



# Confined Spaces



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## TABLE OF CONTENTS

<b>1. INTRODUCTION .....</b>	<b>3</b>
<b>2. DEFINITIONS AND RESPONSIBILITIES.....</b>	<b>3</b>
2.1 COMPETENT PERSON .....	3
2.2 CONFINED SPACE.....	4
2.3 CONFINED SPACE DEFINITION FLOW DIAGRAM .....	5
2.4 CONFINED SPACE RISK ASSESSMENT .....	6
2.5 CONFINED SPACE HAZARDS .....	6
2.6 CONFINED SPACE REGISTERS.....	6
2.7 RESTRICTED SPACE.....	7
2.8 CONTAMINANT.....	7
2.9 EXPLOSIVE (FLAMMABLE) RANGE .....	7
2.10 EXPOSURE STANDARD .....	7
2.11 HOT WORK.....	8
2.12 ISOLATING PERSON.....	8
2.13 MANAGER .....	8
2.14 PPM .....	8
2.15 RESCUE.....	8
2.16 STANDBY PERSON .....	8
2.17 WATCH PERSON .....	9
2.18 PERMIT AUTHORISER .....	9
2.19 PERMIT HOLDER.....	10
2.20 CONFINED SPACE ENTRY DATA SHEET .....	10
<b>3. PROCEDURE.....</b>	<b>10</b>



# Confined Spaces



3.1	CONFINED SPACE RISK ASSESSMENT AND FACILITATION .....	12
3.2	ADDITIONAL RISK FACTORS AND CONTROLS .....	15
<b>4.</b>	<b>CONFINED SPACE ENTRY OFF-SITE .....</b>	<b>17</b>
<b>5.</b>	<b>ISOLATION OF THE CONFINED SPACE .....</b>	<b>17</b>
5.1	GENERAL.....	17
5.2	METHODS OF PROCESS AND ELECTRICAL ISOLATION .....	18
<b>6.</b>	<b>RESCUE AND RETRIEVAL REQUIREMENTS .....</b>	<b>19</b>
6.1	EMERGENCY RESPONSE AVAILABILITY .....	20
<b>7.</b>	<b>ATMOSPHERIC REQUIREMENTS .....</b>	<b>20</b>
7.1	SAFE ATMOSPHERE.....	20
7.2	TESTING THE ATMOSPHERE IN A CONFINED SPACE .....	21
7.3	CSE IN AREAS WHICH MAY CONTAIN ASPHYXIANT GASES .....	22
7.4	ENTRY INTO CONFINED SPACES WITH AN UNSAFE ATMOSPHERE.....	22
7.5	EXPOSURE STANDARDS.....	23
7.6	VENTILATION REQUIREMENTS.....	24
<b>8.</b>	<b>CLEANING TASKS IN CONFINED SPACES.....</b>	<b>25</b>
8.1	GENERAL.....	25
8.2	HYDROJETTING (HP WATER GUN AND PUMP) .....	25
8.3	STEAM CLEANING .....	26
8.4	ABRASIVE BLASTING.....	27
8.5	CHEMICAL CLEANING .....	27
<b>9.</b>	<b>RECORD KEEPING .....</b>	<b>27</b>
<b>10.</b>	<b>REFERENCE MATERIAL.....</b>	<b>27</b>
	REFERENCES.....	27
	<b>APPENDIX 1 – VENTILATION DIAGRAMS .....</b>	<b>29</b>
	OPTIONS FOR VENTILATION OF CONFINED SPACES.....	29
<b>TABLES</b>		
	Table 1 - Exposure Standards for Various Gases .....	23
<b>FIGURES</b>		
	Figure 1 - confined space Rescue – Watch Person.....	32

## 1. INTRODUCTION

Before conducting any task that appears to require confined space entry (CSE) – the job shall be assessed to try and eliminate the need to enter the confined space or, where this is not practicable, minimise the time spent within the space.

When designing confined spaces – requirements for safe future entry, potential work and ventilation within the space shall be considered.

Work in confined spaces is always to be considered a serious activity with significant hazards. This guide manual specifies the requirements for ensuring the safety and health of personnel required to enter, or work in confined spaces by providing guidance and standards to control associated risks.

Adhering to this procedure is essential to prevent injury, illness or death arising from exposure to confined space hazards. It has been written to align with the requirements of AS2865-2009 confined spaces.



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This guide manual should be read in conjunction with Work Permit System ([CSBP-GM-11-031-51](#)).

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## 2. DEFINITIONS AND RESPONSIBILITIES

### 2.1 COMPETENT PERSON

A competent person is one who has, through a combination of training, education and experience, acquired knowledge and skills enabling that person to correctly perform tasks associated with Confined Space Entry. Training required for competence in Confined Space Entry is:

Passing the competency assessment associated with a 'Confined Space Entry course, developed to the National Competency Standard. Confined Space Entry training is delivered by WesCEF for Employees; Contractors must complete training with a Registered Training Organisation (RTO) to qualify them to perform Confined Space Entry.

Employees are required to ensure their core safety and technical competencies are maintained and that their knowledge and skills remain current at all times. Refresher training and/or a verification of competency (VOC) should be completed prior to a competency expiring or at any lesser interval if determined necessary. Contractors who have acquired qualification from an RTO will be required to provide evidence of competency attained within the last three years.

Roles identified as requiring competency in CSE:

- a. All Accountable Persons for contract work that involve confined space entry (this includes entry into excavations that are meeting the confined space definition).
- b. All Personnel that shall enter or be a Watch Person or Standby Person for a confined space entry.
- c. All Team Leaders for CBSP personnel that may have to enter a confined space.
- d. All CSBP Area Safety Advisors.

- e. Shift Supervisors.

All training records shall be available to CSBP personnel via on-site database or production of a card, certificate or sticker indicating competence.

## 2.2 CONFINED SPACE

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 contaminant that may cause impairment, loss of consciousness or asphyxiation.
- c. A concentration of flammable airborne contaminant 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.



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All confined spaces shall be sign posted, once opened, with the sign “CONFINED SPACE - ENTRY BY PERMIT ONLY”.

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At CSBP, confined spaces may include, but are not limited to:

- a. Storage tanks, road tankers, isotainers, process vessels, process drums and boilers.
- b. Bins and other tank-like compartments, usually having only an access hole for entry.
- c. Open-topped spaces such as pump pits and lixators, which are not subject to good natural ventilation.
- d. Pipes, tunnels, ducts and similar structures.

