INTEGRAL SKILLS

CONFINED SPACE & GAS TEST ATMOSPHERES

RIIWHS202D Enter and work in confined spaces
MSMWHS217 Gas test atmospheres
MSMPER200 Work in accordance with an issued permit

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MODIFICATION HISTORY

Version	Date	Nature of Amendment
1	7 Feb 19	Creation

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INTRODUCTION

This confined space and gas test atmosphere course is comprised of three units of competency with each describing a participant's skills and knowledge required to complete the relevant tasks:

- RIIWHS202D Enter and work in confined spaces.
- MSMWHS217 Gas test atmospheres.
- MSMPER200 Work in accordance with an issued permit.

The units come from the in the Resources and Infrastructure Industries and Manufacturing training packages.

This cluster is appropriate for those working in operational roles undertaking work in confined spaces where there is a requirement to use gas detectors and gas test atmospheres.

Licensing, legislative, regulatory and certification requirements that apply to this unit can vary between states, territories, and Industry sectors. Relevant information must be sourced prior to application of the unit.

RIIWHS202D ENTERAND WORK IN CONFINED SPACES

PERFORMANCE EVIDENCE

Evidence is required to be collected that demonstrates a candidate's competency in this unit. Evidence must be relevant to the roles within this sector's work operations and satisfy all of the requirements of the performance criteria of this unit and include evidence that the candidate:

- Locates and applies relevant documentation, policies and procedures.
- Demonstrates completion of entering and working in confined spaces that safely, effectively and efficiently meets all of the required outcomes on more than one (1) occasion including:
    - Obtain appropriate entry permit and instructions for performing work in confined space.
    - Interpreting and applying safe work method statements.
    - Apply tagging and lock out.
    - Selecting, wearing and caring for personal protective equipment applicable to all tasks and environment identified.
    - Entering the confined space.
    - Using atmospheric monitoring devices prior to entering the confined space.
    - Working in the confined space.
    - Using atmospheric monitoring devices during confined space activity.

- Applying safe materials handling methods.
- Exiting the confined space.
- Remove tagging and lock out.

KNOWLEDGE EVIDENCE

The candidate must demonstrate knowledge of enter and work in confined spaces through:

- Identifying areas that constitute confined spaces.
- Complying with site and equipment safety requirements.
- Complying with the entry and exit procedures, risks and regulations.
- Types of air contaminants and toxic gases.
- Identifying the limitations of breathing apparatus.
- Identifying equipment types, characteristics, technical capabilities and limitations.
- Complying with site isolation and site control responsibilities and authorities.
- Locations of safety data sheets (SDS) information and application.
- Using confined space and Industry terminology.

ASSESSMENT CONDITIONS

- An assessor of this unit must satisfy the requirements of the NVR/AQTF or their successors; and Industry regulations for certification and licensing; and,
- this unit is best assessed in the context of this sector's work environment;
- where personal safety or environmental damage are limiting factors, assessment may occur in a simulated environment provided it is realistic and sufficiently rigorous to cover all aspects of this sector's workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills; and,
- this unit must be assessed in compliance with relevant legislation/regulation and using policies, procedures, processes and operational manuals directly related to the industry sector for which it is being assessed; and,
- assessment may be conducted in conjunction with the assessment of other Units of Competency; and,
- assessment must confirm consistent performance can be applied in a range of relevant workplace circumstances; and,
- assessors must demonstrate the performance evidence, and knowledge evidence as outlined in this Unit of Competency, and through the minimum years of current* work experience specified below in an Industry sector relevant to the outcomes of the unit; or,

- where the assessor does not meet experience requirements a co-assessment or partnership arrangement must exist between the qualified assessor and an Industry subject matter expert. The Industry subject matter expert should hold the unit being assessed (or an equivalent unit) and/or demonstrate equivalence of skills and knowledge at the unit level. An Industry technical expert must also demonstrate skills and knowledge from the minimum years of current work experience specified below in the Industry sector, including time spent in roles related to the unit being assessed; and,
- assessor and Industry subject matter expert requirements differ depending on the Australian Qualifications Framework Level (AQF) of the qualification being assessed and/or Industry Sector.

MSMWHS217 GAS TEST ATMOSPHERES

PERFORMANCE EVIDENCE

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria and must include the ability to:

- recognise and assess conditions that require testing
- identify the appropriate action according to procedures and within scope of responsibility, including:
    - selecting, preparing and using gas testing equipment
    - applying testing regime
    - selecting and using personal protective equipment (PPE)
    - identifying hazards and applying control measures
    - cleaning and maintaining equipment
- take readings and interpret, report/record relevant data
- apply known solutions to routine problems
- communicate clearly and unambiguously with a range of personnel on safety conditions and procedures.

KNOWLEDGE EVIDENCE

Evidence must be provided that demonstrates knowledge of:

- organisational procedures, including:
    - work permit systems
    - safety, hazards and hazard control
    - incident, fire and accident
    - PPE
    - organisation standard operating procedures (SOPs)
- common atmospheric hazards and contaminants
- explosive range, upper and lower explosive limits

- exposure standards (time-weighted average, short-term exposure limits, peak limitation values, and examination of toxic effect at the level of a range of flammable gases)
- conditions under which atmospheres become hazardous
- units of measurement used to express concentration of atmospheric contaminants (mg/cubic m. ppm, % v/v).

ASSESSMENT CONDITIONS

- Competency must be achieved before performing this work unsupervised. Therefore this unit will typically be assessed off the job. Where assessment is undertaken on the job appropriate supervision and safety precautions must be provided.
- The unit should be assessed holistically and the judgement of competence based on a holistic assessment of the evidence.
- The collection of performance evidence:
    - must include the use of the relevant gas testing meters and any other relevant tools, equipment and safety gear, and require demonstration of preparation, operation, completion and responding to problems
    - should provide evidence of the ability to perform over the range of situations which might be expected to be encountered, including typical disruptions to normal, smooth work conditions
    - may use industry-based simulation particularly where safety, lack of opportunity or significant cost is an issue.
- Off-the-job assessment must sufficiently reflect realistic operational workplace conditions that cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Assessment in a simulated environment should use evidence collected from one or more of:
    - walk-throughs
    - demonstration of skills
    - industry-based case studies/scenarios
    - ‘what ifs’.
- Knowledge evidence may be collected concurrently with performance evidence (provided a record is kept) or through an independent process, such as workbooks, written assessments or interviews (provided a record is kept).
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications associated with this unit.

- The regulatory framework will be reflected in workplace policies and procedures and is not required to be independently assessed.
- Foundation skills are integral to competent performance of the unit and should not be assessed separately.
- As a minimum, assessors must satisfy the Standards for Registered Training Organisations 2015 assessor requirements.

MSMPER200 WORK IN ACCORDANCE WITH AN ISSUED PERMIT

PERFORMANCE EVIDENCE

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria, and demonstrate the ability to:

- identify type and scope of permit relevant to the job
- interpret and implement permit conditions
- identify changes to conditions which may lead to the permit being revoked before the job is completed
- monitor hazards and hazard controls.

