



## Couple of takeaways

- Confined spaces may present several unique risks including, engulfment, unsafe oxygen levels, harmful airborne contaminants, and explosive atmospheres, amongst others.
- A confined space permit and SWMS are important administrative controls that must be in place before entering a confined space.
- All persons entering a confined space must be confined space trained and qualified.
- A safety observer must be assigned for all confined space work



## What is this procedure for?

This document describes the process that ensures that confined spaces are appropriately identified, planning undertaken before work is carried out and ensures the health and safety of all workers who enter or work in confined spaces.



## What are the roles and responsibilities?

**Asset owner** shall request work to be done.

**Planner / scheduler** shall plan and schedule the work

**Work authoriser** shall authorise the work to be done

**Line manager** shall

- Use this procedure to make the determination that the work is “confined space” work and reassess where necessary
- Ensure that a proper risk assessment is made, in consultation with the workers who are to enter the confined space
- Ensure a confined space entry permit is issued to the workers who are to enter / work in the confined space
- Approve the use of breathing apparatus before it is used

**PIC or Worker with direct control of work** in the confined space shall

- Use this procedure to make the determination that the work is “confined space” work and reassess where necessary
- Ensure the confined space entry permit is revalidated if:
  - **The PIC or worker with direct control of work** in the confined space changes
  - A break in work continuity occurs
  - Changes are made to the work that introduces hazards not addressed by the current permit
  - New control measures are needed.

## **Safety observer** shall

- Be assigned to continuously monitor the wellbeing of those inside the confined space
- Know where emergency equipment is located at site and how it is used
- If practicable observe the work being carried out
- Be compliant with the requirements set out under the safety observer section of this procedure
- Always remain at the site. If the safety observer needs to leave the site for any valid reason, another worker shall take over the role by signing on to the permit before the former leaves the site
- Initiate appropriate emergency procedures when necessary.

## **Assistant** shall

- Be always stationed outside the confined space to light-up the blowpipe, adjust the gas supply, if required, and to render any other assistance required by the operator
- Observe the operator, the work and work area and, in the case of Emergency, close the gas supply and take the necessary emergency action.

## **Competent person** shall

- Determine if a work area is a confined space
- Identify, assess, and control any risks associated with the confined space
- Service and maintain the instruments / equipment e.g. gas and vapour detectors, flammable gas monitors, sound pressure level meters etc.

- Use breathing apparatus
- Be issued with appropriate special equipment such as safety harnesses, fall arrest systems, lifelines etc. if required for entry to a confined space.

## **Workers or instructed persons** shall

- Be appropriately trained and competent
- Not enter a confined space unless they understand the hazards and risks present and the controls implemented and are signed onto the current confined space entry permit
- Not enter a confined space unless they are in contact with the safety observer
- Know where emergency equipment is located at site and how it is used
- Comply with any reasonable instructions given relating to confined space entry permits, risk control measures and emergency procedures

Carry out work in a confined space in accordance with this procedure and any relevant training provided to them.

## **WHS Team** shall

- Coordinate the WHS risk assessments
- Maintain and review WHS documentation
- Communicate and provide training in the application of WHS processes.

# Confined Spaces

## How can a confined space be determined?

Must select YES to all 3 of the first 3 questions	Y	N
Is the space enclosed or partially enclosed?	<input type="checkbox"/>	<input type="checkbox"/>
Is the space not designed intended to be occupied by a person?	<input type="checkbox"/>	<input type="checkbox"/>
Is the space designed or intended to be at normal atmospheric pressure while any person is in the space?	<input type="checkbox"/>	<input type="checkbox"/>
Must select YES to at least 1 (one) of the next 3 questions		
Does the space present a risk from harmful airborne contaminants or contaminants that may cause fire or explosion?	<input type="checkbox"/>	<input type="checkbox"/>
Does the space present a risk from an unsafe oxygen level?	<input type="checkbox"/>	<input type="checkbox"/>
Does the space present a risk from engulfment?	<input type="checkbox"/>	<input type="checkbox"/>
Is this classified as a confined space?	<input type="checkbox"/>	<input type="checkbox"/>

Table: How is a confined space determined

## What is a confined space and confined space criteria?

Confined spaces are commonly found on Hydro Tasmania group worksites inside the penstock / spiral case, tanks, pits, pressure vessels, wet or dry wells, some dewatering pits, shafts, trenches, tunnels or other similar enclosed or partially enclosed structures, when these examples meet the confined space definition.

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, confined space.