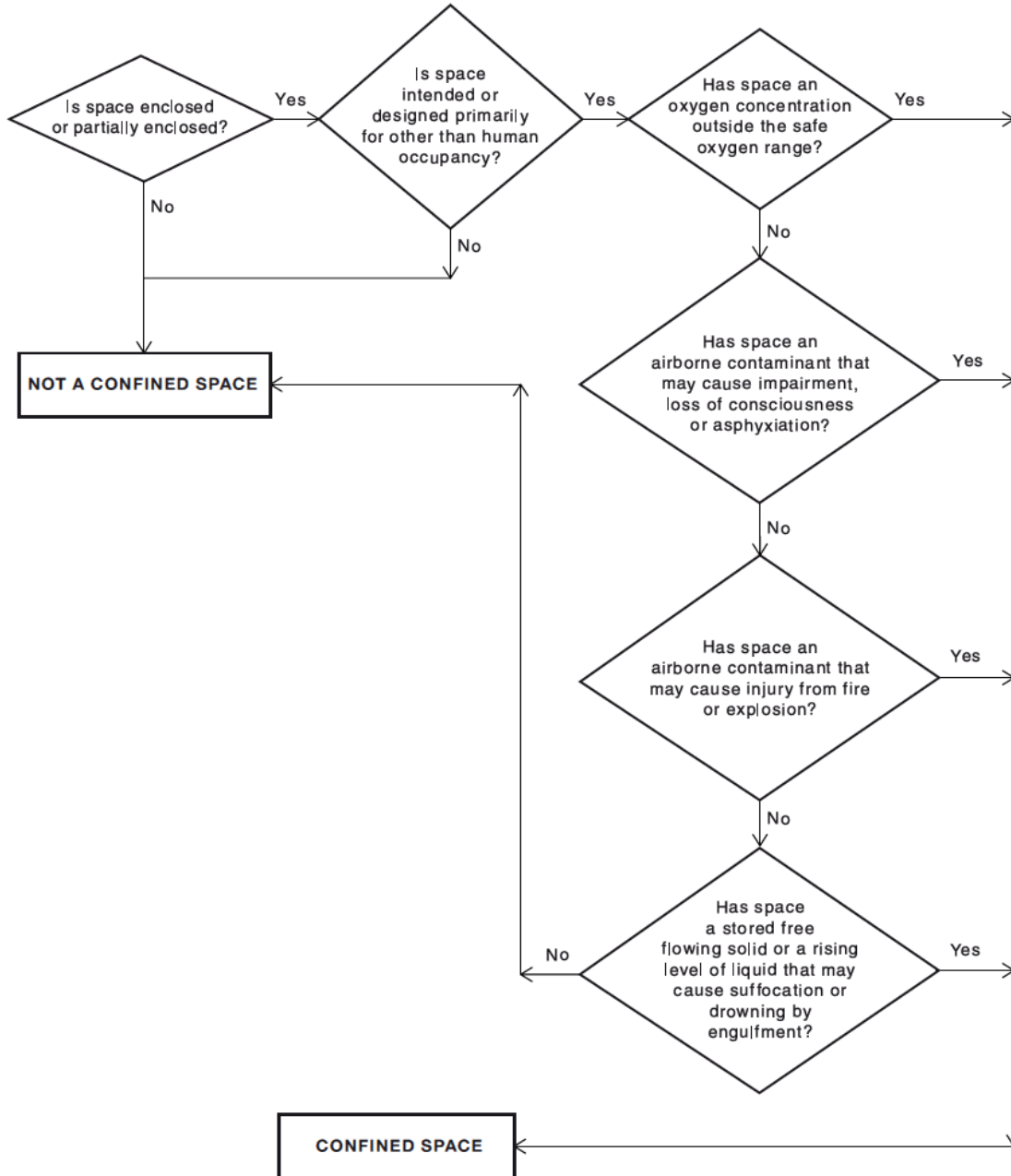


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Entry into a confined space is when a person’s head or upper body is within the boundary of the confined space.

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## 2.3 CONFINED SPACE DEFINITION FLOW DIAGRAM



Description of space	Physical characteristic		Identified hazards				Is the enclosed or partially enclosed space a potential confined space?
	Step A	Step B	Step C	Step D	Step E	Step F	
	Is space enclosed or partially enclosed?	Is space intended or designed primarily for other than human occupancy?	Could the atmosphere have oxygen concentration outside the safe oxygen range?	Could the atmosphere have a concentration of airborne contaminant that may cause impairment, loss of consciousness or asphyxiation?	Could the atmosphere have a concentration of flammable airborne contaminant that may cause injury from fire or explosion?	Could the atmosphere have a stored free-flowing solid or a rising level of liquid that may cause suffocation or drowning?	
	Requires A and B?		Required to have either C, D, E or F?				
Sewage pit	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Workshop welding bay	Yes	No	Yes	No	No	No	No
Boiler	Yes	Yes	Yes	Yes	Yes	Yes	Yes

**NOTES:**

- For an enclosed or partially enclosed space to be considered as a potential confined space, the following conditions apply: Confined Space = A + B + (C or D or E or F).
- The hazards identified in Steps C to F should be confirmed by risk assessment.

## 2.4 CONFINED SPACE RISK ASSESSMENT

A formal risk assessment must be completed prior to entry into any confined space. The risk assessment is Part 2 and 3 of the confined Space Data Sheet. Refer to section 3.

## 2.5 CONFINED SPACE HAZARDS

The major hazards of confined spaces include:

- a. Oxygen deficiency caused by:
  1. slow oxidation reactions of organic or inorganic substances
  2. rapid oxidation (combustion)
  3. dilution of the air with an inert gas
  4. absorption by chemicals or other products
  5. physical activity of personnel within the space.
- b. Oxygen excess in the caused by leaking oxygen supply such as gas cutting or heating equipment.
- c. The presence of contaminants on surfaces or in the atmosphere of the space. These contaminants can be solid, liquid, gas, vapours, fumes or particulates, refer Contaminants in Section 2.7.
- d. Operation of moving equipment within the space – conveyors, rotating or moving parts.
- e. Uncontrolled introduction of steam, water or other gas or liquid.
- f. Suffocation by solids e.g. fertiliser.
- g. Electrocution from live conductors within the space (conductors either inherent to the space or from introduced electrical equipment).
- h. Explosion or fire.

## 2.6 CONFINED SPACE REGISTERS

A register of all confined spaces shall be established and maintained by each area. The register is to be signed and dated by the Area / Department Manager, reviewed annually and displayed in the Control Room or other relevant section.

The register shall identify any likely contaminants within the confined space.



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Spaces that have the characteristic of a confined space, which are not listed on the confined space register can be classed as a confined space on review. Once classified as a confined space, entry will necessitate following this procedure.

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## 2.7 RESTRICTED SPACE

A restricted space is a space that does not meet all criteria of a confined space however still requires additional controls to ensure the safety of people working in that space.

An example of a restricted space is an instrument room where there is a potential for a hazardous environment but is also designed to be a place of work.

- a. Restricted spaces require:
  1. TBRA
  2. Safe work procedure
  3. Signage of restrictions and requirements.
- b. Controls may include:
  1. Permit to work
  2. Watch person
  3. Additional gas detection
  4. Radio contact
  5. Additional personal protective equipment

## 2.8 CONTAMINANT

Any dust, fume, mist, vapour, gas or other substance, in liquid or solid form, the presence of which may be harmful to safety and health. Sources of atmospheric contamination may include the manufacturing process itself, storage of materials (decomposition products) or the tasks performed within the space such as welding, painting or grinding.

Particular care shall be taken when disturbing sludge or scale as additional contaminants can be released.



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Recommended procedures for the conduct of general cleaning tasks (that is, removal of contaminants) in confined spaces are contained in Section 8 - Cleaning Tasks in confined spaces.

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## 2.9 EXPLOSIVE (FLAMMABLE) RANGE

The explosive (flammable) range is the range of mixtures of air and flammable vapour or gas, between the Lower Explosive Limit (LEL) and the Upper Explosive Limit (UEL). Refer to Hot Work [CSBP-GM-11-036-06](#)

## 2.10 EXPOSURE STANDARD

An exposure standard is the airborne concentration of a particular substance in the person's breathing zone, exposure to which, according to current knowledge, should not cause adverse health effects nor cause undue discomfort to most people.



Exposure Standards for some gases are shown in Table 1, Section 7.2.4

### 2.11 HOT WORK

Any work which involves the use of tools, equipment or techniques that could generate heat of sufficient intensity to ignite flammable gases, liquids, dusts or materials. Refer to Hot Work [CSBP-GM-11-036-06](#).

### 2.12 ISOLATING PERSON

As defined in Work Permit System ([CSBP-GM-11-031-51](#)).

### 2.13 MANAGER

The Manager shall be the Business Unit Manager or Department Manager and is responsible for ensuring that nominated the Permit Authoriser, Permit Holders, Persons entering confined spaces, Watch Persons and Standby Persons are competent to perform their confined spaces duties, and that they are familiar with this guide manual.

Also responsible for establishing the list of recognised confined spaces in their area, describing any contaminants or hazards specific to a confined space and having them recorded in a confined space register.

### 2.14 PPM

PPM means **P**arts of vapour or gas **P**er **M**illion parts of air by volume.

### 2.15 RESCUE

Confined space rescue can mean any action or a range of actions that are taken to protect a person within a confined space. Figure 1 - confined space Rescue – Watch Person Flow Chart; provides a guide as to what action is appropriate under certain circumstances. A Watch Person must understand and be able to action the flowchart requirements.

Confined space rescue is generally about planning what actions are necessary based on the risk of entering the space. The confined Space Data Sheet, Work Permit, confined space entry Certificate and the required JSA will establish appropriate controls.

### 2.16 STANDBY PERSON

A person appointed by the Permit Holder, where this has been determined as a requirement from risk assessment e.g. in the case of an irrespirable atmosphere, to enter the confined space on job rotation with personnel within the space. They shall be confined space trained and competent in any other requirements of the work.