KNOWLEDGE EVIDENCE

Evidence must be provided that demonstrates knowledge of:

- different types of permits and the work they cover, including three (3) or more of:
    - cold work/general permit to work
    - excavation
    - hot work
    - vehicle entry
    - minor repairs
    - working at heights
    - confined space entry
    - other permit types as used on site
    - the impact of the regulatory framework and organisation procedures under which the permit operates upon the particular job requiring the permit
    - hazards associated with tasks covered by the permit and related hazard controls
    - types of tests/inspections required for the issue of work permits including one (1) or more of:
    - atmospheric, oxygen/breathability
    - temperature
    - humidity
    - combustibles, oxygen, enriched or reduced
    - electricity

- stored pressure/energy
- flammability/explosivity
- toxicity
- electricity
- stored energy/pressure.

ASSESSMENT CONDITIONS

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  - should provide evidence of the ability to perform over the range of situations which might be expected to be encountered, including typical disruptions to normal, smooth work conditions
  - will typically include the use of appropriate tools, equipment and safety gear requiring demonstration of preparation, operation, completion and responding to problems
  - may use industry-based simulation particularly where safety, lack of opportunity or significant cost is an issue.
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WHAT IS A CONFINED SPACE

The NSW Work Health and Safety Regulation 2017 defines a confined space as an enclosed or partially enclosed space that:

- Is not designed or intended primarily to be occupied or entered by a person.
- Is, or is designed or intended to be, at normal atmospheric pressure while any person is in the space.
- Is or is likely to be a risk to health and safety from:
    - An atmosphere that does not have a safe oxygen level.
    - Contaminants, including airborne gases, vapours and dusts that may cause injury from fire or explosion.
    - Harmful concentrations of any airborne contaminants.
    - Engulfment.

Confined spaces may include:

- Culverts and storm water systems.
- Pipes and live or inactive sewer mains.
- Shafts, ducts and access chambers.
- Pits, trenches and gullies.
- Environmental traps and tanks.
- Box girders and bridge voids.
- Storage tanks, process vessels, boilers, pressure vessels, silos and other tank-like compartments.
- Tank cars.

Shipboard spaces entered through a small hatchway or access point such as:

- Cargo tanks.
- Cellular double bottom tank.

A person is deemed to have entered a confined space when their head (i.e. the breathing zone) or upper part of the body is within the boundary of the confined space. (Note that inserting an arm for atmospheric testing is not considered an entry into a confined space).
Working in confined or enclosed spaces can be extremely dangerous and can lead to serious injury, illness or death for individuals or whole groups of workers.

A confined space can increase a worker's risk of being overcome by fumes, gases or lack of oxygen, damage to hearing through increased noise or vibration, extreme temperatures and injury through falls and slips.

It is very important that you have the ability to correctly identify a confined space in order to take appropriate actions such as obtaining permits and using safety equipment.

HOW TO DETERMINE WHETHER A SAPCE IS A CONFINED SPACE

A confined space is determined by the structure and a specific set of circumstances. The same structure may or may not be a confined space depending on the circumstances when the space is entered. Entry to a confined space is considered to have occurred when a person's head or upper body enters the space.

A space may become a confined space if work that is to be carried out in the space would generate harmful concentrations of airborne contaminants.

Temporary control measures such as providing temporary ventilation or achieving a satisfactory pre-entry gas test will not cause a confined space to be declassified. For a confined space to be declassified as a non-confined space, it needs to have undergone sufficient changes in structure and use to eliminate all inherent hazards that define a confined space.

The following flowchart will help to determine whether a space is a 'confined space' for purposes of the WHS Regulations.

Appendix A provides a table to further illustrate how a confined space is determined.

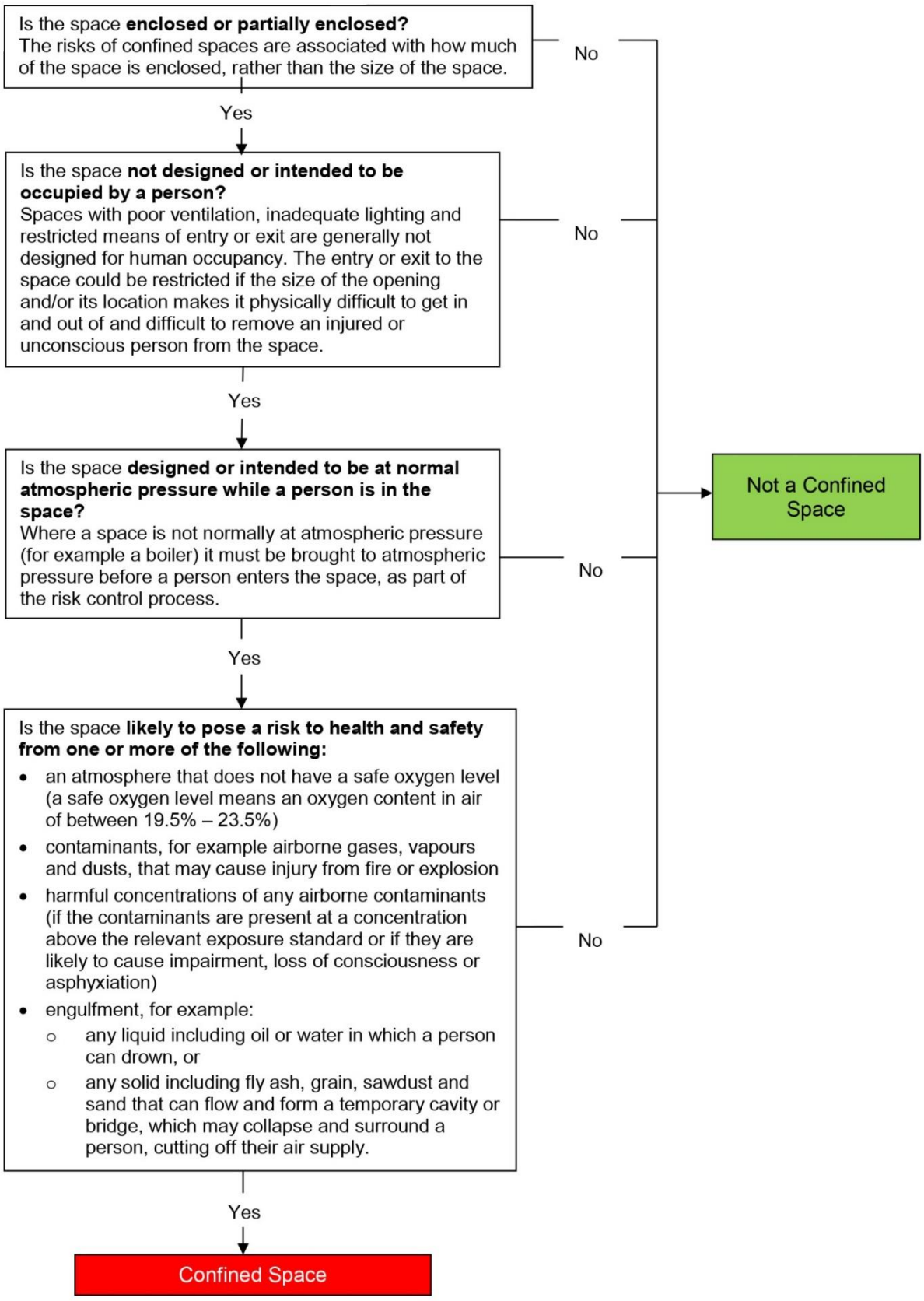


Figure 1 – Confined Space identification flow

CONFINED SPACE OPERATIONS

The need to enter a confined space can be for any number of reasons including (but not limited to) repair work, installing pumps, cleaning, inspections and rescuing other workers. In order to assess the dangers involved it is important that you know the purpose for entering the confined space. You also need to determine the required skills and knowledge as well as the need for a work permit.

