site (OHS Regs, Sec. 403(1)).
- Exception: Item #7 doesn't apply to:
    - A properly trained firefighter.
    - A competent worker who meets the requirements of Item #9 below and who's acting in an emergency situation at the work site (OHS Regs, Sec. 403(2)).
- An employer must ensure that:
    - A competent worker referred to above is trained, equipped, and works according to an approved standard.
    - The training required is provided by a competent person.
    - A written record is kept of that training (OHS Regs, Sec. 403(3)).

ONTARIO

- An employer must appoint a person with adequate knowledge, training, and experience to perform adequate tests as often as necessary before and while a worker is in a confined space to ensure that acceptable atmospheric levels are maintained in a confined space in accordance with the relevant entry plan (*Conf Spaces Reg*, Sec. 18(1)).
- If the confined space has been both unoccupied and unattended, tests must be performed before a worker enters or re-enters (*Conf Spaces Reg*, Sec. 18(2)).
- The employer must ensure that atmospheric hazards in confined spaces are controlled via ventilation, purging, rendering the atmosphere inert, or other adequate means, in accordance with the

relevant entry plan.

- The employer must ensure that no worker enters or remains in a confined space that contains or is likely to contain an airborne combustible dust or mist whose atmospheric concentration may create a hazard of explosion (*Conf Spaces Reg*, Sec. 19(3)).
- The employer must ensure that no worker enters or remains in a confined space that contains or is likely to contain an explosive or flammable gas or vapour, unless one of the following applies:
    - The worker is performing only inspection work that doesn't produce a source of ignition. In the case of an explosive or flammable gas or vapour, the atmospheric concentration is less than 25% of its lower explosive limit, as determined by a combustible gas instrument.
    - The worker is performing only cold work. In the case of an explosive or flammable gas or vapour, the atmospheric concentration is less than 10% of its lower explosive limit, as determined by a combustible gas instrument.
    - The worker is performing hot work. All the following conditions are satisfied:
        - In the case of an explosive or flammable gas or vapour, the atmospheric concentration is less than 5% of its lower explosive limit, as determined by a combustible gas instrument.
        - The atmosphere in the confined space doesn't contain and isn't likely to contain while a worker is inside, an oxygen content greater than 23% by volume.
        - The atmosphere in the confined space is monitored continuously.
        - The entry permit includes adequate provisions for hot work and corresponding control measures.

        - An adequate warning system and exit procedure are provided to ensure that workers have adequate warning and are able to exit the confined space safely if either or both of the following occur:
            - In the case of an explosive or flammable gas or vapour, the atmospheric concentration exceeds 5% of its lower explosive limit.
            - The oxygen content of the atmosphere exceeds 23% by volume (*Conf Spaces Reg*, Sec. 19(4)).
- Items #4 and #5 above don't apply if:
    - The atmosphere in the confined space:
        - Has been rendered inert by adding an inert gas, and
        - Is monitored continuously to ensure that it remains inert; and
    - A worker entering the confined space uses:
        - Adequate respiratory protective equipment.
        - Adequate equipment to allow persons outside the confined space to locate and rescue the worker if necessary.
        - Such other equipment necessary to ensure the worker's safety (*Conf Spaces Reg*, Sec. 19(5)).
- The equipment mentioned in Item #6 (b) (i), (ii), and (iii) above must be inspected by a person with adequate knowledge, training and experience, appointed by the employer, and must be in good working order before the worker enters the confined space (*Conf Spaces Reg*, Sec. 19(6)).
- If atmospheric hazards exist or are likely to exist in a confined space, the confined space must be purged, ventilated, or both, before any worker enters, to ensure that acceptable atmospheric levels are maintained in the confined space while any worker is inside (*Conf Spaces*

Reg, Sec. 20(2)).