**They cannot be the same person as the Watch Person.** In the event of a rescue situation occurring, and the Standby Person is not wearing BA, they can participate with the Watch Person to action a rescue from **outside the space** using an external retrieval system, prior to arrival of CSBP Emergency Response Team (ERT) or offsite emergency services.

- a. The Standby Person shall be fully trained and competent in confined space entry including:
  1. trained in the use of all respiratory equipment they may be required to wear or monitor,



2. their potential role in providing assistance during rescue.
- b. A Standby Person shall only be allowed to enter a confined space to assist in the rescue if:
    1. they are wearing full Breathing Apparatus, and
    2. there is another BA wearing Standby Person to relieve them at the access point on entry.

## 2.17 WATCH PERSON

A person appointed by the Work Permit Holder, and required in all cases of confined space entry, to;

- a. Monitor and control movements of equipment and personnel entering/leaving the confined space,
- b. Raise the alarm in an emergency and follow the requirements of the confined Space Rescue – Watch Person Flow Chart Prior to arrival of ERT or offsite emergency services.
- c. In the case where continuous monitoring of a confined space is required, the Watch Person must be familiar with the operation of the gas testing equipment.
- d. Be trained and competent in confined space entry.
- e. Have an understanding of CSBP radio protocols (refer [CSBP-GM-11-031-53](#)) and be able to monitor the personnel in the confined space via agreed signals, voice or radio.
- f. Be able to monitor any ventilation equipment and if monitoring BA they shall be trained in the use of that equipment.
- g. Be competent in any retrieval equipment nominated in the rescue plan section of the confined Space Entry Certificate.

A Watch Person cannot monitor more than one confined space at CSBP at the same time. The Watch Person shall not enter the confined space.



**The Watch Person is not allowed to enter the confined space under any circumstance. Many confined space Watch Persons have died entering a confined space to attempt rescue.**

## 2.18 PERMIT AUTHORISER

As defined in Work Permit System ([CSBP-GM-11-031-51](#)).

A Permit Authoriser for a Work Permit involving a confined space entry shall be a competent person, refer Section 2.1.

## 2.19 PERMIT HOLDER

As defined in Work Permit System ([CSBP-GM-11-031-51](#)).

Additionally the Permit Holder for a confined space task cannot be the Permit Holder for any other task at the same time.

A Permit Holder for a Work Permit involving a confined space entry shall be a competent person, refer Section 2.1.

## 2.20 CONFINED SPACE ENTRY DATA SHEET

All confined space entries require a confined space entry Data Sheet. The confined Space Entry Data Sheet will show:

- a. Plant/Area location of confined space
- b. Description of the confined space (including photographs when available)
- c. Confined space Evaluation
- d. Confined Space Risk Assessment (CSRA)
- e. Ventilation Requirements
- f. Rescue Plan
- g. CSRA hazard prompts

## 3. PROCEDURE

No work shall be carried out in a confined space until the following activities have been completed:

- a. Review to assess if the work can be done without entering the confined space.
- b. Entry into the confined space is deemed necessary and hazard identification and risk assessment is conducted in accordance with section 3.1 of this procedure on the Confined Space Data Sheet.
- c. The Permit Holder provides a JSA or other form of documented description regarding the safe work to be conducted within the confined space. This JSA shall be reviewed and approved by placing the name and signature on the JSA, by either the:
  1. Supervisor or Responsible Officer.
  2. Safety Advisor.
  3. Shift Supervisor (out of hours).
- d. Adequate isolation is vital to confined space work, refer to section 4.2. The Permit Authoriser will ensure that appropriate isolations are in place. Often this will require isolation activities to be undertaken on an additional Work Permit and the work within the confined space to be on a separate

Work Permit. This is to allow preparation of the confined space as a safe place of work, e.g. Gas Testing by BA wearing personnel or removal of spool pieces.

- e. Depending on the results of the risk assessment for that job at that confined space, external means of retrieval can form part of the Rescue Plan. The Confined Space Rescue – Watch Person flowchart shall be understood by the Watch Person, any workers and the Permit Holder.
- f. A confined space entry Certificate and a Work Permit has been obtained and authorised.
- g. No confined space shall be entered before gas testing. The confined space atmosphere shall be tested by the Permit Authoriser (or their designated and competent gas tester) in the first instance and will be performed during the work, in accordance with the Confined Space Data Sheet and Work Permit requirements, to determine whether:
  - 1. there is a safe oxygen level,
  - 2. any explosive gas is present,
  - 3. the level of any contaminant present is above the prescribed exposure limit (refer to [Table 1 - Exposure Standards for Various Gases](#)).



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A Watch Person can control continuous gas monitoring if they are trained in its use and alarms.

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- h. The original white confined space entry Certificate, CSRA, JSA and Work Permit are placed on the Entry Permit Control Board at the access point for the confined space (or within 2 metres). Documents shall be in clear plastic weatherproof sheaths for protection.
- i. The Permit Authoriser or nominated delegate has inspected the exterior of the confined space and verified that all requirements have been carried out and suitable ongoing arrangements have been made including:
  - 1. Checks that the Watch Person(s) and Standby Person(s) (if required) are in attendance and are competent to understand and complete their responsibilities (check their training record).
  - 2. Checks documentation, rescue equipment required for the confined space is in place.
- j. A competent Watch Person has been nominated by the Work Permit Holder, has signed to accept their responsibilities on the confined space entry Certificate and will control confined space access and monitor gas testing and equipment.
- k. The Personal Danger Locks with Tags of all personnel working under the Work Permit are placed on the Permit Board lock box.
  - 1. The Personal Danger Tags of all personnel entering the confined space are additionally placed on the confined space entry Board at the access point as they enter and removed as they come out by the worker.

During the course of the work, the Work Permit that allows the confined space entry will require revalidation by the Permit Authoriser if:

- 1. There is a change in the Permit Holder

2. A break in work continuity (the space is to be left unattended)
3. A change in confined space atmosphere
4. A change in the scope of work
5. A change in the risks arising that are not covered by the Permit

In general there shall be only one access point to a confined space. Where more than one is required, each shall have a Watch Person and a CSE Entry Board. Concurrent work within the confined space is an additional risk that requires planning and control, refer Section 3.2.7.

If a confined space is left unattended, it shall be signed and barricaded at all access points. Where possible it shall be locked.

When work is completed in the confined space, the following actions shall occur:

1. Permit Holder ensures that all personnel are clear and that they have removed the Personal Danger Tags (or Locks with Tags) from the Permit Board.
2. The Permit Holder surrenders the original Work Permit and the confined space entry Certificate to the Permit Authoriser and signs both as completed.
3. The Permit Authoriser acknowledges cancellation of confined space entry Certificate and close out of the Work Permit in writing on the documents.
4. If the confined space is to be returned to service, the Permit Authoriser shall confirm by inspection that all personnel are clear, tags and/or locks removed and the area is safe, before authorising.

A confined space entry or work within the space shall be stopped and the space evacuated if:

1. The personnel in the space are showing unusual signs or symptoms in their behaviour or movement.
2. If the Watch Person or required Standby person cannot do their duties
3. There is an external emergency
4. The on-site Emergency Siren sounds
5. Any hazardous conditions not on the confined space entry Certificate or risk documentation appear.

### 3.1 CONFINED SPACE RISK ASSESSMENT AND FACILITATION

All confined spaces must have a Confined Space Risk Assessment (CSRA) completed prior to entry. The risk assessment template is located on, and forms part of the Confined Space Data Sheet. Before the decision enter a confined space is made the work must be reviewed with a focus on completing the task without the need for personnel to enter the confined space.