WORKING IN ACCORDANCE WITH POLICIES, PROCEDURES AND LEGISLATION

All confined space operations need to be conducted in accordance with policies, procedures and applicable legislation.

Policies, procedures and legislation exist to ensure that all work in completed in a way that is safe and achieves the required outcomes efficiently without causing harm to personnel/workers, equipment, work area or the environment.

Procedures and legislation can include:

- Codes of Practice.
- Regulations.
- Australian Standards (AS2865).
- Environmental Protection Agency (EPA) guidelines.
- Licence and certification requirements.
- Permits and internal permit control systems.
- Isolation techniques (mechanical and electrical).
- Atmospheric testing and action taken to provide safe entry to the confined space.
- Training and information provided to personnel/workers to determine that the situation is safe and work may proceed.
- Communication procedures in accordance with organisational requirements

TRAINING AND COMPETENCY

All persons working in confined spaces, or carrying out associated tasks must be trained and assessed as competent to do so. Confined spaces workers must be re-assessed regularly to maintain a sufficient level of skill and knowledge to carry out work in confined spaces.

COMPLIANCE DOCUMENTATION

Before you begin your task ensure that you access the relevant documentation and plan your work. Part of this is identifying any compliance documentation.

Compliance documentation is essential to all aspects of operations on every worksite.

From work instructions through to quality and environmental requirements, compliance documentation sets out the what, when, how and who of everything that needs to be done in the safest, most effective way.

Interpretation of compliance documentation will allow you to make the right decisions for each situation or task. Interpretation means understanding what is required of you and how you are expected to perform the tasks.

Applying documentation involves following all instructions given by these documents at all times – they are designed to keep you safe.

Statements containing the words “must”, “shall” or “will” are often used within these documents to indicate that there are mandatory (legally must be applied) requirements.
Each project site will have different compliance documentation that must be referred to.

This may include:

- Legislative, organisation and site requirements and procedures.
- Occupational Health and Safety (OHS)/Workplace Health and Safety (WHS) legislation, codes of practice and guidance material.
- Manufacturers’ guidelines and specifications.
- Australian Standards.
- Codes of Practice.
- Equal Employment Opportunity and Disability Discrimination legislation.
- Licence and certification requirements.
- Internal permit control systems.
- Mechanical and electrical isolation processes.
- Company policy and permit control systems.

Compliance documentation may be provided by:

- WHS authorities and ASCC/NWHSC.
- Environment Protection Authority (EPA).
- Employment and workplace relations legislation.

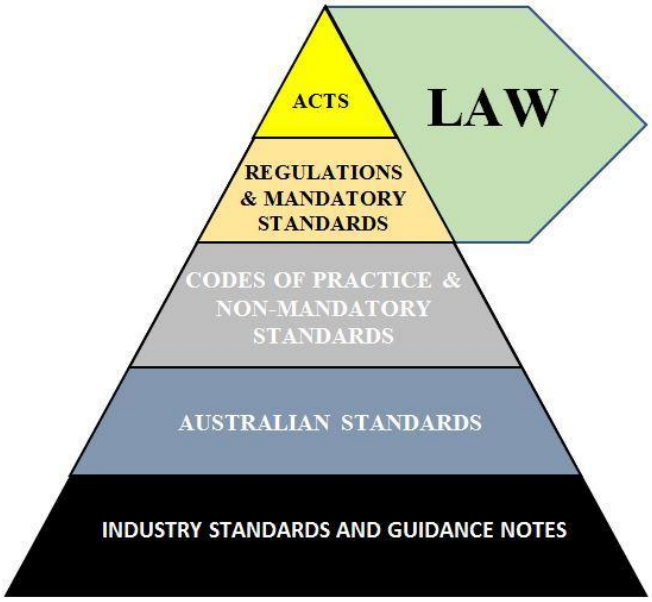


Figure 2 – Legislation Hierarchy

WHS LEGISLATION AND REGULATIONS

Workplace Health and Safety (WHS) are laws and guidelines to help keep your workplace safe.

These can be broken down into four main types:

- Acts & Regulations.
- Codes of Practice.
- Australian Standards.
- Regulations.

Legislation/Acts	Acts of Parliament and laws to protect the health, safety and welfare of people at work. For example the Work Health and Safety Act (the WHS Act) 2011.
Regulations	More details or information on particular parts of the Act.
Codes of Practice/Compliance Codes	Practical instructions on how to meet the terms of the law. For example the Code of Practice "Managing the Risk of Falls in Workplaces".
Australian Standards	The minimum levels of performance or quality for a hazard, work process or product. For example AS/NZS 1891

Table 1 – Legislation Descriptions

HARMONISATION OF WORKPLACE HEALTH AND SAFETY LEGISLATION

In 2011, Safe Work Australia developed a single set of WHS laws to be implemented across Australia. These are known as 'model' laws. For the model WHS laws to become legally binding, the Commonwealth, states and territories must separately implement them as their own laws.

The model WHS laws include:

- The model WHS Act.
- The model WHS Regulations.
- Model Codes of Practice.

These elements are supported by the National compliance and enforcement policy, which sets out principles of how WHS regulators monitor and enforce compliance with their jurisdictions' WHS laws. WHS regulators in the Commonwealth and in each state and territory are responsible for regulating and enforcing the laws in their jurisdictions.

The model WHS laws have been implemented in the Australian Capital Territory, New South Wales, the Northern Territory, Queensland, South Australia, Tasmania and the Commonwealth. Some jurisdictions have made minor variations to make sure the legislation is consistent with their relevant drafting protocols and other laws and processes.

MODEL WHS ACT

The Model WHS Act forms the basis of the WHS Acts that have been implemented in most jurisdictions across Australia.

The main object of the Act is to provide for a balanced and nationally consistent framework to secure the health and safety of workers and workplaces. It does this by:

- Protecting workers and other persons from harm by requiring duty holders to eliminate or minimise risk.
- Providing for fair and effective representation, consultation and cooperation.
- Encouraging unions and employer organisations to take a constructive role in promoting improvements in WHS practices.
- Promoting the provision of advice, information, education and training for WHS.
- Securing compliance with the Act through effective and appropriate compliance and enforcement measures.
- Ensuring appropriate scrutiny and review of actions taken by persons with powers or functions under the Act.
- Providing a framework for continuous improvement.
- Maintaining and strengthening national harmonisation of WHS laws and facilitating a consistent national approach to WHS.

CODES OF PRACTICE AND AUSTRALIAN STANDARDS

Model Codes of Practice are practical guides to achieving the standards of health and safety required under the model WHS Act and Regulations.

To have legal effect in a jurisdiction, a model Code of Practice must be approved as a code of practice there. To determine if a model Code of Practice has been approved in a particular jurisdiction, check with your local WHS regulator.

