

Christchurch City Council – Confined Space Entry Protocol

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Introduction and Scope

This Protocol sets the minimum standards required for workers entering confined spaces owned and/or operated by Christchurch City Council (CCC). It applies to workers, meaning our employees, contractors and sub-contractors.

The overall aim of this Protocol is to ensure the safe entry, work and exit from a confined space for those workers.

The requirements outlined in this Protocol align with the Australian Standard 2865:2009 Confined Spaces. Compliance is expected with the full Standard as our Regulator, WorkSafe NZ, accepts AS 2865:2009 as the current state of knowledge and practice when it comes to confined space entry work in New Zealand.

Objectives

The objective of the Protocol is to eliminate the need to enter confined spaces, or where this is not practicable:

- a. Provide for the health and safety of all workers who need to enter confined spaces by preventing exposure to hazards which may otherwise be experienced when working in a confined space, and thereby prevent collapse, injury, illness or death arising from exposure to those hazards: and
- b. Ensure all CCC workers who require entry are consistent and follow the same procedures, have the right knowledge, experience and equipment to do so safely.

Definitions

Competent Person: A person who has, through a combination of training, education and experience, acquired knowledge and skills enabling that person to perform a specified task correctly.

Confined Space: (As defined in AS 2865:2009) A confined space is an enclosed or partially enclosed space that is not intended or designed primarily for human occupancy, within which there is a risk of one or more of the following:

- a. An oxygen concentration outside the safe oxygen range.
- b. A concentration of airborne contaminants that may cause impairment, loss of consciousness or asphyxiation.
- c. A concentration of airborne contaminants that may cause injury from fire or explosion.
- d. Engulfment in a stored free-flowing solid or a rising level of liquid that may cause suffocation or drowning.

Confined spaces include but are not limited to tanks, vessels, silos, storage bins, hoppers, vaults, pits, manholes, tunnels, ductwork, pipework etc.

See Appendix 1 for Identification of Confined Spaces Flowchart

Contaminant: Any dust, fume, mist, vapour, gas, biological matter or any other substance in liquid or solid form, the presence of which may be harmful to health and safety.

Engulfment: The immersion or envelopment of a person by a solid or liquid that is stored within the confined space.

Explosive Limit:

Lower Explosive Limit (LEL) - The concentration of a flammable contaminant in air below which the propagation of a flame does not occur on contact with an ignition source.

Upper Explosive Limit (UEL) - The concentration of the contaminant in air above which the propagation of a flame does not occur on contact with an ignition source.

Flammable Range: The range of flammable contaminant (percentage by volume) in air in which an explosion can occur upon ignition. Expressed by lower explosive limit (LEL) and upper explosive limit (UEL).

Impairment: The condition of being unable to safely conduct a task because of physical or mental unfitness.

Stand-by person: A competent person assigned to remain on the outside of, and in proximity to, the confined space and capable of being in continuous communication with and, if practical, observing those inside. In addition, where necessary, the competent person may operate and monitor equipment for the safety of personnel in the confined space and initiate emergency response.

Confined Space Entry Procedures

Use of Permit to Work (PTW) Systems

Workers entering a CCC confined space can do so under a formally recognised Permit to Work (PTW) system such as that of the CCC Wastewater Treatment Plant (CWTP), City Care Ltd or Fulton Hogan. That PTW system however, must have the following components and processes as a minimum:

- Documented and assigned accountabilities and responsibilities for all aspects of the confined space entry, work and exit.
- A risk assessment (often the permit document) that clearly identifies all hazards, associated risk levels and adequate controls.
- Information on gas detection levels and isolations.
- Emergency response plans.
- Consultation processes for those involved in the actual confined space work.
- Identified training and competency requirements for all involved in the confined space work.
- A named permit issuer (trained and assessed as competent as an issuer).
- A named permit receiver (trained and assessed as competent as a receiver).
- Named permit users (all trained and assessed as competent as a user).
- A named observer/spotter (trained and assessed as competent as an observer/spotter).
- A documented monitoring process that is applied regularly to ensure standards at the confined space site are occurring as intended.
- A documented audit system that is applied regularly to ensure standards in the overall PTW system are satisfactorily maintained.