### What is not a confined space?

The following kinds of workplaces are also generally not confined spaces for the purposes of the WHS Regulations:

- Places that are intended for human occupancy and have adequate ventilation, lighting and safe means of entry and exit, such as workshops, offices, and other general work areas
- Enclosed or partially enclosed confined spaces that are designed to be occupied by a worker if the confined space has a readily and conveniently accessible means of entry and exit via a doorway at ground level e.g. alternator enclosure or the turbine pit
- Trenches are not considered confined spaces based on the risk of structural collapse alone but will be confined spaces if they potentially contain concentrations of airborne contaminants that may cause impairment, loss of consciousness or asphyxiation.

# Confined Spaces

## Confined space criteria – Hydro Tasmania group examples

Table 1: Confined space criteria – Hydro Tasmania group examples are provided to show how to apply the confined space definition criteria only. The worksites and tasks listed have been generalised for this procedure. Each worksite / work area / confined space / task shall be considered as part of the risk assessment process.

	Confined Space Criteria						Confined Space?
Description of the Confined Space and activity	A	B	C	D			If the answer to A, B, C and at least one of D is yes, then the Space is a Confined Space.
	Is the Confined Space enclosed or partially enclosed?	Is the Confined Space not designed or intended to be occupied by a Worker?	Is the Confined Space designed or intended to be, at normal atmospheric pressure while any Worker is in the Confined Space	Does the Confined Space present a Risk from:			
				Harmful airborne or flammable contaminants?	An unsafe oxygen level?	Engulfment?	
Penstock or spiral casing entry for the purpose of inspection.	✓	✓	✓	✗	✗	✓	Yes
Penstock or spiral casing for the purpose of grit blasting or painting.	✓	✓	✓	✓	✓	✓	Yes
Placing head and upper body in a transformer to work on internal connections	✓	✓	✓	✓	✓	✗	Yes
Entering an alternator enclosure while operational.	✓	✗	✓	✗	✗	✗	No
Dislodging a sludge blockage in a drain / dewatering pit.	✓	✓	✓	✓	✓	✓	Yes
Entering a short adit to take V-Notch readings.	✓	✓	✓	✗	✗	✗	No
Installing insulation in a roof cavity	✓	✓	✓	✗	✗	✗	No

Table 1: Confined Space Criteria - HT Examples

## Tunnels and adits

Hydro Tasmania group manage and work in many tunnels and adits some of which are a “normal” place of daily work such as an underground

power station. Underground power stations are not classified as a confined space because it is a confined space that is a designated place of work.

Underground tunnels primarily used to transport water for the purposes of electricity generation are occasionally entered by workers and contain many hazards including those which would define the worksite as a confined space.

Underground tunnels such as diversion tunnels may meet the definition of a confined space depending on the work to be performed. This determination will be made as part of the job risk assessment. Consideration will need to be given to the length of the tunnel, access and the presence of gasses either introduced or naturally occurring such as carbon dioxide (CO<sub>2</sub>), and hydrogen sulphide (H<sub>2</sub>S).

NOTE: each worksite / work area / confined space / task shall be assessed using the confined space criteria.

## Risk assessment

A risk assessment shall be conducted in line with hazard identification and operational risk management procedure by a competent person to identify, assess and control any risks associated with the confined space. The risk assessment shall be in writing and consider the following as a minimum:

- The hazards of the confined space
- The 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 involved and associated risks involved with the actual method selected and equipment proposed to be used
- Emergency response plans
- The competence and accreditation of the workers to conduct the tasks.



## What are the process details?

### Confined space work process

- First the work is requested and then identify if the work area is a confined space.
- If it is not a confined space, then continue using normal safe work practices.
- If yes, then prepare a SWMS.
- Obtain a confined space entry permit.
- Complete atmospheric testing and evaluation.
- Check if breathing apparatus is required. If yes, then engage confined space specialists.
- If not required, then evaluate method of entry.
- Select and obtain PPE and rescue equipment's.
- Assign safety observer.
- Undertake work in confined space and continue to monitor atmospheric conditions.
- Close confined space entry permit and relinquish.
- File documentation.



## What are the hazards associated with confined space?

### Restricted entry or exit

Small entrances and exits make it difficult to rescue injured workers or to get equipment in or out of the confined space. In some cases, entrances and exits may be very large but their location can make them difficult to access.