An approved code of practice applies to anyone who has a duty of care in the circumstances described in the code. In most cases, following an approved code of practice would achieve compliance with the health and safety duties in a jurisdiction's WHS Act and Regulations. Like regulations, codes of practice deal with particular issues and do not cover all hazards or risks that may arise. Health and safety duties require you to consider all risks associated with work, not only those risk that regulation and codes of practice exist for.

While approved codes of practice are not law, they are admissible in court proceedings. Courts may regard an approved code of practice as evidence of what is known about a hazard, risk or control and may rely on the relevant code to determine what is reasonably practicable in the circumstances.

DUTY OF CARE

Employers/PCBUs, self-employed persons, persons in control of the workplace, Supervisors, Designers, Manufacturers, Suppliers, Workers and Inspectors, have a legal responsibility under duty of care to do everything reasonably practicable to protect others from harm by complying with safe work practices. This includes activities that require licences, tickets or certificates of competency or any other relevant state and territory OHS/WHS requirements.

ORGANISATUIONAL AND SITE REQUIREMENTS

During your site induction your employer will tell you where to find the compliance documentation relevant to your site and duties.

All work needs to be conducted in accordance with organisational policies and procedures and site requirements.

Procedures exist to ensure that all work is completed in a way that is safe and achieves the required outcomes efficiently without causing harm.

MANUFCTURES GUIDELINES AND SPECIFICATIONS

These requirements will be documented in operator's manuals, equipment specifications and work instructions.

Designers and manufacturers have a responsibility to ensure that structures, plant and equipment meet strict criteria for the safe operation and protection of workers while also meeting relevant environmental standards.

ENVIRONMENTAL PROTECTION REQUIREMENTS

When entering and working in confined spaces, you should always aim to reduce environmental risk and waste.

To do this you need to:

- Identify the environmental management plans, requirements and constraints.
- Confirm any aspect of the environmental protection requirements that may be unclear.
- Apply and comply with the project environmental protection requirements of all tasks undertaken in and around the worksite.

Some environmental requirements are:

- Organisational/project environmental management plans – These outline the steps and processes required to prevent or minimise harm to the environment due to work operations.
- Waste/clean-up management – This covers the disposal of site waste materials and rubbish as well as the recycling and re-use of waste materials.
- Water quality protection – This can include methods for directing run-off away from the stormwater system or other waterways. Spills of chemicals or other materials and the use of spill kits are included.
- Noise, vibration and dust management – These plans aim to limit or avoid creating noise pollution and vibration for people in and around the worksite. Dust management includes the use of screens, tarpaulins and other dust suppression methods.

The NSW Environmental Protection Authority (EPA) can investigate and issue fines for sites that do not meet the state and federal environmental protection arrangements that are in place.

If you have concerns, questions or queries about the exact requirements you must meet, you should speak to your supervisor, the site environmental officer or contact the NSW EPA for more information.

REVIEW TECHNICAL INFORMATION BEFORE YOU START

Before starting you need to make sure you obtain all the relevant technical information appropriate for your worksite. This will enable you to conduct your work in the safest and most efficient way. This may include:

- Identification and description of the work site (e.g. site details).
- Assessment of conditions and hazards (e.g. hazard report).
- Work requirements from work orders and supervisor instructions.
- Identifying equipment defects (e.g. fault reports or isolation systems).
- Accessing diagrams or plans.
- Safety Data Sheets.
- Consignment notes (items and weights).

SAFE WORK PRACTICES

Safe work practices are methods that must be implemented to make sure a job is carried out as safely as possible. Safe work practices are governed by legislative requirements and workplace procedures and relate to such things as drugs and alcohol at work, requirements to safely enter and work in confined spaces, including safety devices, general requirements for use of personal protective equipment and clothing just to name a few.

The scope of tasks and the safe work practices you are going to apply should be referred to, and documented, when completing Safe Work Method Statements (SWMS) or Job Safety and Environment Analysis (JSEA).

This will provide a guideline for how to carry out all tasks safely in accordance with WHS requirements.

RISK MANAGEMENT INVOLVES THE FOLLOWING STAGES

- Identification of risks or hazards.
- Assessing the risk/hazard which involves analysis and evaluation.
- Identifying ways to address the risk/hazard to reduce the risk.
- Re-assessing the risk/hazard.

Consultation, communication, monitoring and review should be planned for and carried out at every stage of the risk management process.

Controlling a hazard should be a team effort and it's important that everybody not only has input, but knows what they need to do and how/if they need to change their work processes to suit.

Monitoring and review are an important part of the risk management process and should be planned for at every stage. Monitoring and review involves regular surveillance and checking and clearly identifying the responsibilities of those involved.

It is important that monitoring and review results are recorded, reported and stored for future reference.

RISKS AND HAZARDS

If you can remove or at least control a hazard you can reduce the risk involved. Each worksite has its own specific risks and hazards. Always check to see what systems and procedures are in place before conducting a risk assessment at a worksite, as they may affect the outcomes of the risk assessment.

It is important that personnel/workers with the required relevant skills are involved in the risk identification process.

You should also check records of injuries and incidents, safety tags and talk to other workers. Safety Data Sheets (SDS) can be useful tools in identifying potential hazards so make sure you check the SDS documents for your site.

If you find that there is no documentation or guideline in place to resolve an identified risk, you need to assess the risk and identify a feasible course of action to deal with it.
It is important that all records, policies and procedures are kept up to date so that the most relevant information is available and used.

Talk to others to find out if the risk has already been addressed, and what techniques are available to you to resolve, these can include:

- Safety officers.
- Site engineers (where applicable).
- Supervisors.
- Colleagues.
- Managers who are authorised to take responsibility for the workplace or operations.

These people may also have information about site hazards. It is important to communicate with other personnel and safety officers before starting on a worksite to ensure that any workplace policies or site-specific procedures are followed.

COMMON CONFINED SPACE HAZRADS

Unsafe Oxygen Levels
Levels of oxygen within a confined space which are too high (above 23.5%) or too low (below 19.5%) are a major hazard.

There are a number of reasons why oxygen levels inside a confined space may fall below a safe level including:

- The combustion of flammable materials (e.g. welding or cutting).
- Slow bacterial reactions of organic substances (e.g. sewerage).
- Reaction of inorganic substances (e.g. rust).
- Oxygen absorbed by materials (e.g. grain in silos).
- Oxygen displaced by another gas (e.g. nitrogen used to remove toxic fumes).
- High oxygen consumption rate (e.g. many people working in a small confined space).
- Leakage from oxygen lines, pipes, and fittings can raise the level of the atmosphere becoming a fire, explosion or breathing hazard.

Fires and Explosions

'Hot work' such as welding and thermal/oxygen cutting can create hazards such as excessive heat, sparks and the risk of fires or explosions.

Fires and explosions can be caused by:

- Open flames (e.g. welding torches)
- Hot surfaces (e.g. steam lines)
- Frictional sparks (e.g. a metal tool striking another object)
- Incorrectly installed wires or overloaded fittings
- Static electricity sparks (e.g. from synthetic clothing)
- A spark or heat produced by electrical equipment (e.g. a mobile phone, flashlight)
- Combustible/flammable dusts can often be found in a confined space such as a storage bin or grain silo.