A CSRA must be conducted by a team with the appropriate level of knowledge to identify potential hazards

of the entry. As a minimum, an approved facilitator, along with the minimum attendees listed below, shall complete the assessment by utilising the confined Space Data Sheet Form

The minimum confined space Risk Assessment Team attendees include, but are not limited to:

- a. Operations delegate
- b. Responsible officer (RO) or delegate
- c. Process Engineer for the Business Unit (process engineer) does not have to attend but must supply up to date information on what materials that have been stored in the space prior to the meeting).
- d. Health and Safety Advisor (Authorised to perform both the facilitator and OHS Role. If out of hours and advisor cannot attend then can be completed and approved via email)

Optional Attendees include:

- a. Maintenance Supervisor or leading hand for the entry task
- b. Watch Person (if required for the entry)
- c. Member of the CSBP ER team
- d. Planner
- e. Plant inspector

Where a completed CSRA (on approved Confined Space Data Sheet) for the space already exists, in the approved Docova location, then that CSRA can be reviewed and updated by Operations delegate or Shift Supervisor and, where a contractor is involved, RO or AP.

### 3.1.1 STEPS IN THE CSRA PROCESS

It is assumed that the meeting with the above listed mandatory attendees has been arranged and all are in attendance, before the below steps are commenced.

1. Intention to enter confined space identified
2. confined space register checked for assessment
3. Hold the CSRA, where the Health and Safety Advisor shall facilitate if available
4. Completed (except Rescue Plan) CSRA shall then be forwarded onto the CSBP ER team, where they will complete the rescue plan, disregard this step if the ER plan has already been completed by the CSBP ER team.
5. The completed CSRA/ Confined Space Data Sheet will then be submitted to the Permit Authoriser for use when generating the Permit to work and confined space entry Certificate.

### 3.1.2 USING THE CONFINED SPACE ENTRY DATA SHEET

#### Introduction:

Determine if the attendees to the assessment are familiar with the space and its location. All attendees should



be familiar with the space and its location prior to attending the CSRA. Photos of the equipment to be worked on should be made available at the CSRA meeting and those document numbers referenced in the sections labelled.

### **Location information:**

Complete the Area, Business unit, tag/equipment number and equipment name information.

### **Authorisation:**

To identify the location of the confined space, the attendees at the risk assessment, the authorisers of the overall level of risk, and related permits for entry. This section is completed fully once the CSRA section on the following page has been completed.

### **confined space Evaluation:**

Using the prompts in the left hand column the team is to identify the inherent hazards present in the space. The right hand column can be added to; however, deductions are not permitted. The process engineer is expected to provide technical information in this section.

The questions shall be systematically answered to identify the hazards and controls of the confined space.

### **Identify Suitable Controls:**

For each hazard and consequence, suitable control measures shall be identified. These controls should eliminate, substitute, control and/or mitigate the hazards.



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Where there are controls identified that are critical for the safety of the entrants, these controls must be verified as being implemented and checked for effectiveness and continuous operation.

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### **Identify the severity level of each consequence:**

Once the suitable control measures for each hazard have been identified, assign a Severity Level to the consequences with these control measures in place i.e. Are the control measures adequate?

Use the Consequence Severity Level Table in the TBRA Form to do this. With all the controls in place now look at each row in the table and see which one most accurately describes the most serious probable outcome of each step/hazard.

### **Agree whether to recommend the entry for approval:**

If the Overall Residual Risk is the “acceptable” category, and all attendees agree that there is no overall benefit from applying any further controls, the CSRA Team then approves and completes the CSRA by signing the form. It is essential that team agreement is reached.

The CSRA Team may also conclude that, because of the complexity or severity of the risks involved, a more detailed engineering or technical assessment is needed. In this case, further planning of the entry should be suspended until that assessment is available.

If the CSRA Team judge there are insufficient independent controls available, or the proposed controls are likely to be ineffective against any specific hazard, that risk shall be recorded as “Unacceptable”. The entry shall not proceed and an alternative solution needs to be found or the entry re-planned to a shutdown. The Maintenance Planner/Scheduler shall coordinate involvement of the work requestor to identify an alternative approach to carrying out the desired work.

When the CSRA is fully completed all Team members sign the form. The Overall Residual Risk level determines the approval level.

### 3.1.3 Rescue Plan

A member/s of the CSBP Emergency Response Team shall complete this section of the Confined Space Data Sheet (CSDS) form for each confined space entry prior to the CSE permit being raised.

CSE prompts table is used as a memory prompter or checklist to ensure that the participants effectively capture and control all the relevant hazards for the confined space. This prompts table is not exhaustive and therefore unlisted hazards can be used when identified.

The rescue plan must indicate whether or not on-site emergency response is required during entry.

### 3.1.4 Photograph of the confined space

Completion of this section is optional, however having a photograph of the process vessel or excavation location will assist the standby in their duties, and is therefore best practice.

## 3.2 ADDITIONAL RISK FACTORS AND CONTROLS

The following items shall be considered as possible risk factors and these risk controls implemented where necessary:

### 3.2.1 Entry, Falls & Rescue

The effects of personnel falling during ascent or descent shall be considered and appropriate precautions taken against accidental tripping, falling or collapsing including fall restraint equipment where appropriate or as a second option, fall protection equipment.

The confined space method of entry and exit chosen shall minimise the risk of personal injury. Excessive climbing, bending or stooping shall be avoided where possible and the impact of using an external retrieval system shall be considered.

It is not always desirable to specify the use of a safety harness, safety lines or rescue line, as this may be impracticable or may introduce a hazard or unnecessarily hinder free movement within a confined space. In the event of free movement being hindered, alternative plans should be arranged for fall prevention, fall protection and possibly retrieval.

Wherever possible all services (lighting, power, ventilation etc.) shall be run into the confined space through a different point to that used for entry / egress.

### 3.2.2 Contaminants

Where contact with hazardous or toxic substances exists, such as acids, caustics (alkalis), acidic or alkaline sludge, full body protection must be worn (disposable overalls, gloves, rubber boots) with respiratory protection equipment. Protective equipment shall be decontaminated at an appropriate place before removal, and removed carefully to prevent any remaining contaminant contacting the skin. The decontamination area is to be defined and prepared prior to work commencing.

Proper and safe disposal of contaminants from the confined space shall be organised prior to work commencing including having containers available outside the Space.

### 3.2.3 Electricity

Portable power tools shall preferably be battery-driven. Air-driven and/or RCD protected mains-powered (240 V) tools are permitted where battery driven tools are not a practical option. Portable RCDs shall be sited outside of the confined space. Extension cords shall be suspended from the floor of the space wherever possible.

Portable lighting shall be 32-volts or less (with the transformer mounted outside the confined space) or RCD



protected 240-volts. Portable RCDs are placed outside the confined space.

### 3.2.4 Gas

Gas cylinders shall not be taken into a confined space. Care shall be taken to avoid damage to any gas cylinder hose/line inside or leading into a confined space.

Welding and cutting equipment shall not be left unattended within the confined space. They shall be taken in and out of the space with the personnel. The Watch Person shall be able to isolate welding gas from their position.

### 3.2.5 Explosion or fire

To protect against explosion or fire:

Before any ignition source is introduced, or hot work commenced in a confined space, a test for flammable gases shall be carried out. Procedure for Hot Work shall be followed at all times. For requirements refer Guide Manual Hot Work ([CSBP-GM-11-036-06](#)).

Combustible materials inside the confined space shall be kept to a minimum at all times.

A dry chemical powder portable fire extinguisher shall be placed at the entrance to the confined space before any hot work is carried out or power tools are used.

A fire watch shall be maintained for at least 30 minutes after the completion of any hot work within a confined space.

### 3.2.6 Heated confined spaces

No confined space with an internal temperature above 45°C shall be entered. Working times in temperatures below 45°C will need to be strictly regulated depending on the ambient humidity, the movement of air and the level of protection clothing required. For details on the requirements for safe working in a hot environment refer CSBP Guide Manual Safe Working in a Hot Environment ([CSBP-GM-11-036-03](#)).

The possibility of collapse or heat stress should always be considered when work is conducted in a heated environment. The nature of the work (physical exertion) and the wearing of full body protection (PVC or encapsulated suit) will shorten the working time considerably.

Responsible management of the personnel working within the space must be exercised, with suitable starting and finish times, breaks in the work and the provision of sufficient cool drinking water and protection from the elements. The Watch Person must keep in close contact with the workers within the space if it is affected by heat.

### 3.2.7 Multiple Tasks within a confined space

Where more than a single task is to occur within a confined space, each task activity shall be authorised separately on its own Work Permit. Multiple tasks generate multiple or overlapping risks that shall be identified and controlled.