- If mechanical ventilation is required to maintain acceptable atmospheric levels, an adequate warning system and exit procedure must also be provided to ensure that workers have adequate warning of ventilation failure and are able to exit the confined space safely (*Conf Spaces Reg*, Sec. 20(3)).
- If compliance with Item #8 above is not practical in the circumstances for technical reasons:
    - Compliance with Item #9 is not required.
    - A worker entering the confined space must use:
        - Adequate respiratory protective equipment.
        - Adequate equipment to allow persons outside the confined space to locate and rescue the worker if necessary.
        - Such other equipment necessary to ensure the worker's safety (*Conf Spaces Reg*, Sec. 20(4)).
- The equipment mentioned in Item #10(b)(i), (ii), and (iii) above must be inspected by a person with adequate knowledge, training and experience, appointed by the employer, and must be in good working order before the worker enters the confined space (*Conf Spaces Reg*, Sec. 20(5)).

PRINCE EDWARD ISLAND

- An employer must ensure that a confined space in which there exists or is likely to exist (A) a hazardous accumulation of gas, vapour, dust, mist, smoke, or fumes; or (B) an oxygen content of less than 19.5% or more than 23% at atmospheric pressure, is entered only when:
    - The requirements for entry listed in Section 13.2 of the Regs. and sentinel requirements listed

in Section 13.5(a) are met.
    - The space is purged and ventilated to provide a safe atmosphere.
    - Provisions for continuous or periodic monitoring have been established to ensure that the hazardous condition doesn't recur (*OHS Act Gen Regs*, Sec. 13.3).
- If the gas or vapour in a confined space is or is likely to be explosive or flammable, the employer must ensure that a confined space is entered only where:
    - The concentration of the gas or vapour in a confined space doesn't or isn't likely to exceed 50% of its lower explosive limit.
    - The only work performed is cleaning or inspecting and other work of such a nature not to create any sources of ignition (*OHS Act Gen Regs*, Sec. 13.4(1)).
- Cold work may be performed in a confined space which contains or is likely to contain an explosive or flammable gas or vapour where the concentration doesn't and isn't likely to exceed 10% of its lower explosive limit (*OHS Act Gen Regs*, Sec. 13.4(2)).

QUÉBEC

- No worker may enter or be present in an enclosed area unless it's ventilated either by natural or mechanical means such that the following atmospheric conditions are maintained:
    - The concentration of oxygen must be greater than or equal to 19.5% and less than or equal to 23%.
    - The concentration of inflammable gases or vapours must be less than or equal to 5% of the lower explosion limit.
    - The concentration of one or more

contaminants must not exceed the standards for such contaminants listed in Schedule I of the Regs. (*OHS Regs*, Sec. 302).

- If it proves impossible by ventilating the enclosed area to maintain an internal atmosphere in compliance with the above standards, a worker may only enter or be present in this area:
    - If they wear a respirator that meets the standards listed in Division VI.
    - If the internal atmosphere of this enclosed area complies with Item #1, subparagraph (b) (*OHS Regs*, Sec. 302).
- No worker may enter or be present in an enclosed area where there are combustible dusts posing a risk of fire or explosion unless the safety of the worker is ensured by the implementation of one of the following procedures:
    - By maintaining and controlling such dusts at a safe level.
    - By controlling existing ignition sources in the enclosed area associated with the training of the worker, by a qualified person, on the methods and techniques for performing the work safely.
    - By making the atmosphere in the enclosed area inert, associated with the worker wearing a respirator in accordance with Division VI and the training of the latter in compliance with subparagraph (b) immediately above (*OHS Regs*, Sec. 303).
- Wherever hot work is performed in an enclosed area, a worker may only enter or be present if the following conditions are met:
    - The conditions listed under Items #1 to #3 above.
    - A continuous monitoring of the concentration of inflammable gases and vapours found therein is carried out by a direct reading instrument equipped with an alarm (*OHS Regs*, Sec. 304).