### Harmful airborne contaminants

Airborne contaminants may be present in confined spaces which can be harmful to workers, including airborne gases, vapours, and dusts. These contaminants may be present due to:

- Substances stored in the confined space
- Work performed in the confined space introducing contaminants such as exhaust gases, other gases such as nitrogen and paint fumes
- Entry of natural contaminants e.g. groundwater and gases into the confined space from the surrounding land, soil or strata
- Release of airborne contaminants due to disturbance / agitation
- The manufacturing process (residues) and
- Entry and accumulation of gases and liquids from adjacent plant, installations, services, or processes

### Unsafe oxygen level

Air normally contains 20.9% oxygen by volume, although oxygen levels of 19.5% — 23.5% by volume are safe although any variation to a “normal” oxygen range should be investigated as it could be caused by the

introduction of other gasses. Some situations can cause the level of oxygen to decrease, leading to an oxygen-deficient atmosphere. This may occur if oxygen in the atmosphere is:

- Displaced by other biologically generated gases
- Displaced through purging the confined space with an introduced gas
- Depleted due to rust / oxidation
- Consumed during combustion
- Absorbed or reacts with grains, wood chips, soil or chemicals in sealed silos.

Too much oxygen is also a hazard and can increase the risk of fire or explosion. Oxygen-enriched atmospheres may occur if:

- Chemical reactions cause the production of oxygen or
- There is a leak of oxygen from an oxygen tank or fitting while using oxy-acetylene equipment.

### Fire and explosion

A flammable atmosphere can present a risk of fire or explosion when a flammable gas, vapour or mist reaches its lower explosive limit (LEL). Gas detectors configured to monitor flammable gasses are set to alarm at 5% of the LEL. A flammable atmosphere may result from flammable materials used in the confined space, a chemical reaction (such as the formation of methane in sewers), or from the presence of combustible dust (such as that in flour silos). If an ignition source, such as a sparking electrical tool or static on a worker, is introduced into a confined space containing a flammable atmosphere, an explosion is likely to result.

## Engulfment

Engulfment means to be swallowed up in or be immersed by material, which may result in asphyxiation.

## Working in confined spaces

### Safe Method Work Statement (SWMS)

Work in a confined space is classified as high-risk construction work as defined in the section 291 of the WHS regulations and is therefore required to have a SWMS developed and used to assist with control of the risk associated with the work.

## Evaluation atmosphere

Atmospheric testing or monitoring shall be conducted in a manner consistent with the hazards identified in the risk assessment of the confined space. An initial test may be all that is required depending on the risk assessment or continuous monitoring may be used. Preference should be given to continuous monitoring.

The atmosphere inside the confined space is tested to:

- Determine if the oxygen level inside is within the safe oxygen range (19.5% to 23.5%)
- Confirm that flammable or toxic gases identified in the risk assessment as a hazard do not exceed the Australian Exposure Standards, or present undue risk.

When evaluating the atmosphere inside the confined space:

- Sufficient time shall be allowed for an electronic gas detector to sample the atmosphere effectively prior to entry
- Samples shall be taken from several areas / levels particularly in still air environments to detect layering
- Every attempt shall be made to carry out the initial atmospheric testing from outside the confined space prior to entry
- Every attempt shall be made to ensure the atmosphere inside the confined space is safe prior to entry
- Results from atmospheric contaminants shall be recorded on the confined space entry permit
- On completion of work peak readings should be recalled and recorded on the confined space entry permit
- If during evaluation of a confined space, a reading with a +/- 1% deviation from 20.9% is detected, the work party shall consider possible causes of the deviation. If the reason can be explained and there is no risk of the atmosphere of the confined space falling outside of the safe oxygen range, then the work can continue. For other circumstances, the reason shall be further investigated, and a suitable remedy identified prior to entry or work continuing.

Where the oxygen level inside is not safe to enter and/or harmful contaminants are present, then a risk assessment is made to determine whether it is practicable to use artificial ventilation. If so, install an approved type of ventilation and re-test the confined space.

In some cases, purging and further cleaning may be required to establish a safe atmosphere. Purging must not be done with any gas or gas mixture containing more than 21% oxygen. If it is not practicable to clean and purge, then another risk assessment is made to determine whether self-

contained breathing apparatus can be used by the workers to enter or work inside.

Note: Equipment such as gas and vapour detectors, flammable gas monitors, sound pressure level meters etc., shall be serviced and maintained as per the specifications given by the manufacturer or the applicable Australian Standard. Also, such equipment shall be subjected to a periodic calibration at a frequency specified by the manufacturer at an approved laboratory and records of such calibrations should be maintained by a competent person who is responsible for servicing and maintenance of the instruments / equipment.

## Breathing apparatus

Where the risk assessment identifies a need, appropriate breathing apparatus may be required to safely carry out work in a confined space. **Line Manager** approval shall be gained before using breathing apparatus. Breathing apparatus is to be used by a competent person(s) only and appropriate controls implemented which may require the engagement of a high risk confined space specialist.