#### 4. CONFINED SPACE ENTRY OFF-SITE

Where CSBP employees (or persons under the control of CSBP) are required to enter a confined space that is not located on a CSBP controlled site the following is required:

- a. A confined space risk assessment (CSRA) be developed using the CSBP template.
- b. Gas testing of the space:
  1. With a CSBP provided gas testing unit fitted with appropriate sensors (a non CSBP maintained unit may be used only if certified as adequate by a member of the CSBP Health and Safety team)
  2. Gas testing must be in accordance with the CSRA
- c. A check by the entrant/s to ensure that the space is isolated/segregated from hazardous services or equipment that may possibly adversely affect the atmosphere of the space. This includes checking:
  1. The space is not connected to purging gases or liquid services
  2. Combustion engines are located at least eight (8) metres from any entrance to the space and the exhaust gases are not likely to enter the space i.e. from wind direction
- d. Written authority to enter (i.e. permit or certificate). As a minimum the form must:
  1. Identify the confined space (i.e. equipment to be entered)
  2. Capture gas testing results
  3. Record entry and exit of space
- e. A competent Watch Person trained in the hazards of confined space entry be assigned
- f. A JSA capturing task risks

To ensure these requirements can be met it is vital that off-site tasks involving confined space entry are adequately planned.

#### 5. ISOLATION OF THE CONFINED SPACE

##### 5.1 GENERAL

Before entry into the confined space is permitted, steps are to be taken to ensure:

- a. Prevention of the introduction of any material (solid, liquid or gas) into the confined space through equipment such as piping, ducts, vents, drains, conveyors, elevators or service pipes.

- b. The prevention of movement of the confined space itself e.g. granulator, dryer / cooler drum, trommel.
- c. The prevention of movement of equipment (agitators, fans, and other moving parts) within the confined space.
- d. Electrical power to any conductors within the space is isolated.

### 5.2 METHODS OF PROCESS AND ELECTRICAL ISOLATION

Before access to a confined space is permitted, pipelines and electrically driven equipment connected to the confined space are to be isolated as follows:

- a. Pipelines containing gas at low pressure (natural gas, hydrogen, hydrogen chloride or hydrogen cyanide) shall be isolated by the insertion of a suitable full pressure spade (blind) as close as practical to the confined space.
- b. Pipelines containing a liquefied gas (i.e. ammonia) shall be isolated by the removal of a valve, spool piece or expansion joint in piping leading to, and as close as practical to, the confined space and blanking or capping the supply pipeline.

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If the methods described in 5.2.a. and 5.2.b. are not practical, isolation by means of closing, tagging and locking of at least two valves in the piping leading to the confined space, and the opening, tagging and locking open of a drain valve to atmosphere between these two valves, can be used. Special consideration shall be given to the location of the drain point and potential emissions to ensure that additional hazards are not created.

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- c. Pipelines containing liquid or gas under pressure (i.e. acids, caustic, process fluid or steam) shall be isolated by either:
  - 1. Closure of at least two valves (proven to be holding), preferably with a drain between them, in the pipeline leading to the confined space, or
  - 2. Valve closure, and either, inserting a suitable full pressure spade or removal of a spool piece or expansion joint and blanking or capping the supply pipeline.
- d. Pipelines containing non-hazardous materials and not under pressure may be isolated by closure of a single valve or blanking that is proven to be holding.

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The tagging/lockout open of venting valves and equipment is as important as the tagging/lockout of closed valves.

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- e. All electrical isolations of any internal conductors are effected at a designated isolation point and that this point is tagged or locked and tagged.
- f. Pumps, instrumentation or other equipment that may operate to allow entry of materials to the confined space under normal operations are electrically isolated at the designated isolation point and locked and tagged.

- g. Where a generator set is being used to provide power to the confined space for lighting and/or ventilation purposes it shall be locked and tagged in the 'ON' position to ensure it is not inadvertently shut down without the permission of those working on the job. Note: The emergency stop button must not be disabled as part of this isolation.

All isolations must be conducted in accordance with the [Work Permit System \(CSBP-GM-11-031-51\)](#).

Consideration of the following isolations should also be made and implemented where required:

- a. Steam supply to any steam jacket or trace lines connected to the confined space shall be isolated and the line drained.
- b. Relief valves that vent into a common header or scrubber system shall be isolated from the system as part of the vessel isolation.

## 6. RESCUE AND RETRIEVAL REQUIREMENTS



**In an emergency, the spontaneous reaction to immediately enter and attempt a rescue from the confined space may lead to the death or serious injury of those attempting the rescue. 60% of confined space fatalities are would be rescuers.**

The need to rescue and retrieve personnel from the confined space may arise. The Permit Authoriser must ensure that the Rescue Plan section of the Confined Space Data Sheet is appropriately completed and that the confined space Watch Person flowchart is understood by the Permit Holder and the Watch Person.

Consideration should be given to the following issues that are relevant to rescue:

- a. Access points to the confined space should, where possible, be selected to be of adequate size to permit the rescue.
- b. Wherever possible, openings shall not be obstructed by fittings or equipment.
- c. Landings outside of the confined space are of adequate size to permit handling of a retrieved or injured person.
- d. Where an external retrieval system is determined from risk assessment as appropriate to the entry (either hand or power operated lifting equipment) this shall be in place and trialled before entry to the confined space is permitted..
- e. An external retrieval system can be any combination of harness, ropes, tripods, pulleys, motorised equipment that allow a person external to the confined space to retrieve a person inside the confined space.
- f. Where an external retrieval system has been established the Watch Person should be familiar in its use if they will be required to operate the equipment.

- g. To facilitate the recovery of the person once retrieved from the space, consider the availability of a first aid kit, an oxy-port set or a stretcher.
- h. In the event of the person working in the confined space becoming injured, behaving out of character or becoming unconscious the alarm shall be raised and the confined space Rescue Watch Person flow chart shall be followed until the emergency response assistance arrives.
- i. If an emergency involving a hazardous atmosphere occurs in a confined space, the only personnel that can enter the space are the CSBP Emergency Response Team or external emergency services.

### 6.1 EMERGENCY RESPONSE AVAILABILITY

Competent emergency response personnel are required to be located on-site for CSE if:

- a. It is indicated as required on the Confined Space Data Sheet,
- b. The space contains a hazardous atmosphere at the time of entry or has the credible potential to have a hazardous atmosphere generated by activity within or nearby to the space. Examples include simultaneous operations and work within the space (e.g. cleaning),
- c. The rescue is complicated and would require the establishment of a rescue system at the time of an emergency or,
- d. Where ladders over 1.8m are the only established access arrangement to the entry/exit point

Emergency response personnel 'on-site' is defined as a minimum of two competent responders located on premises and available for response via established emergency procedures. The personnel can be members of the CSBP ERT or designated contract services competent in

- Vertical rope rescue,
- Self contained breathing apparatus,
- Application of first aid and
- Confined space entry

## 7. ATMOSPHERIC REQUIREMENTS

### 7.1 SAFE ATMOSPHERE

Before a person enters a confined space, and where it is technically feasible to do so, the atmosphere of the confined space shall have—

- a. A safe oxygen range (19.5% -23.5%);
- b. Airborne contaminants that may cause impairment, loss of consciousness or asphyxiation reduced to below the relevant exposure standards; and
- c. A concentration of flammable airborne contaminant below 5% LEL.

Contamination (refer to Section 2.5 for definition) shall be removed whenever possible by draining, cleaning and ventilation, before entry into the confined space is considered.

## 7.2 TESTING THE ATMOSPHERE IN A CONFINED SPACE

Evaluation of the inside atmosphere and survey of other hazards shall occur from outside the confined space before any entry occurs. This is completed by the Authoriser of the confined space entry Certificate (or their designated and Gas Tester qualified Isolating Person) and the results recorded on the confined space entry Certificate (all copies) before authorisation.

Where continuous monitoring of the atmosphere is required or the gas testing function is performed by any other competent person, the gas test equipment shall be signed out of the Control Room and signed in on return. Competence in gas testing is generated by being trained and assessed by an authorised provider in Gas Testing.

Evaluation of more remote regions of a confined space may be performed once the area adjacent to the point of entry has been proven safe. Evaluation of these regions within the confined space may need to be undertaken by persons wearing breathing apparatus or if they can be reached using extension poles or probes.