- Where risks associated with the atmosphere are identified, readings of the oxygen concentration in the enclosed area as well as of inflammable gases and vapours and contaminants measurable by direct reading and likely to be present in the enclosed area or nearby must be made:
    - Before workers enter the enclosed area and, subsequently, on a continuous or periodic basis, according to the evaluation of the danger made by a qualified person.
    - If circumstances modify the internal atmosphere of the enclosed area and result in the evacuation of workers due to the fact that the quality of the air no longer complies with the standards set out in subparagraphs (a) to (c) of Item #1.
    - If the workers leave the enclosed area and the work site, even momentarily, unless continuous monitoring is maintained.
    - When an atmospheric risk other than those identified in accordance is identified and likely to modify the internal atmosphere of the confined space, such as the introduction of a product or material that may emit toxic or flammable gases or vapours (*OHS Regs*, Sec. 306).

SASKATCHEWAN

- Before a worker is required or permitted to enter a confined space, an employer must appoint a competent person to assess the hazards and if a hazardous atmosphere is identified, to test the atmosphere of the confined space for:
    - Oxygen enrichment or deficiency.
    - The presence of flammable or explosive substances.
    - The presence and hazardous concentration of

airborne chemical substances.

- To determine whether:
    - Work activities or processes will result in the release of toxic, flammable, or explosive concentrations of any substances during the worker's occupation of the confined space.
    - Measures have been taken to ensure that a worker won't drown or become entrapped in any liquid or freeflowing solid present in the confined space.
    - The entry of any liquid, freeflowing solid or hazardous substance into the confined space in a quantity that could endanger the health or safety of the worker has been prevented.
    - All energy sources that present a hazard to a worker entering into, exiting from or occupying the confined space have been locked out, with the energy sources being put in a zero-energy state.
    - Any hazards from biological substances are present in the confined space.
    - The opening for entry into and exit from the confined space is sufficient to allow safe passage of a worker using PPE required by the regulations (*OHS Regs*, Sec. 18-5(1)).
- If 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 must ensure that the hazardous confined space is:
    - Purged and ventilated before a worker is allowed to enter the space, so that:
        - Any hazard associated with a toxic, flammable or explosive substance is reduced to the extent possible or

eliminated; and
        - An oxygen content of not less than 19.5% and not more than 23% is ensured; and
    - Continuously ventilated at all times the worker occupies the hazardous confined space, to maintain a safe atmosphere (*OHS Regs*, Sec. 18-8(1)).
- If ventilation is used to reduce or eliminate a hazard, an employer must ensure that a competent person tests the atmosphere to determine that the confined space is safe for entry by a worker:
    - Before a worker enters the confined space.
    - If all workers have vacated the confined space, before any worker reenters the confined space.
    - On the request of a worker required or permitted to enter the confined space.
    - Continuously if any condition in the confined space may change and put the worker's health or safety at risk (*OHS Regs*, Sec. 18-8(2)).
- If a hazardous confined space cannot be purged and ventilated to provide a safe atmosphere or a safe atmosphere can't be maintained in accordance with the above requirements, an employer must ensure that no work is carried on in the confined space except in accordance with Items #5 and #6 below and the requirements for atmospheric flammable and explosive substances listed in Section 2511 of the Regs. (*OHS Regs*, Sec. 18-9(1)).
- An employer must ensure that a competent person continuously monitors the atmosphere in a hazardous confined space (*OHS Regs*, Sec. 18-9(2)).
- An employer must ensure that a worker is provided with and required to use a respiratory protective device that meets the requirements of Part 7 if:
    - The airborne concentration for any substance meets or exceeds the permissible contamination limit listed in 216(1)(a) of the Regulations.

- Oxygen deficiency or enrichment is detected.
- The airborne concentration of any other substance may be harmful to the worker (*OHS Regs*, Sec. 18-9(3)).