Atmospheric Hazards

A safe atmosphere must be ensured, as far as is reasonably practicable, during work in a confined space.

A safe atmosphere in a confined space is one that:

- Has a safe oxygen level.
- Is free of airborne contaminants or any airborne contaminants are in concentrations below their allowable exposure standard (if any).
- Any flammable gas or vapour in the atmosphere is at concentrations below 5% of its LEL.

A safe atmosphere can be achieved within the confined space using methods such as cleaning, purging and ventilation.

Hazardous dusts, gases, fumes, mists and vapours can arise in a confined space because of:

- The work processes being undertaken (e.g. spray painting producing mists).
- Spills or leaks from pipes or machinery.

- Disturbance of materials.
- The storage or transfer of materials (e.g. grain).
- Gasses in stormwater drains and sewers.
- Chemical reactions between substances.
- Exhaust gases from pumps or other machinery being drawn into the confined space by ventilation fans.

Appendix B has a Gas Chart that shows various gasses and detection methods.

Residue left in confined spaces such as empty tanks and containers can cause a build-up of toxic or explosive gasses. Toxic gasses can quickly overcome and kill an unprotected worker. **Confined spaces must be monitored for dangerous gases or unsafe oxygen levels.**

Layering of Gasses

When there is no ventilation, gases will layer depending on their relative density to the air. It is important to be aware of this when gas testing as not to miss remote pockets or layers.

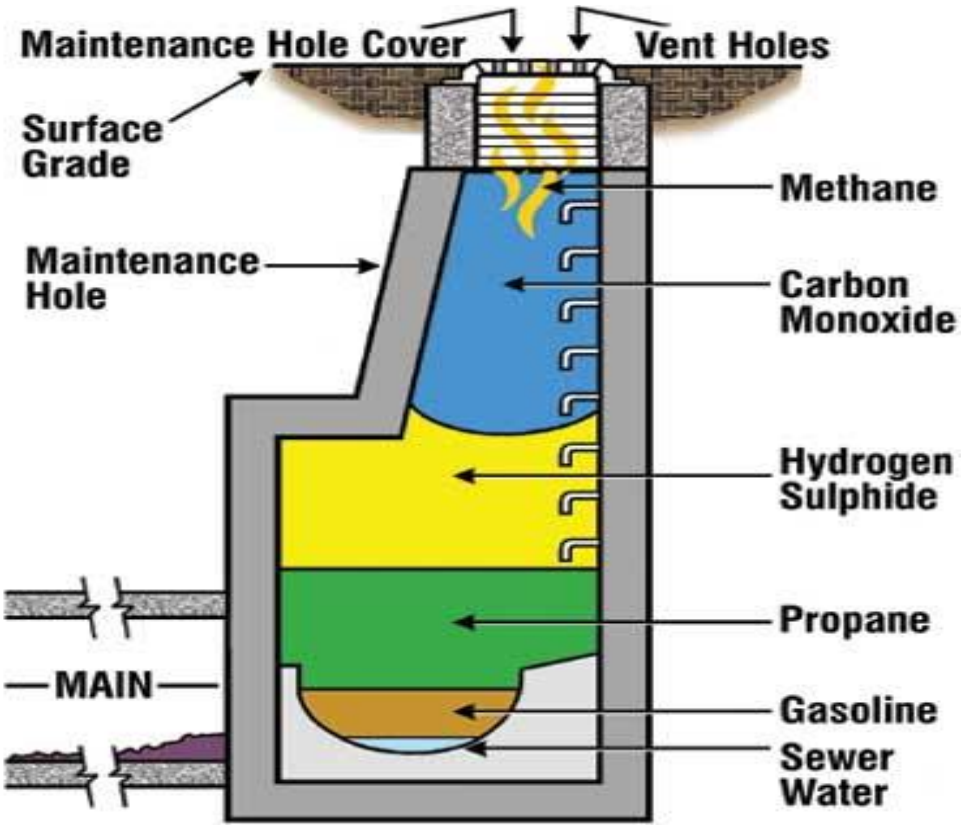


Figure 3 – Gas density layering

Hazardous Chemicals (HAZCHEM)

Figure 4 – HAZCHEM sign example

It is important to understand the HAZCHEM code system when inspecting a worksite.
The HAZCHEM Code consists of either two or three characters – a number followed by either one or two letters.

The number indicates the type of medium used:

1 = the use of solid streams of water.
2 = the use of a water fog or fine water spray.
3 = the use of a water-based foam.
4 = the use of a dry agent such as a dry chemical powder.

You may use a higher number classification than the one indicated but not a lower one (e.g. a 2 would mean you could use water fog/fine water spray, water-based foam or a dry agent, you could NOT use solid streams of water).

The first letter indicates the risk of violent reaction or explosion, type of Personal Protective Equipment (PPE) to be worn and whether the substances should be contained or diluted.

Violent Reaction
P, S, W, Y = A violent reaction or explosion may occur.
Personal Protective Equipment (PPE)
P, R, W X = a full chemical protection suit and breathing apparatus should be worn.
S, T, Y, Z = breathing apparatus only needs to be worn.

Dilute or Contain
P, R, S, T = Substance should be diluted.
W, X, Y, Z = Substance should be contained.

White letters on a black background indicate that breathing apparatus should be worn only if the substance is involved in a fire.

There may be a letter E after the first letter. This indicates that evacuation of other personnel/workers in the area should be considered.

OTHER HAZARDS

Some materials stored in or around a confined spaces (e.g. grains, sawdust, or soil) can engulf (completely surround and trap) a person in seconds. If they are not rescued immediately they will die within a few minutes.

It is important not to forget about psychological hazards such as stress and claustrophobia (fear of confined spaces).

Other common hazards that you may find while working in or around confined spaces include:

- Underground services such as water and waste pipes, electrical cables and gas pipelines.
- Excavations.
- Traffic.
- Uncontrolled introduction of substances.
- Environmental hazards (e.g. inadequate lighting, heat and cold).
- Biological hazards such as viruses, bacteria or fungi.
- Limited head spaces or overhangs.
- Noise, rotational equipment or vibration.
- Sharp edges, protrusions or obstructions.
- Equipment or product mass.
- Mechanical hazards (e.g. injury from moving mechanical parts).
- Electrical hazards
- Slippery surfaces, spills or leaks.
- Manual handling hazards
- Restricted access and egress (entry and exit).

Once a risk has been identified, check for any existing procedural documentation, workplace procedure or workplace policy which describes how to eliminate or control the risk.

It is important that all records, policies and procedures are kept up to date so that the most relevant information is available and used.

Talk to other workers, your manager, supervisor, team leader or health & safety representative to find out if the risk has already been addressed, and what techniques are available to you to resolve it.

If you find that there is no documentation or guideline in place to resolve an identified risk, you need to assess the risk and identify a feasible course of action to deal with it.

TASK RELATED HAZARDS

There may be other factors that you need to consider when planning out the task that are not necessarily site hazards, but hazards relating to the way the task is carried out.

When planning out the task some of the things that you may consider are:

- Adequate and safe communication.
- Access and egress to the work area.
- Location and specific details of the task.
- Permits that may be required for the task.
- Equipment requirements and availability.