Site Supervisor for Confined Space Entry

For all confined space entries there must be an appointed and named Confined Space supervisor who is responsible for the entire confined space entry, work and exit. The Confined Space Entry Form/Risk Assessment template (see Appendix 1) will be used as the risk assessment for this work.

No person is to enter a confined space without an approved Permit to Work with a Confined Space Entry certificate.

Roles and Responsibilities in CCC Confined Space Work

Confined Space Supervisors are responsible for the overall confined space entry, work and exit as well as:

- Ensuring that all processes outlined in the Confined Space Entry Form/Risk Assessment are in line with the HSW Act 2015, the Regulations 2016 and AS/NZ 2865-2009.
- Ensuring the Confined Space Entry Form/Risk Assessment has been completed adequately and completed by all those involved in the confined space entry (e.g. workers, observers, rescue p).
- Ensuring all those involved in the confined space entry are trained based on the training requirements outlined in this Protocol.
- Ensuring that the documentation includes any foreseeable precautions or instructions necessary for safe entry and the execution of work.
- Ensuring calibrations, function checks are completed and battery levels are up to date/correct for all equipment used in the confined space entry.
- Inspecting the confined space before entry is made.
- Inspecting the confined space on completion of work
- Keeping a copy of the Confined Space Entry Permit for future inspection.

Workers, Spotters/Observers, Rescue Personnel are responsible for:

- Participating in the completion of the Permit to Work Confined Space Entry certificate.
- Participating in the confined space work as written in the Confined Space Entry Permit by following the agreed processes and wearing and using PPE as intended.
- Communicating with the Spotters and following any instructions of the Spotter.
- Keeping to the plan of work, Confined Space Entry Form/Risk Assessment and emergency procedures.

Spotters/Observers/Standby Persons are responsible for:

- Participating in the completion of the Permit to Work Confined Space Entry certificate
- Remaining in constant contact with persons in the confined space.
- Ensure the area in and around the confined space remains safe.
- Knows what to do in the event of an emergency.
- Has access to emergency services.
- Advises evacuation when necessary and raises alarm.
- Able to effect immediate rescue if set up.
- First Aid duties
- Documents gas test results on the Permit to Work Confined Space Entry certificate.
- **Ensuring they never enter the confined space.**

Training and Competency Requirements for CCC Confined Space Work

All persons who enter a confined space shall be trained and assessed as competent to perform those activities. Training is required for the supervisor of any confined space entry work. **A refresher course must be attended at least every two (2) years.**

Training must be completed by a recognised training provider who will train and assess to the required NZQA Unit Standards in Confined Space. The course **must also have a practical component** so that participants experience a confined space entry. The course must cover:

- Relevant legislation and standards
- Hazards/risks relating to work in or near confined spaces
- Safe work practices including isolation/lockout methods
- Emergency Response Procedures
- Selection, use, maintenance and fitting of personal protective equipment
- Observer or Spotter responsibilities
- Gas detection

Confined Space Entrants must hold the following NZQA Confined Space Unit Standards:

- 17599 – Plan a Confined Space Entry
- 18426 – Demonstrate knowledge of hazards associated with confined spaces
- 25510 – Operate an atmospheric testing device to determine a suitable atmosphere to work safely **OR**
- 3058 – Perform Gas tests for an energy and chemical plant
- 17596 – Safety Observer
- 19207 – Enter, work in and exit a confined space in the water industry (optional)

Only trained specialists will be permitted to work in oxygen deficient environments and require the certification listed below. They will also have training in rescue procedures, CPR and First Aid.

- 25044 – Wear and Operate Compressed Air Breathing Apparatus in the Workplace

Hazard and Risk Management

Prior to any person entering a confined space the Confined Space Supervisor must ensure that where practicable all potentially hazardous service normally connected to that space are purged (cleaned), ventilated, cooled down, isolated and/or locked out and tagged where practicable, to prevent:

- a. The introduction of any contaminants or conditions harmful to the confined space workers.
- b. The activation or energising in any way of equipment or services that may pose a risk to the confined space workers.