Entry to affect gas testing shall be completed on its own Work Permit with confined space entry Certificate. If the Gas Tester is not confined space entry competent they cannot enter the confined space to conduct testing.

A plan for where such readings are made, allowing for the size, shape and contents of the confined space including any pockets of potential gas behind internal structures or in lowered sections, shall form part of the risk assessment. These shall be documented by the Authoriser of the confined space entry Certificate.



**Never trust your senses to determine if the air in a confined space is safe.**

**You cannot see or smell many toxic gases and vapours,  
nor can you determine the level of oxygen present.**

The normal means of determining atmosphere conditions is to test for specific materials with a suitable portable gas analyser. Gas testing must only be conducted by an Authorised Gas Tester with a calibrated gas analyser.

All readings of atmospheric levels throughout the confined space shall be documented. The requirement for ventilation and continuous gas monitoring for the work to follow can then be determined by the Permit Authoriser.

Where there is potential for later release of hazardous material, arrangements should be made to continuously monitor or periodically re-test the atmosphere within the confined space. This monitoring is controlled by the Watch Person and the readings are logged on the original white confined space entry Certificate at the confined space entry Board.

### 7.3 CSE IN AREAS WHICH MAY CONTAIN ASPHYXIANT GASES

Asphyxiant gases can displace or remove the normal safe oxygen level in air. These gases pose a significant risk for personnel entering confined spaces. Due to this risk it is mandatory that continuous gas testing for a safe oxygen level be conducted in areas which may contain asphyxiant gases. This includes the Ammonia and Ammonium Nitrate Production areas and the Sodium Cyanide Manufacturing Facility.



**Asphyxiant gasses can displace or remove the normal safe oxygen level in air. Entering a confined space with an oxygen level that is less than 19.5% can be fatal. Most asphyxiant gases cannot be detected by human senses. A calibrated gas analyser is the only suitable method for determining the atmospheric safety of a confined space. Continuous gas testing is mandatory in areas which may contain asphyxiate gasses unless deemed not necessary via a TBRA.**

### 7.4 ENTRY INTO CONFINED SPACES WITH AN UNSAFE ATMOSPHERE

Work in confined spaces that have an unsafe atmosphere (oxygen outside of safe range, contaminant over exposure standard, or LEL greater than 5%) shall only be done as a last resort in exceptional circumstance.

In addition to the normal confined space requirements, the following shall occur:

- a. A TBRA must be conducted; a Safety Advisor or Hygiene Team member must be present.
- b. Ventilation must be used to make the atmosphere as safe as practicable. Ventilation device must be controlled so as not to be able to fail or if failure occurs, the device must be able to signal to the watch person to immediately remove people from the space.

If there is an unsafe oxygen range or contaminants are immediately dangerous to life or health (IDLH):

- a. Supplied Air Breathing Apparatus (SABA), with full face-piece, and Emergency Breathing Apparatus (EBA) back-up shall be used by trained personnel for respiratory protection by entering personnel.
- b. Whilst work is in progress, two trained Standby Persons, with equal protection available (independent SABA with EBA backup or Self-contained Breathing Apparatus (SCBA)), shall be in attendance at the entry point to the confined space. Only one can ever enter the space at a time.
- c. The Rescue and Retrieval Plan shall be prepared and agreed upon before entry. The retrieval equipment shall be trialled.
- d. A lifeline and /or harness shall be used, where practical, to facilitate rescue from outside the confined space with a retrieval system.



A second, trained Watch Person shall be in attendance at the supplied air source (air cart/cylinder(s)/compressor) if the first Watch Person cannot perform this function whilst

watching the person(s) working within the confined space.

- e. Two Standby Persons, with independent SABA or SCBA shall be in attendance (only one can ever enter).

Where flammable airborne contaminants are present in the atmosphere of a confined space, the following requirements shall apply:

- a. Except in case of emergency response, entry shall not be permitted where the concentration of flammable airborne contaminants in the atmosphere is 5% LEL or greater, or where the oxygen concentration of the atmosphere exceeds 23.5%.
- b. Where persons have entered or are conducting tasks in a confined space and the concentration of flammable airborne contaminant in the atmosphere of the confined space has been found to be greater than 5% LEL and less than 10%LEL, the persons shall be removed unless continuous monitoring with a suitably calibrated explosive (flammable) atmospheric substance detector is used in the confined space at all times while persons are present.
- c. Where the concentration of flammable airborne contaminant in the atmosphere of a confined space has been found to be 10% LEL or greater, no persons shall remain in the confined space.

### 7.5 EXPOSURE STANDARDS

For definition of Exposure Standards refer to DEFINITIONS.

For further listings of Australian exposure standards refer to the [Safe Work Australia](#) Website.

CONCENTRATION GAS OR VAPOUR	EXPOSURE STANDARD TWA (PPM)	PEAK (PPM)	STEL (PPM)
Ammonia (NH <sub>3</sub> )	25		35
Chlorine (Cl <sub>2</sub> )		1	
Carbon Monoxide (CO)	30		400
Carbon Dioxide (CO <sub>2</sub> )	5000		30 000
Fluorides (F)	3		
Hydrogen Cyanide (HCN)		10	
Hydrogen Chloride (HCl)		5	
Nitrogen Dioxide (NO <sub>2</sub> )	3		5
Sulphur Dioxide (SO <sub>2</sub> )	2		5
Hydrogen sulphide (H <sub>2</sub> S)	10		15
Nitrogen Hydrogen Methane	These gases are known as simple asphyxiates, which, when present in an atmosphere in high concentrations, lead to a reduction of the oxygen by displacement or dilution. The minimum oxygen content in air shall be 19.5% by volume.  Hydrogen and methane will also present an explosion hazard.		

**Table 1 - Exposure Standards for Various Gases**



## 7.6 VENTILATION REQUIREMENTS

There are two main types of ventilation – natural or forced (mechanical). Either type should be employed for confined space entry to establish and maintain a safe atmosphere. Ventilation should be continued throughout the period of occupancy to reduce the hazard of ongoing or unexpected release of contaminants.

### 6.6.1 Natural Ventilation

For natural ventilation to be effective: There must be two ventilation points – one at low and one at high level.

### 6.6.2 Forced Ventilation

Forced ventilation can be either by blowing breathable air into the space and displacing the atmosphere within or by sucking contaminated air out of the space and natural air pressure forcing breathable atmosphere into the confined space.

Requirements for forced ventilation include:

- a. For explosive atmospheres any fans or blowers shall be intrinsically safe rated equipment or pneumatic or water powered.
- b. For confined spaces that contain irrespirable substances – calculations based on the volume of the confined space and the flow rates of the fan/blowers shall ensure an exchange rate of > 60 times per hour if personnel are to work in the space without respiratory protection.
- c. The extractors and blowers used shall have flow rates that ensure adequate protection of the atmosphere during work or be allowed sufficient time to clear the respiratory hazards before work is commenced within the space.
- d. Placement of equipment and ducting so that all areas of the confined space are purged of their atmosphere and breathable air is introduced. Such a Ventilation Plan must also consider the vapour density of the materials in the confined space in order to be effective in displacing the contaminated atmosphere.
- e. Mechanical ventilation may not be adequate or reliable enough to maintain a safe atmosphere in the breathing zone of personnel within the confined space, particularly during operations that may generate toxic contaminants e.g. cleaning. In this case ventilation shall continue to reduce risk but respiratory protection shall also be worn.

Where maintenance of a breathable atmosphere is dependent on mechanical ventilation then the equipment shall:

- a. Be continuously monitored whilst the confined space is occupied. This may not be able to be completed safely by the Watch Person and require an additional person.
- b. Have its controls, including remote power source, clearly identified, listed on the Isolation Checklist and locked/tagged to prevent unauthorised interference.
- c. Be placed in such a manner that emissions from equipment do not enter the confined space, i.e. recirculating the contaminated exhaust.



- d. Be placed in such a way that the fresh air introduced does not move directly from the inlet to the exhaust outlet without reaching the other areas within the space, i.e. short circuiting the air flow.

Care should be taken regarding where the contaminated atmosphere is blown so as to not introduce hazards for other work areas or workers.