YUKON

- Pre-entry testing in a confined space with a low hazard atmosphere must be conducted where:
  - A more hazardous atmosphere could develop.
  - The effectiveness of isolation and pre-entry control is required.
  - Representative sampling has demonstrated that the confined space doesn't meet the low hazard atmosphere definition (WSC Regs, Sec. 2.19).
- While a worker is inside a confined space with a moderate hazard atmosphere or high hazard hazard atmosphere, additional testing must be conducted as necessary to ensure the worker's continuing safety (WSC Regs, Sec. 2.20(1)).
- Whenever practicable, the atmosphere in the confined space must be continuously monitored (WSC Regs, Sec. 2.20(2)).
- Where a worker enters a confined space with a moderate or high hazard atmosphere, the atmosphere must be continuously monitored where a flammable or explosive atmosphere in excess of 20% of the lower explosive limit could develop (WSC Regs, Sec. 2.20(3)).
- Where testing has shown that hazards from a contaminated atmosphere may exist in a confined space:
  - The possible hazards from a contaminated atmosphere inside a confined space and those from a dead end of an isolated line must be controlled by cleaning, purging or venting, and
  - The atmosphere of the controlled confined space must be re-tested before a worker enters the

space (WSC Regs, Sec. 2.21).

- Where clean respirable air can’t be assured in a confined space before a worker’s entry:
    - Workers entering the space must be provided with and use appropriate PPE including respirators.
    - The concentration of flammable gases must be maintained below 20% of the lower explosive limit.
    - All ignition sources must be eliminated or adequately controlled where flammable or explosive gas vapours or liquids are present (WSC Regs, Sec. 2.22).
- Workers may only enter and work in a confined space which has been inerted if:
    - A pre-project meeting has been held between the project supervisor and an officer.
    - A comprehensive safe work procedure has been developed and will be followed.
    - Entry precautions meet the requirements of high atmosphere hazards, except for the requirement for continuous ventilation.
    - Workers are equipped with and use appropriate supplied-air respiratory protective equipment.
    - All ignition sources are controlled.
    - The atmosphere inside the confined space remains inerted while workers are inside (WSC Regs, Sec. 2.23).
- Each confined space must be ventilated continuously while a worker is inside the space, except in:
    - An atmosphere intentionally inerted in accordance with Item #7 above.
    - A low hazard atmosphere controlled in accordance with Item #9 below.
    - An emergency rescue, where ventilation is not practicable (WSC Regs, Sec. 2.24).
- Each worker inside a confined space with a low hazard

atmosphere must be atmosphere supplied with a minimum of 85m3/hr (50 cfm) of clean respirable air, except where:

    - The atmosphere is continuously monitored and shown to contain clean respirable air, or
    - The space has an internal volume greater than 1.8 cubic metres (64 cu. ft.) per occupant, is occupied for less than 15 minutes, and the work inside the space generates no contaminants other than exhaled air (WSC Regs, Sec. 2.25).

- Concentrations of airborne contaminants in a confined space must be controlled and maintained below the applicable exposure limits by mechanical ventilation systems (WSC Regs, Sec. 2.26(1)).
- Mechanical ventilation systems must be designed, installed and maintained in accordance with established engineering principles and as specified in the written procedures (WSC Regs, Sec. 2.26(2)).
- Ventilation equipment must be located and arranged to ensure adequate ventilation inside the confined space (WSC Regs, Sec. 2.26(3)).
- Where a contaminant is produced in a confined space, it must be controlled at the source by a local exhaust ventilation system if practicable, by general (dilution) ventilation, or by a combination of both (WSC Regs, Sec. 2.26(4)).
- Where practicable, mechanical ventilation systems must maintain concentrations of airborne contaminants below the applicable exposure limits (WSC Regs, Sec. 2.26(5)).
- Concentrations of airborne contaminants in a confined space may be controlled by natural ventilation systems (WSC Regs, Sec. 2.27(1)).
- Where natural ventilation is used in a confined space, the rate of airflow through the space must be monitored to ensure that it’s sufficient to maintain concentrations of airborne contaminants

below the applicable exposure limits (WSC Regs, Sec. 2.27(2)).

- Natural ventilation must not be used:
    - To ventilate a confined space that has a high hazard atmosphere, or
    - Where such ventilation could draw air other than clean respirable air into the confined space (WSC Regs, Sec. 2.27(3)).