Potential Hazards

Hazardous Atmospheres: The most common risk in a confined space is an atmosphere outside of the safe oxygen range, toxic or flammable.

To maintain a safe working environment in a confined space the oxygen level must be between 19.5% and 23.5%

An oxygen deficient atmosphere has less than 19.5% of available oxygen. This can be caused by fire, rust or oxidation of other substances, displacement by other gases and respiration.

Any confined space with less than 19.5% oxygen must not be entered without the appropriate training, equipment and rescue plan.

An oxygen enriched atmosphere has more than 23.5% oxygen inside. There is a greatly increased risk of fire, explosion or spontaneous combustion if a fuel and ignition source is present.

Toxic atmospheres can contain gases, vapours, dust or fumes that can be poisonous to people. Sewage and other rotting organic materials produce hydrogen sulphide and carbon monoxide. Other toxic substances may have been spilled or dumped into a sewer system. Cleaning, painting or welding may produce dangerous vapours or fumes. All are hazardous, even more so in a confined space. Workplace exposure standards should be referred to in determining safe levels. See Appendix 3 for the Workplace Exposure Standards for some gases common to CCC.

Falls from Height: Where there is a potential for a worker to fall from any height, reasonable and practicable steps must be taken to prevent harm from resulting (e.g. wearing of safety harness connected to a winch).

Engulfment: Workers can be trapped or buried by a liquid or substances that can be inhaled and cause death by strangulation, constriction or crushing. Where this risk exists, the worker must wear a safety harness and be connected to a lifeline to ensure an immediate rescue is achieved.

Falling Objects: Workers in confined spaces should be aware of the possibility of falling objects, especially in spaces which have top-side openings and where work is being done above the worker.

Temperature Extremes: Extremely hot or cold temperatures are dangerous for workers and can lead to hyper or hypothermia. For example, if the space has been steam cleaned, it should be allowed to cool before entry is made.

Noise: Noise within a confined space can be amplified because of the design of the space. Excessive noise cannot only damage hearing but can also affect communication such as a shouted warning to go unheard.

Slick/Wet Surfaces: Slips and falls can occur on wet surfaces causing injury or death to workers. Also, a wet surface will increase the likelihood and severity of electric shock in areas where electrical circuits, equipment and tools are used.

Biological Hazards: Bacteria, viruses or fungi may be present in the confined space. Always follow good personal hygiene practices and wash hands and face before eating, drinking or smoking.

Moving Equipment: Augers, rotating or moving parts such as conveyer belts must be locked out to prevent trapping or crushing.

Drowning: Tide and weather will impact storm water levels and need to be carefully monitored. Other potential sources for liquid or solid will need to be managed in line with risk management procedures.

Confined Space Entry Risk Assessment

All confined space entries shall take place under the Permit to Work procedure. The risk assessment shall be undertaken by the permit receiver before undertaking any works associated with the confined space. The risk assessment will consider the following:

- Potential and actual hazards/risks associated with the confined space.
- Tasks required to be conducted, including the need to enter the confined space.
- The range of methods by which the tasks can be conducted.
- The hazards and associated risks of the method and equipment selected.
- Emergency response procedures
- Competence of the persons to undertake the tasks.

Other templates may be used (e.g. permits relating to a formal Permit to Work system) but only on the provision they have the same or higher standard as this CCC document and align with the AS/NZ 2865-2009 (Confined Space) as a minimum.

Each entry within that day may require further atmospheric testing that must be recorded and each entrant recorded on the certificate. On completion of the shift the Confined Space Entry certificate shall be suspended. The Confined Space Entry certificate allows for up to six work shifts, after which a new Permit will need to be issued. Should the work continue the following day, a new Confined Space site inspection shall be completed and approved by the supervisor.

Hazard & Risk Controls

The hierarchy of control measures are:

1. Elimination
2. Substitution
3. Isolation
4. Engineering Controls
5. Administrative Controls
6. Personal Protective Equipment (PPE)

PPE should only be used as a last resort when all other controls have failed to adequately control the risk.