Atmospheric testing of ventilated spaces is a long process that will require waiting 30-60min between establishing the ventilation and the ability to obtain a reading anywhere within the space. Each reading will require the same time period before re-testing to allow for changes. All testing shall be documented on the confined space Certificate.

Appendix 1- Ventilation Diagrams provide examples of how to establish ventilation in different circumstances.

### **6.6.3 PURGING ATMOSPHERE PRIOR TO ENTRY**

Where appropriate, the confined space shall be cleared of contaminants by the use of a suitable purging agent. Pure oxygen or mixes of oxygen with greater than 21% shall not be used.

Care should be taken not to rupture/collapse a confined space due to pressure differentials when purging.

Where flammable contaminants are being purged all equipment used (and for ventilation) shall be designed for hazardous locations and precautions taken to eliminate sources of ignition.

Purging should also take into account the location where contaminants are purged to so that they do not present another hazard. The same requirements for atmospheric testing of purged spaces as for ventilated spaces apply.

## **8. CLEANING TASKS IN CONFINED SPACES**

### **8.1 GENERAL**

General requirements for cleaning a confined space are:

- a. The method chosen for cleaning will depend upon the material in the confined space and the hazards that may be created by the cleaning process itself.
- b. Wherever practicable, initial cleaning shall be performed from outside the confined space. Such initial cleaning, including drainage and scale removal shall continue until the hazard of atmospheric contaminants has been reduced as far as practical.
- c. Contaminants shall be disposed of in a manner that will not constitute a hazard to any person or equipment or the environment.
- d. Hose couplings should be of such a design that they are unable to loosen or be accidentally dislodged during operation.

### **8.2 HYDROJETTING (HP WATER GUN AND PUMP)**

The following general precautions shall be observed when hydrojetting in a confined space:

- a. Hydrojetting shall be done by trained personnel.

- b. Each person shall be provided with protective suits, waterproof safety footwear, goggles, a safety helmet with face shield, protective gloves and, where necessary, an appropriate respiratory protective device.
- c. An emergency stop switch, to shut off high pressure water in the event of an incident, shall be available at the entrance of the confined space or at a safe location.
- d. Warning signs and/or barricading indicating that hydrojetting is in progress shall be clearly displayed outside the confined space. Areas affected shall be barricaded or guarded.
- e. Only personnel involved in the hydrojetting works shall be permitted into the confined space.
- f. Where practical the high pressure delivery hose shall be run through a separate entrance to the confined space to that used for personnel access and egress.
- g. Water gun operators shall have direct visual or audible communication with the pump operators.
- h. Fluids shall be removed continuously where possible or at least regularly from the confined space during the operation.
- i. A high pressure/low volume gun shall be used intermittently when cleaning within a confined space, rather than continuously, thus allowing adequate replacement of atmospheric air.
- j. Where other workers are required to enter the space being cleaned, a system shall be established to notify the water jetting equipment operators of others entering and working. Establish measures to ensure the operation of the equipment does not pose a hazard to those entering/leaving.

Refer also to Hydrojetting Safety ([CSBP-GM-11-031-18](#)) and High Pressure Water (Hydro) Jetting Systems ([CSBP-GM-11-031-39](#)).

### **Cleaning Equipment**

All high pressure cleaning equipment shall be fitted with actuating devices which require positive effort by the operator (hand or foot) to keep the supply valve open. In addition, the following requirements for hoses shall, where practicable, be observed:

- a. Hoses used for high pressure cleaning shall have a bursting pressure of at least twice that of the intended operating pressure.
- b. Hoses shall be tagged to indicate working pressure, date into service and predicted life.
- c. Hoses with exposed reinforcing wire shall be disposed of or repaired immediately.
- d. Care shall be taken when laying out hydrojet hoses on the ground to avoid constant pulsation damage, especially from corners.
- e. Couplings shall be of such a design that they are unable to loosen or be accidentally dislodged during operation.

### **8.3 STEAM CLEANING**

Where a confined space is to be steam cleaned, the following precautions shall be observed:

- a. The steam cleaning machine shall remain outside the confined space.

- b. Where oxygen is present in the confined space, steam temperatures shall not exceed the auto-ignition temperature of likely products present in the confined space.
- c. The confined space shall not be entered until the temperature has returned to an acceptable level, refer Section 4.1.3 Heated confined spaces.
- d. Where there is a possibility of a flammable airborne contaminant the pipe or nozzle of the steam hose should be bonded to the confined space enclosure to prevent the build-up of static electricity (see also AS/NZS 1020).

### 8.4 ABRASIVE BLASTING

When abrasive blasting is to be carried out, the need to provide the following shall be considered:

- a. Suitable air-supplied respirators.
- b. Illumination and visibility adequate to allow safe working to continue.
- c. Protection of the breathing airline to the respirator.
- d. Appropriate protective clothing and equipment.
- e. Rescue Plan and equipment.
- f. Ventilation of dust through a suitable scrubbing device or ventilation to a safe location.



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Wet blasting using garnet shall be used wherever possible for abrasive blasting.  
Silica abrasive material shall not be used.

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Refer also to Abrasive Blasting and Spray Painting Safety ([CSBP-GM-11-031-13](#)).

### 8.5 CHEMICAL CLEANING

In addition to creating toxic hazards, chemicals used in cleaning operations may also be capable of producing a flammable atmosphere. Accordingly, the safety of the atmosphere shall be re-evaluated after cleaning and before starting further work.

Chemical cleaning and the confined space work to follow shall be authorised on separate Work Permits and confined space entry Certificates.

## 9. RECORD KEEPING

confined space entry Certificates and their JSA's shall be retained for 12 months after the work is completed.

## 10. REFERENCE MATERIAL

### REFERENCES

Australian/New Zealand Standard; AS/NZS 2865: 2009 - confined spaces

Occupational Safety and Health Act: 1984



## Confined Spaces



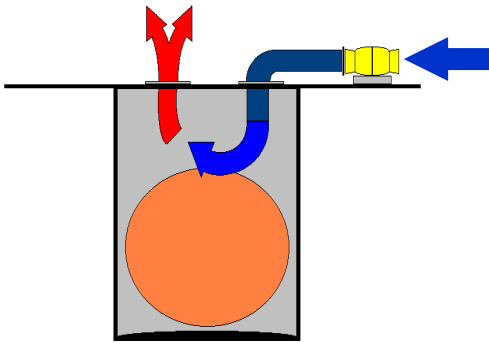
Occupational Safety and Health Regulations: 1996

National Occupational; Health and Safety Commission Guidelines

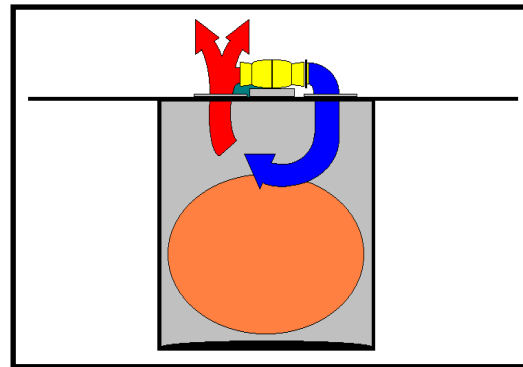
## APPENDIX 1 – VENTILATION DIAGRAMS

Print this Appendix in colour if possible.

**AVOID** the following situations:



**Short circuiting** the air flow by not introducing the fresh air flow deeply enough within the space. Use extension ducting to avoid this.



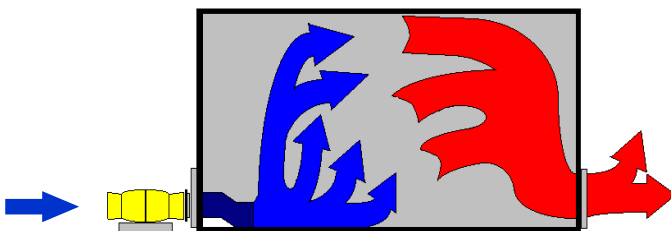
**Recirculation** of contaminated exhaust back into the space by having the blower too close to the exhaust position.

Move the blower further away or attach ducting to protect the introduced air supply

This diagram shows both recirculation and short circuiting.