PRE—WORK HAZARD ASSESSMENT E.G. SWMS/JSEA'S ETC

A Risk Assessment to identify hazards is to be undertaken prior to commencing work. Such Risk Assessments as an example may include:

- Personal Risk Assessments;
    - Take 5, and
    - SLAMS.
- Group Risk Assessments;
    - Safe Work Method Statements (SWMS), and
    - Job Safety and Environment Analysis (JSEA's).

SWMS/JSEA's may also have been used in the development of as Safe Work Procedures (SWP) and Standard Operating Procedures (SOP). They detail the steps required to carry out a task as well as how specific hazards and risks related to a task will be managed.

They fulfil a number of objectives:

- They outline a safe method of work for a specific job.
- They provide a documented set of steps / processes that workers must read and understand before starting the job.
- They assist in meeting legal responsibilities for the risk management process, hazard identification, risk assessment and risk control.
- They assist in effectively coordinating the work, the materials required, the time required and the people involved to achieve a safe and efficient outcome. They are a quality assurance tool.

How do you complete a SWMS/JSEA?

Each organisation will have different forms and documents to manage risk, some called SWMS, JSEA, JSA etc. The fundamental steps remain the same as follows:

- Break the job down into its basic steps.
- Identify the workplace hazards associated with each step.
- Identify controls to eliminate or control those hazards.

- Rate / rank the risk with the controls in place, this is called the residual risk.
- Once agreement to the hazards and risk ratings has been achieved, the residual risk must be as low as reasonably achievable.
- Each person signs the SWMS/JSEA acknowledging that they have understood its contents.
- Put controls in place.
- Proceed with job, monitoring the controls for effectiveness and looking for new hazards.

The SWMS/JSEA must be available for inspection at any given time and must be reviewed as conditions change.

Risk / Hazard Assessment

Risk/Hazard Assessment has 2 stages:

(1) Risk/Hazard Analysis.

Risk analysis is used to determine the seriousness of a hazard based on how likely it is to happen and the consequences if it does happen. The risk level of each identified hazard should be worked out. Risk analysis comprises of 3 factors Likelihood, Consequence and Risk level.

Using a table similar to the one below, you can analyse how high the risk level is.

Likelihood	Consequence				
	Insignificant	**Minor** First Aid required	**Moderate** Medical attention and time off work	**Major** Long term illness or serious injury	**Severe** Kill or cause Permanent Disability or Illness
Almost certain	M	H	H	VH	VH
Likely	M	M	H	H	VH
Possible	L	M	H	H	VH
Unlikely	L	L	M	M	H
Rare	L	L	M	M	M

Table 2 – Likelihood vs Consequence Matrix

(2) Risk/Hazard Evaluation.

Risk evaluation is based upon the outcomes and results of the risk analysis.

Risk evaluation involves making decisions about:

- Have all the hazards been controlled.
- Is the residual risk acceptable.
- Is it safe to proceed.

Your evaluation should be used to determine how soon you should act to remove or control the hazard to achieve an acceptable level of risk.

You can do this using a table similar to the one shown below:

Risk Level	Action
Very High	Act immediately: The proposed task or process activity must not proceed. Steps must be taken to lower the risk level to as low as reasonably practicable using the hierarchy of risk controls.
High	Act today: The proposed activity can only proceed, provided that: 1. The risk level has been reduced to as low as reasonably practicable using the hierarchy of risk control. 2. The risk controls must include those identified in legislation, Australian Standards, Codes of Practice etc. 3. The risk assessment has been reviewed and approved by the Supervisor. 4. A Safe Working Procedure or Safe Work Method has been prepared. 5. The supervisor must review and document the effectiveness of the implemented risk controls.
Medium	Act this week: The proposed task or process can proceed, provided that: 1. The risk level has been reduced to as low as reasonably practicable using the hierarchy of risk controls. 2. The risk assessment has been reviewed and approved by the Supervisor. 3. A Safe Working Procedure or Safe Work Method has been prepared.
Low	Act this week: The proposed task or process can proceed, provided that: 1. The risk level has been reduced to as low as reasonably practicable using the hierarchy of risk controls. 2. The risk assessment has been reviewed and approved by the Supervisor. 3. A Safe Working Procedure or Safe Work Method has been prepared.

Table 3 – Hazard Evaluation Level example

Note: Any hazard with a residual risk level of high or very high should have further risk treatment measures (controls) in place to reduce the risk to an acceptable level. They will also require a higher level of approval in most cases and a higher level of risk management processes.

RISK/HAZARD TREATMENT

Once hazards have been identified, risk treatment options (controls) need to be considered and applied. Risk treatment involves selecting one or more controls to modify and reduce a risk and then implementing the control. Controls act as a barrier or layers preventing the unwanted event from happening. Every control has its limitations or holes in each layer and can be likened to a piece of Swiss cheese, the more layers / controls the more effective.

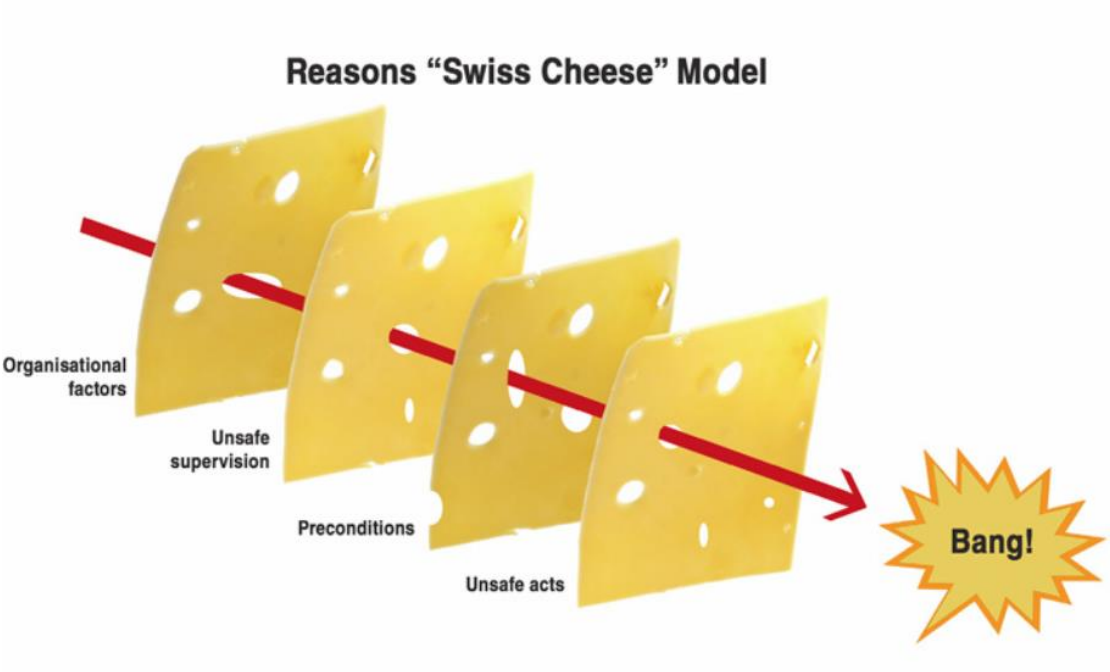


Figure 5 – "Swiss Cheese" model

Hierarchy of Control

Control measures can be ranked from the highest level of protection and reliability to the lowest. The WHS Regulations require duty holders to work through this hierarchy to choose the control that most effectively eliminates or minimises the risk in the circumstances. This may involve a single control measure or a combination of two or more different controls.