Basic equipment to be available is:

- Gas detector (calibration up to date)
- Permit to Work with Confined Space certificate
- Protective clothing
- First Aid equipment
- Rescue Equipment (with inspection/maintenance programme up to date)
- Hygiene and wash up equipment
- Communications equipment

Persons to be available at the work site for the duration of the work are:

- Supervisor – holds current competency (can enter the confined space)
- Spotter/Observer/Standby person – holds current competency (must **not** enter the confined space)
- Workers entering confined space – holds current competency
- Rescue personnel – holds current competency (can also be the observer/spotter)

Securing a safe atmosphere

Atmospheric monitoring is mandatory prior to each entry into a confined space and at regular intervals (15-30 mins) throughout the entry. Monitoring levels must be recorded on the Confined Space certificate document by the observer.

The testing of the atmosphere with gas detection instruments, for contaminants (i.e. hydrogen sulphide and carbon monoxide), percentage (%) LEL and oxygen must be carried out from outside the confined space. Identify other likely contaminants to monitor by reviewing the hazards identified and the risk assessment that has been done.

Before a person enters a confined space, it shall be ensured that:

- The oxygen levels are within the safe range (19.5% - 23.5%)
- Atmospheric contaminants are below the relevant workplace exposure standards
- The concentration of flammable contaminant is below 5% of its lower explosive limit (LEL)
- The confined space is free from extreme temperatures
- Engulfment of any sort cannot occur

Only when test results show the confined space is safe, should normal entry be considered.

Continuous personal atmospheric monitoring for the presence of contaminants and safe oxygen levels is also mandatory in all Christchurch City Council confined spaces while they are occupied.

Where it is not practicable to provide a safe oxygen level, or atmospheric contaminants cannot be reduced to safe levels, no person enters the confined space unless they are equipped with and trained in the use of self-contained breathing apparatus.

Gas detection equipment should be recalibrated at regular intervals according to the manufacturer's instructions (e.g. six monthly). A pre-use test (as per manufacturer's instructions) is to be run daily (when being used) to check the instrument is working correctly.

Securing the space from engulfment

Precautions should be taken to prevent potentially dangerous materials from entering the confined space while workers are inside. The safest course is to completely disconnect the space from every other item of plant and seal off every inlet pipe. If isolation is not possible, and the space is likely to be contaminated during occupancy, continuous ventilation and monitoring is required. A rescue plan must also be in place and understood by all workers.

All materials - solids, liquids or gases - which are liable to present a hazard inside the space must be removed. Potentially dangerous materials may be trapped in sludge, scale or behind loose linings or brickwork. Special care should therefore be exercised and cleaning processes adopted to meet each set of circumstances. With steam-volatile substances, steam cleaning will be found to be effective to remove residue. Always allow confined space to return to an acceptable temperature prior to entry. Forced ventilation with a blower fan is the recommended method of displacing contaminated air.

Emergency Specialist Work

In some unforeseen circumstances it may be necessary for an untrained person to enter a confined space. In this instance, the site supervisor who has completed the confined space entry training must be name accompany the untrained person throughout the confined space entry, work and exit.

The untrained person entering the space must be given the necessary information (hazards/risks, control measures, rescue requirements) for entering and working in a CCC confined space. They must also be named on the Permit to Work's Confined Space entry certificate.

Safety Equipment Requirements

Equipment Maintenance Programme

The employer must ensure that, where practicable, the safety equipment is appropriate to the work being carried out in the confined space, is part of a regular, documented maintenance programme and is inspected by an independent qualified person. The employer must ensure that the PPE and rescue equipment provided is selected and fitted to suit the individual.

In addition, all equipment used in any confined space entry will be inspected prior to use each day by the workers. Inspections will ensure the equipment maintenance programme is up to date, no equipment is past its expiry date and the equipment is fit for purpose in good working order.

The supervisor of the confined space entry is responsible for ensuring the daily inspection occurs.

Safety Harness

Safety harnesses, safety lines and rescue lines must comply with AS/NZS1891.4:2009 and be stored, inspected and maintained in accordance with this standard. Harnesses must be worn in accordance with the risk assessment carried out prior.

As part of the risk assessment it is important to ensure that this equipment would not introduce a hazard or unnecessarily hinder free movement within the confined space. If free movement could be hindered, alternative plans should be arranged for rescue and fall arrest.