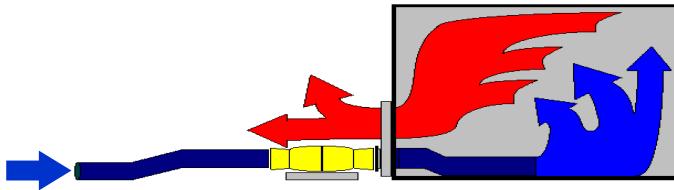
## OPTIONS FOR VENTILATION OF CONFINED SPACES

Options for ventilation of various confined spaces with different openings and configurations

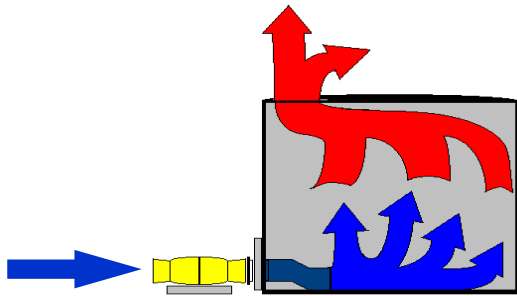


Ventilation of a **Long confined space** can be achieved by blowing fresh air in at one end and exhausting the contaminated air at the other end. In the case of the example here, unless the airflow is *directed up* into the 'dead zone', you will get a situation where the ventilation is short-circuited.

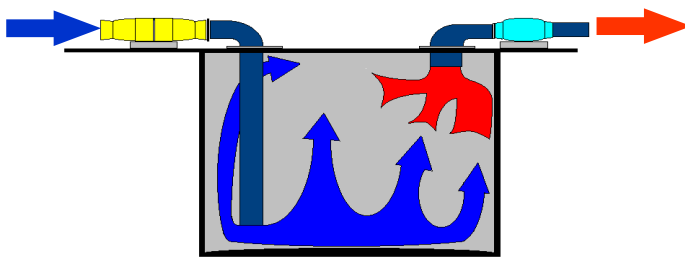
OR



If the entry and exit spaces are close together or the same access point, by blowing fresh air *deep* within the space using ducting and allowing exhaust air to be pushed out of the exit. In this case the introduced air must be protected from the exhausted air by attaching ducting.



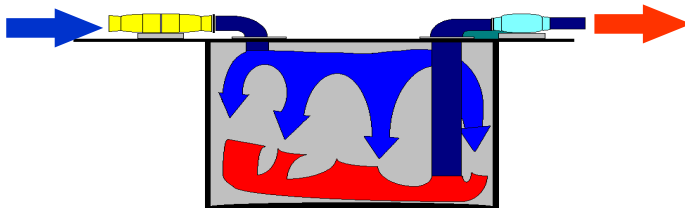
Ventilation of a **deep confined space** should introduce air at the lowest point possible with the contaminated air exhausted to the top. This can be achieved by an access through a low point or by directing air into the low part of the tank via ducting.



**Removing lighter than air contaminants, dual opening vessel.**

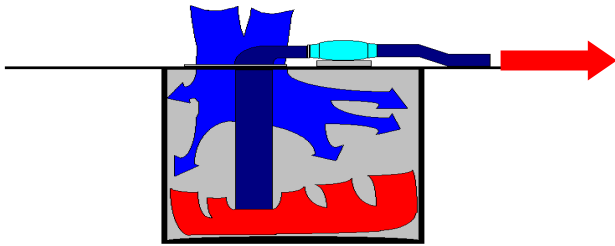
Use duct work to introduce the fresh air at the bottom of the space.

Exhaust the contaminated air from the top.



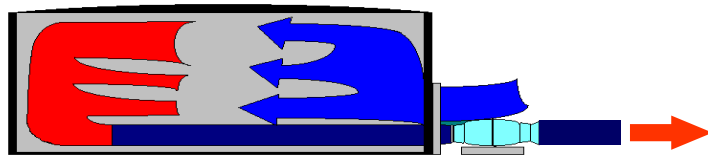
**Removing heavier than air contaminants, dual opening vessel.**

Connect a duct onto the inlet side of the exhaust fan down to the bottom of the vessel. Fresh air is blown into the space to force contaminated atmosphere to the low exhaust point.



### Ventilation of a single top opening vessel

Use duct work to extract air from the bottom of the vessel. Fresh air is drawn in from the top.



### Ventilation of a long single opening confined space

Utilise duct work to ensure fresh air is introduced or contaminated air is extracted well within the space.

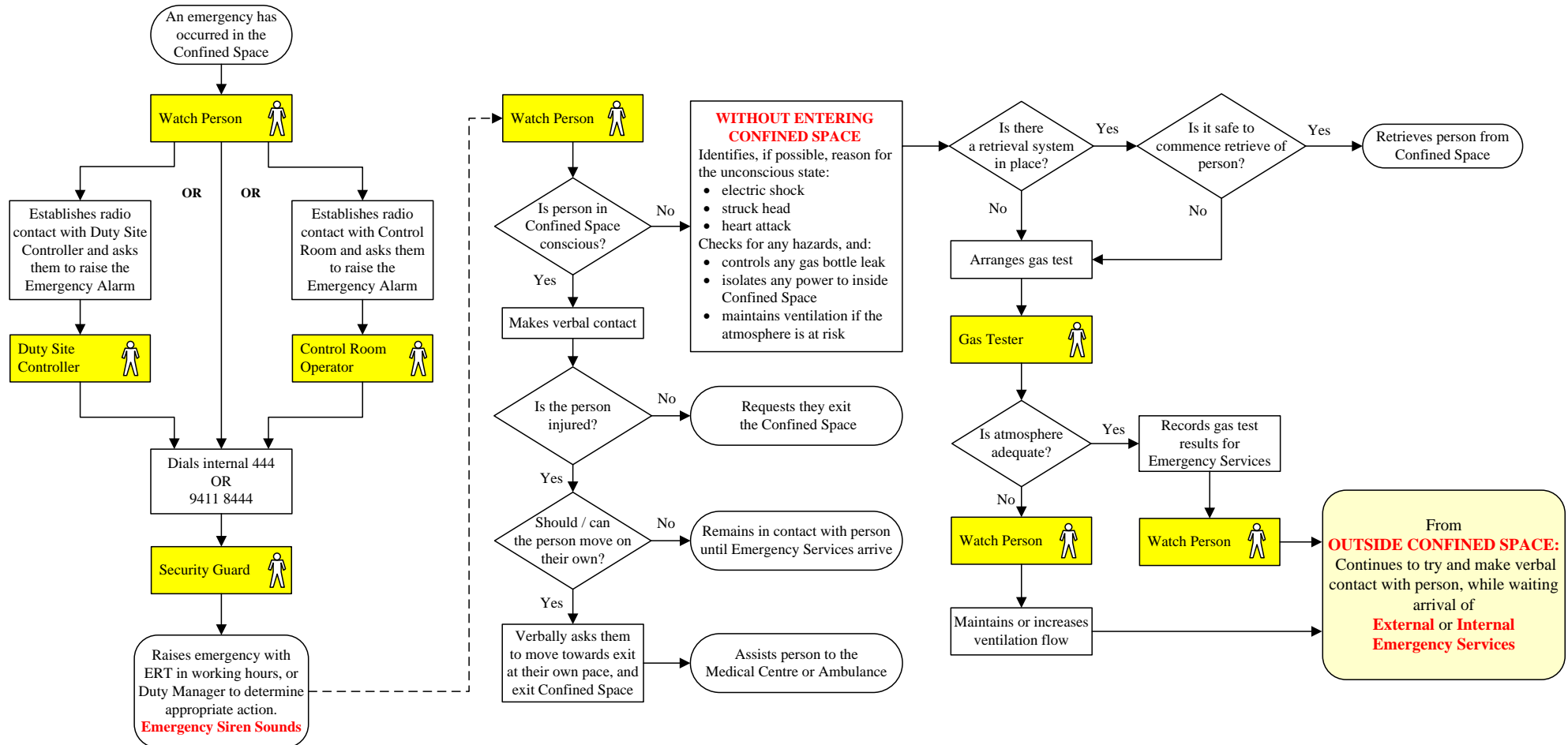


Figure 1 -confined space Rescue – Watch Person