The hierarchy of control is as follows:

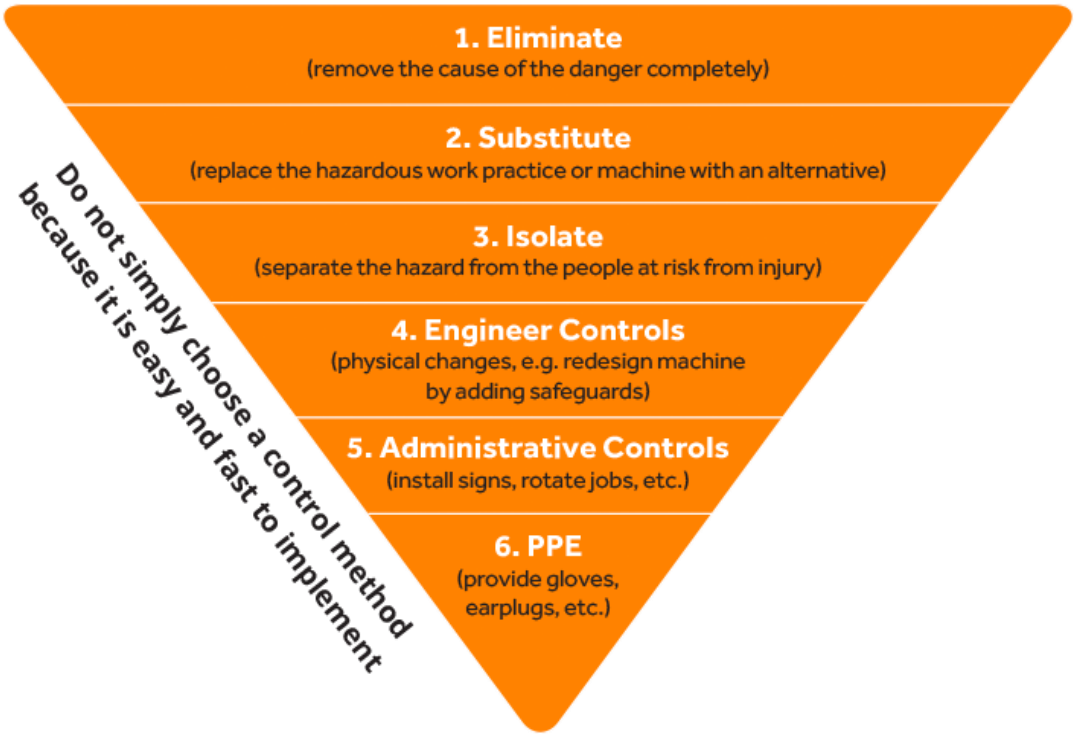


Figure 6 – Hierarchy of Control

It is important to consider all of the options available when deciding on the best course of action as not all options are feasible or possible under some circumstances. You may also need to use a number of control strategies in conjunction to reduce the risk level to an acceptable level.

The risk treatment plan should clearly identify the order in which to implement the individual risk treatments.

The risk treatment plan should be complete and adhere to workplace policies and procedures. Risk treatment plans should be discussed with appropriate personnel/workers and included within the management process of the organisation.

SPECIFIC CONTROL STRATEGIES FOR TRAFFIC

If the work area is going to be shared with pedestrians, site personnel/workers, vehicles or mobile plant, you will need to make sure you have selected appropriate control measures. These may include:

- Setting up pedestrian and vehicle exclusion zones.
- Setting up warning signs and barriers.

Figure 7 – Confined Space signage example

SAFETY REQUIREMENTS

It is important that you understand all safety requirements needed to perform your allotted tasks. Sources of safety information can include:

- Site safety plans.
- Organisational policies and procedures.
- Federal state and local statutory/regulatory authorities.
- Australian Standards.
- Verbal or written and graphical instructions.
- Signage and labels.
- Work schedules, plans and specifications.
- Work bulletins and memos.
- Charts, diagrams, maps and engineer's drawings.
- Safety Data Sheets (SDS).
- Regulatory and legislative requirements relating to work in confined spaces.
- Manufacturers' specifications and instructions.
- Safe Operating Procedures (SOP)/Job Safety Analysis (JSA)/Safe Work Method Statements (SWMS).

SAFETY DATA SHEETS

A Safety Data Sheet (SDS) is a document containing important information about a hazardous chemical (which may be hazardous substance and/or dangerous goods) and must state:

- A hazardous substance's product name.
- The chemical and generic name of certain ingredients.
- The chemical and physical properties of the hazardous substance.
- Health hazard information.
- Precautions for safe use and handling.
- The manufacturers or importer's name, Australian address and telephone number.

The SDS provides employers/PCBUs, self-employed persons, workers and other health and safety representatives with the necessary information to safely manage the risk from hazardous substance exposure.

IMPLEMENT CONTROL STRATEGIES

Control strategies need to be implemented before starting the task, or as soon as a hazard is identified during operation.

You should consult with other workers and management to ensure the implementation is done correctly and does not have a negative bearing on other trades, procedures or workers. Once the risk control measure is in place you will need to review the level of risk to determine if more needs to be done to lower the risk level.

The acceptable level of risk is determined by an organisation's policies and procedures, goals and objectives towards safety.

Discuss this with your supervisor or health and safety representative if you are not sure about whether or not the risk has been reduced enough to carry out the work.

If you determine the risk to be at an unacceptable level, the work must not be carried out until the situation can be reviewed by an authorised person.

MONITORING AND REVIEWING THE RISK MANAGEMENT PROCESS

Monitoring and review are an important part of the risk management process and should be planned for at every stage. Monitoring and review involves regular surveillance and checking. All responsibilities regarding monitoring and review should be clearly defined.
Monitoring and review should:

- Be used to detect any changes, including changes to risks, which may require revision of treatments, or the emergence of new risks.
- Ensure that treatments and controls are effective and efficient.
- Aim to improve risk assessment through obtaining further information.
- Be used to analyse events and changes that have occurred through the implementation of the process and any lessons that may be learned from this.

REPORTS AND RECORDS

Make sure you record any action you've taken and talk to your supervisor and OHS/WHS officer about the control strategies in place.

Reports and records could include:

- Risk Assessment Reports.
- Incident Reports.
- Job Safety Analysis (JSA).
- Safe Work Method Statements (SWMS).

DESIGN, MANUFACTURE, SUPPLY AND MODIFICATION OF CONFINED SPACES

All confined spaces should be designed and manufactured to minimise the need to enter the confined space and the risks associated with working in the confined space.

Any entry points need to be big enough to allow persons to be rescued in an emergency situation. Any modification to the confined space must not affect the safe means of entering, working in, or exiting the confined space.

INFORMATION AND INSTRUCTIONS

Make sure you collect all necessary information and instructions when planning to work in a confined space. Instructions can include:

- Plans.
- Specifications.
- Operational details.
- Instructions issued by authorised organisational or external personnel/workers.
- Project quality requirements.