Respiratory Protective Devices

The aim is to achieve a safe atmosphere where respirators are not necessary. If this is not practicable then an appropriate respirator should be considered. The person/s must be fitted with a respirator by a suitably qualified person.

Air-purifying respirators offer no protection against oxygen deficient or oxygen rich environments. To safeguard against dusts, fumes and mists, respirators must be fitted with particulate filters. To protect against chemical vapours and gases, respirators must be fitted with the appropriate chemical filter. Some atmospheres require respirators fitted with a combination of both.

NOTE: There are no filters suitable for protection against hydrogen sulphide gas.

Self-contained breathing apparatus are the only form of respiratory protection suitable for rescue purposes. Only those with specialist training in the use of SCBA gear can use them.

For further information see the WorkSafe NZ Guideline 'A Guide to Respiratory Protection', AS/NZS 1716:2012 Respiratory Protective Devices, AS/NZS 1715:2009 Selection, Use and Maintenance of Respiratory Protective Devices.

Other Equipment

Hard hats, safety goggles, face shields, gloves, safety footwear, disposable coveralls, ear/hearing protection, non-sparking flashlights and tools may also be needed when entering a confined space. Where possible and practicable, tools should be rated as intrinsically safe.

Retrieval Equipment

When it is recognised as part of the risk assessment that retrieval equipment is necessary to facilitate entry and exit, a proper retrieval system for workers and equipment must be in place. Proprietary systems are available consisting of a heavy duty-duty lifeline, tripod and personnel winch.

All equipment must be carefully checked before use. Harnesses or retrieval lines showing any signs of wear should not be used.

The selection of the type of safety or rescue line, storage and maintenance should be in accordance with AS/NZS 1891.4:2009.

Ladders and tripods

Ladders and tripods should be checked to ensure they are firmly secured to prevent movement during use. A maintenance programme must be in place for all equipment. Portable ladders should comply with AS/NZS 1892. All equipment should be inspected prior to use.

Communication

Communication is most effective when it is continuous and uninterrupted. The Standard recommends clear visual contact as the primary method of communication. This provides instant awareness of any emergency situation and rapid initiation of emergency procedures.

Appropriate systems of communication between spotters and workers should be in place and understood by all prior to commencing works. These can include voice, rope tugging, tapping or battery-operated communications especially designed for confined space use. Note that radio frequency/wireless do not work well in spaces where there is metal or concrete shielding between the interior of the space and the outside.

Body alarm devices may be useful in a confined space where communication between workers and safety observers is difficult. These are designed to sound if a wearer does not move for a specified period.

Be aware that in some instances electrical communication may introduce an ignition source in a flammable atmosphere. Where possible, equipment used should be intrinsically safe.

Always have a back up method of communication in case the primary one is lost.

Closing Out on Completion of Confined Space Work

All tasks inside the confined space must cease and all persons have exited prior to the PTW being closed out.

Emergency Procedures

All contingencies for emergencies within the confined space shall be evaluated and the necessary equipment to handle any response is available and on site. Appropriate emergency response and first aid procedures and provisions shall be planned, established and rehearsed.

Should an emergency occur within a confined space, follow these steps for rescue:

1. Call 111, request Fire Service assistance. Inform the dispatcher of the situation including whether breathing apparatus or other special equipment is required.
2. If the confined space is safe to enter (based upon air quality monitoring, available personnel and equipment and risk assessment of current circumstances) then suitable personnel may enter to administer first aid. Any new entrant must wear appropriate safety equipment.
3. Assist emergency services as required.

In an emergency, the spontaneous reaction to immediately enter and attempt to rescue a person from a confined space may lead to the deaths or serious injury of those attempting the rescue. Most fatalities are from people trying to rescue others.

No persons are to enter a contaminated atmospheric space to carry out retrieval of an unconscious person unless they have been trained in the use of SCBA equipment, have it available and are wearing it.

Monitoring Site Work

Monitoring of work at the confined spaces should occur on a regular basis to ensure safe work practices are being used and the processes on the Permit are being adhered to.