## Evaluation of entry mode

**The Line Manager** is to ensure that a proper risk assessment is made, in consultation with the workers who are to enter the confined space, on the mode of entry to the confined space.

If no special equipment is identified by the risk assessment for entry mode, then normal entry is made under a confined space permit by wearing the appropriate PPE.

## Selection of PPE and emergency equipment

Minimum PPE requirements apply, and the risk assessment will document any additional PPE requirements.

The emergency equipment shall be documented in the risk assessment and be appropriate to the work to be carried out in the confined space. Emergency equipment for confined space emergencies shall be selected and made available to suit the site requirements and be maintained in proper working condition.

The location of the emergency equipment shall be documented in the site emergency response plan and workers entering the confined space (including the **Safety Observer**) shall be familiar with its location and on how the equipment is to be used.

## Confined space entry permits

No worker shall enter a confined space unless the worker has signed on to a current confined space entry permit and complies with the requirements of entry / work in a confined space (see – confined space entry permit).

**The Line Manager** is responsible to ensure a confined space entry permit is issued to the workers who are to enter / work in the confined space. A confined space entry permit provides a formal check to ensure all elements of a safe system of work are in place before workers are allowed to enter the confined space. It also provides a means of communication between **site management, supervisors and those carrying out the work.**

## A confined space entry permit:

- Shall be completed for each confined space



- May be issued for more than one day
- Shall be revalidated if:
  - **The Worker with Direct Control of Work** in the confined space changes
  - A break in work continuity occurs
  - Changes are made to the work that introduce hazards not addressed by the current permit
  - New control measures are needed.

Entry / work in a confined space a worker is deemed to have “entered” a confined space when their head i.e. the breathing zone or upper body is within the boundary of the confined space.

No person shall enter a confined space unless the person:

- Is in possession of a current confined space qualification appropriate for the work certificate
- Is wearing PPE identified through the SWMS
- Is aware of the hazards present in the confined space
- Is in contact with the **Safety Observer** stationed outside the confined space
- Has ensured that appropriate emergency response and first aid procedures and provisions as identified through the SWMS are planned, established, and rehearsed to the level required
- Has ensured the confined space is ventilated sufficiently prior to entry and a process installed to monitor the atmosphere during occupancy to ensure the quality of air in the confined space is always maintained to the acceptable levels
- All other controls identified in the SWMS for the work are followed.

Note: Prior to any worker entering a confined space and during any occupancy of confined space, appropriate signs and protective barriers shall be erected to prevent entry of workers not involved in the work.

## Safety Observer

Before a worker enters a confined space, a **Safety Observer** must be assigned to continuously monitor the wellbeing of those inside the confined space, and if practicable observe the work being carried out and initiate appropriate emergency procedures when necessary.

## A Safety Observer must:

- Be trained and assessed as competent in confined spaces
- Understand the nature of the hazards inside the confined space
- Ensure all workers entering the confined space understand the requirements of the SWMS, confined space entry permit, and other relevant permits and have signed on to those permits. The **Safety Observer** must also ensure that entrants sign off the confined space entry permit when leaving the confined space
- Ensure the confined space entry permit is displayed in a prominent place adjacent to the entry, to facilitate signing and clearance
- Monitor the confined space and the occupants and not be distracted from this task
- Maintain contact with the occupants in the confined space (verbal, line of sight, two-way radios, etc.)
- Record gas testing results on the confined space entry permit
- Ensure emergency procedures are in place prior to workers entering confined space and have all required rescue equipment immediately available

- Monitor equipment or conditions outside the confined space, to ensure the health and safety of workers in the confined space (e.g. ventilation, running vehicles and weather)
- Initiate emergency response if required
- Notify the occupants of any emergencies / alarms / sirens happening outside of the confined space and
- Never enter the confined space to attempt rescue.

The **Safety Observer** is to remain at the site at all times. If the **Safety Observer** needs to leave the site for any valid reason, another worker shall take over the role by signing on to the permit before the former leaves the site.

## Introduced hazards / hot work

When special works e.g. welding works, have to be carried out inside a confined space, the risk assessment shall take into account the additional hazards introduced into the confined space by these works and they need to be addressed accordingly e.g. if welding is to be carried out inside the confined space, a hot work permit shall be used. See AS 4839: The safe use of portable and mobile oxy-fuel gas system for welding, cutting, heating and allied processes.