The Project Manager, or manager for which the work is being done, is responsible for ensuring this monitoring occurs periodically and is documented.

Auditing Systems

Auditing of the management systems used in CCC Confined Space Work (e.g. this protocol or any PTW systems in use) should occur periodically to ensure the systems and related documentation remain adequate and current with legislation.

Documentation

All completed Confined Space work permits, and any other associated documentation will be kept indefinitely by the supervisor responsible for the confined space entry. This is for the purpose of monitoring and audit by CCC and/or request form the Regulator, WorkSafe NZ.

References and Appendices

References

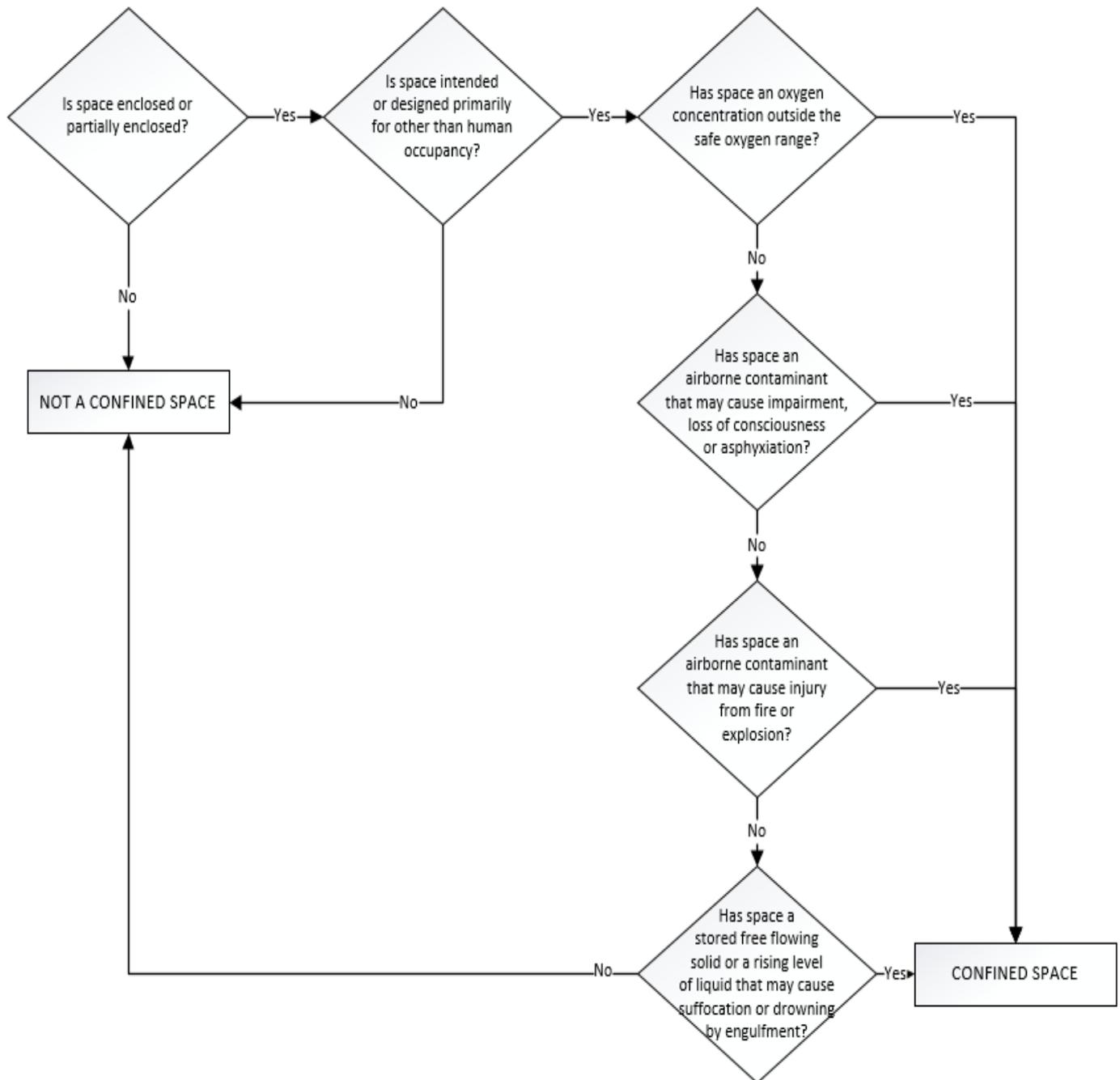
- AS 2865:2009 – Confined Spaces
- AS/NZS 1716:2012 – Respiratory Protective Devices
- AS/NZS 1715:2009 – Selection, Use and Maintenance of Respiratory Protective Devices
- WorkSafe Factsheet – [Confined Spaces: Planning entry and Working Safely in a Confined Space](#)
- WorkSafe Guideline – [A Guide to Respiratory Protection](#)
- National Guidelines for Health and Safety in the NZ Water Industry