- For confined space working, the cylinders shall be kept outside the confined Space, clear of the entry, and in a well-ventilated area
- Extra care shall be taken to ensure that there are no leaks in the system and that the equipment is working properly
- Provision shall be made to extract fumes. The confined space worker shall, where necessary, be provided with a suitable supplied air respirator and a supply of breathing air

- An assistant shall be always stationed outside the confined space to light-up the blowpipe, adjust the gas supply, if required, and to render any other assistance required by the operator
- An assistant shall observe the operator, the work and work area and, in the case of emergency, close down the gas supply and take the necessary emergency action. If the equipment is not to be used for a substantial time, such as lunch breaks or overnight, then the relevant shutdown procedure should be followed (see AS 2865: Confined Spaces).

Note: When not in use, the blowpipe shall be extinguished and removed from the confined space after ensuring that the cylinder valves are closed tight.

## Signage

To ensure easy identification, all confined spaces listed in the workplace hazard register are to be permanently signposted. Any other confined space identified as a confined space through a risk assessment done for a particular task is to be signposted for the duration of the works only to warn against unauthorised access.

Signs must warn against entry by workers other than those who are listed on the confined space permit and must be placed at each entrance to the confined space. Signs must be in place while the confined space is accessible, including:

- When preparing to work in the confined space
- During work in the confined space
- When packing up on completion of the work.



## How do we manage emergency procedures?

A documented emergency response and rescue plan shall be in place with the SWMS. For complex confined space work, rescue scenarios shall be practised prior to commencing the work.



## What training is required?

A person shall not enter or work in a confined space unless the worker has undergone accredited training on “confined space work”. The training must be delivered by a registered training organisation. The training shall be current prior to the commencement of work involving a confined space. Refresher training must be done at three-yearly intervals as a minimum requirement.

Workers shall be trained and assessed as competent to:

- Enter or work in confined spaces
- Undertake hazard identification or risk assessment in relation to a confined space
- Implement risk control measures
- Issue permits
- Act as a **Safety Observer**
- Monitor conditions while work is being carried out
- Purchase equipment for confined space work
- Design or lay out a work area that includes a confined space.

Workers who are to use any other specialist work practices or equipment such as fall arrest systems and / or respiratory protective equipment must be appropriately trained and competent in the correct use of the equipment, maintenance, and storage requirements.

All training which is provided to a worker shall be recorded and such records shall be kept and maintained for the term of the worker’s employment with Hydro Tasmania group.



## What records are needed?

- A copy of the risk assessment related to the confined space work must be kept for a minimum of 28 days, or if a notifiable incident occurs in connection with the work to which the risk assessment relates, for at least 2 years after the incident occurs
- A copy of the permit must be kept until the work is completed, or if a notifiable incident occurs, for at least 2 years after the confined space work to which the permit relates is completed
- Training records must be kept for the term of the worker’s employment.

## Appendix: Risk assessment prompt list for hazard

### identification

#### Hazards

##### Chemical agents:

- Oxygen deficiency or excess
- Combustible gases, vapours, liquids, solids, sludges, fumes, or particulate
- Toxic gases or vapours (rotting vegetation, or fish resulting in H<sub>2</sub>S or low O<sub>2</sub> CH<sub>4</sub>, Rust, Algae, etc.)
- Potentially explosive dusts or other contaminants
- Potential work generated contaminants (exhaust fumes, glues, paints, chemical reactions etc.).

##### Physical agents:

- Thermal extremes
- Noise
- Fire or explosion
- Entrapment or engulfment
- Potential work generated risks to health & safety
- Radiation
- Flooding
- Operation of moving equipment
- Uncontrolled introduction of steam, water or other gas or liquid

- Suffocation by solids
- Drowning in liquids
- Inappropriate manual handling
- Falls, trips or slips
- Inadequate lighting
- Opening obstructed which could impede rescue
- Risk assessment
- How will access be gained
- Awareness that conditions may vary and the need for continuous monitoring
- Types of clothing and equipment required for the work
- Need for respiratory protective device
- Need for safety harness and line
- Need for emergency lighting
- Need for communication equipment
- Number of workers to enter confined space
- Number of safety observers
- Trained workers for rescue and first aid
- The need for signposting or barricading
- Need for prohibition of smoking or naked flame within the confined space or surrounding area
- Need for communication between Safety Observers and back up Workers
- Need for emergency procedures, evacuation procedures, rescue drills, training etc.
- Provision and location of rescue equipment

# Confined Spaces

- Location of first aid equipment
- Provision of firefighting equipment
- Emergency exit entry procedures
- Isolation & access procedures
- Need for gas detectors
- Use of combustion engines inside confined spaces

Note: This list is not limited to the above only but may include additional requirements to meet special risks that may be considered during the risk assessment of the site concerned.