Appendices

1. Confined Space Identification Flowchart
2. CCC Risk Matrix
3. Workplace Exposure Standards

Appendix 1

From AS/NZS 2865-2009



Appendix 2

NEW RISK MATRIX		Severity	Insignificant	Minor	Moderate	Major	Severe
		People	No harm (No Lost Time Injury)	Minor harm (Requiring first aid, Lost Time Injury < 3 days)	Moderate harm (Requiring medical treatment Lost Time Injury > 4-15 days)	Harm (Resulting in incapacity – permanent absence, Lost Time Injury > 15 days)	Death or permanent harm
Consequences		Environment	Nuisance, notifications from other parties eg noise complaint	Hazard contained without third party/external assistance	Hazard contained with third party assistance-no detrimental effects	Hazard with potential detrimental effects e.g fire that spreads beyond initial area	Toxic release or hazard requiring evacuation and causing damage to property, access, reputation
		Asset	Cost overrun or reduction in revenue 2% per site	Cost overrun or reduction in revenue > 2-4% per site	Cost overrun or reduction in revenue > 4-7% per site	Cost overrun or reduction in revenue > 7-10% per site	Cost overrun or reduction in revenue > 10% per site
		Reputation	Individual verbalised complaint - no management required	Individual negative feedback – managed locally	Potential for event complaint or media interest – possibly resulting in negative media and reputational damage	Event complaint or negative media article. May result in reputational damage	Serious reputational damage caused by major incident or media exposure.
Likelihood	Certain	Is expected to occur on a regular basis (Most weeks or montly)	Medium	High	Extreme	Extreme	Extreme
	Almost Certain	Is likely to occur several times a year	Low	Medium	High	Extreme	Extreme
	Likely	Will possibly occur (May happen every one to two years)	Low	Medium	Medium	High	Extreme
	Unlikely	Unlikely to occur (Could occur at some time in two to five years)	Low	Low	Medium	High	Extreme
	Highly Unlikely	May occur in exceptional circumstances (May happen every five to twenty years)	Low	Low	Low	Medium	Extreme

Appendix 3

Name	Symbol	TWA Time Weighted Average	STEL Short Term Exposure Limit	Ceiling	Vapour Density	Lower Explosive Limit	Upper Explosive Limit
Ammonia	NH ₃	20ppm	40ppm	-	0.58	15%	28%
Carbon Dioxide	CO ₂	5000ppm	30,000ppm	None recommended, first alarm often set at 10,000ppm	1.53	-	-
Carbon Monoxide	CO	20ppm	100ppm	200ppm	0.97	12.5%	74%
Chlorine	Cl	0.5ppm	1ppm	-	2.5	-	-
Difluoromethane	R-32	-	-	-	1.86	14.4%	31%
Hydrogen Cyanide	HCN	1ppm	-	5ppm	0.93	5.6%	40%
Hydrogen Sulphide	H ₂ S	5ppm	10ppm	-	1.19	4%	44%
Methane	CH ₄	-	-	-	0.6	5%	15%
Methyl Mercaptan	CH ₄ S	0.5ppm	N/A	-	1.66	3.9%	21.8%
Oxygen	O ₂	-	-	-	1.0	-	-
Sulphur Dioxide	SO ₂	-	0.25ppm	-	2.2	-	-