PROJECT QUALITY REQUIREMENTS

All civil construction and mining tasks and activities need to meet project quality requirements. These are based on project plans and specifications as well as client expectations. Project quality requirements will detail exactly what you are expected to achieve and the standards you are expected to reach.
Project quality requirements may include:

- Dimensions and tolerances of tasks.
- Material standards.
- Work standards.
- Documentation requirements.
- Project specifications and drawings.
- Client standards and expectations.

OBTAIN A CONFINED SPACE WORK PERMIT

There is a range of important information to consider when applying for a permit such as:

- Sites under which permit activities must be applied.
- Work instructions and agreed/site procedures.
- Type of permit to be executed.
- Types of tools and equipment to be employed.
- Size of work team.
- Scope, location and urgency of work.
- Persons in the confined space/rotation of people in confined space.
- Risk control measures.
- Confirmation that work has been completed and that persons have left the confined space when appropriate.

<u>The permit must be kept until the work has been completed or for at least 2 years if a notifiable incident occurs.</u>

To obtain a confined space work permit you will need to have adequate language, literacy and numeracy skills to complete the permit documentation: This includes:

- The ability to read and correctly interpret complex Piping and Instrumentation Diagrams/Drawings (P&ID).
- The ability to speak clearly and unambiguously in English.
- The ability to explain, describe and verify complex needs and issues.
- The ability to complete workplace forms.
- Numeracy skills are needed to differentiate between high and low pressures and temperatures, voltages or masses.

Appendix C contains an example of a Confined Space Entry Permit.

TYPES OF WORK THAT REQUIRE A PERMIT

There are a number of different types of work that require a permit. These include:

- Working in a confined space.
- Working at heights.
- Cold work/general permit to work – issued for work that WILL NOT generate any source of ignition, such as flame, spark or temperature sufficient to ignite flammable material.
- Hot work – issued for work that WILL generate any source of ignition, such as flame, spark or temperature sufficient to ignite flammable material vehicle entry.
- Excavation – issued for the penetration of any ground surface with mechanical excavating equipment.
- Operation of plant.
- Other special permits such as plumbing/gas/electrical work.

CONDITIONS OF THE PERMIT

The conditions of the permit should reflect the hazards and hazard controls that have been identified. A confined space permit should include details of:

- Location, description and duration of work to be done.
- Hazards that may be encountered.
- Atmospheric test and monitoring requirements and results.
- Hot work.
- Authorisation.
- Isolation, lock-out, tagging out processes.
- Hazard control measures (e.g. signs and barriers).
- Personal protective equipment and clothing.
- Other precautions (e.g. signs, barricades).
- Size of work crew.
- Permit located with the stand-by person at entry to the confined space.
- Stand-by personnel/workers and emergency response and rescue arrangements.
- Other requirements as determined by risk assessment and in accordance with legislative requirements and relevant Australian Standard AS 2865-2009.

Once issued, you must confirm that the details in the work permit reflect the identified hazards, risk assessment and implemented hazard control measures. The permit should meet the requirements of AS2865 or other appropriate standards.

IMPLEMENTATION OF PERMIT HAZARD CONTROLS

Before commencing work you should implement the hazard control strategies outlined in the confined spaces work permit. Some of these strategies could include:

- Placing a stand-by person outside the confined space.
- Applying isolation, tagging and lock-out procedures for liquid, gas, electric current or other stored energy, as well as erecting barriers and signage.
- Purging gasses and ventilation of the confined space.
- Using protective equipment and apparatus.
- Any other requirements outlined in the confined space entry permit, AS2865 or other relevant sources.

DEVIATION FROM A WORK PERMIT

The permit may have to be re-issued or re-applied for if work conditions such as the identification of new hazards are identified. Other problems that can arise while carrying out work requiring a permit may include:

- Provision of the wrong permit/need for additional permits.
- Incorrect information being supplied with the permit.
- Errors being made in the understanding of permit data.
- Failure to correctly correspond to the requirements of the permit.
- Failure to seek clarification when anomalies occur.
- Variation in job scope from that specified in the permit.

STAND-BY PERSONNEL/WORKERS

All necessary safety procedures and standards should be followed including hazard identification and control prior to entering a confined space. All personnel should be conversant in the emergency procedures put in place, all rescue personnel appropriately trained and rescue equipment positioned close to the point of entry. A standby person should remain close by to the confined space.

A standby person should:

- Be fully trained and competent.
- Be in continuous communication and (if possible) visual contact with those inside the confined space.
- Be ready to immediately initiate emergency response procedures.
- Be continually monitoring hazards both inside and outside the confined space.
- Maintain clear access and egress (entry and exit).
- Not be involved in any other work while personnel/workers are within the confined space.
- Have the permit in their possession.

The stand-by person should not attempt to enter the confined space unless properly trained and equipped to deal with an emergency. There should also be another stand-by person outside the confined space to help them if they should require assistance.

Figure 8 – Entry using a tripod

CONFIRM INCIDENT/EMERGENCY RESPONSE PLAN

An emergency response plan must be in place before any confined space operations are carried out.

The emergency response plan is one part of a larger confined spaces management program coordinated by your supervisor. It includes the roles and responsibilities of all workers involved in the confined spaces work (as per legislation) and the identification and designation of areas of responsibility (who is responsible for different parts of the work), including the stand-by person.

Note: Training may need to take place to ensure all workers are capable of reacting as required in the case of an incident.

Before starting any confined spaces work you need to make sure the emergency response plan is appropriate for the work situation and that the stand-by person is fully aware of all required emergency response procedures.

If the emergency response plan does not meet the requirements of the situation, people's lives are at greater risk in the event of an incident or emergency. When determining the appropriateness of the plan you may need to check the skills/training of personnel/workers involved (e.g. first aid, fire-fighting, use of specialist safety and rescue equipment).
It is also important to make sure that:

- The entry/exit openings are large enough to allow for emergency access and that they are not obstructed.
- All necessary equipment, plant and PPE are correctly maintained and available in case of an emergency.
- You know your role in an incident/emergency and how to react.

COMMUNICATION

Being able to communicate effectively in the workplace is extremely important, especially in dangerous situations such as working in confined spaces.
For the safety of all personnel/workers involved in confined space operations it is vital that you can:

- Speak clearly;
- Are able to explain, describe and verify complex needs, issues and situations.

Effective communication also means understanding the language, jargon and systems of the site, as well as industry terminology which can vary between states and individual sites.
While you may not need to apply some of the more technical terms or phrases you should be able to recognise what they are referring to when you come across them in the documentation.

If you are unsure of the meaning of any words, phrases or other terminology, you should seek clarification at your tool box talk or site meeting, or by asking your supervisor.
Effective communication is particularly important in situations where you or a fellow worker is in immediate or potential danger.

<u>Remember: Confined space environments can change in seconds and being able to communicate events as they occur provides you with the best possible chance of survival in life threatening situations.</u>

Communication Equipment

Communication equipment can include mobile phones or two-way radios.
Fixed frequency two-way radios are a system that stops other radios using a selected frequency.

SIGNAGE AND BARRICADES

You should always separate a confined space from other personnel/workers by using appropriate signage and barriers to prevent unauthorised entry. Signage may include:

- Site safety signage.
- Temporary signage for the benefit of motorists and pedestrians.
- Barricades.
- Erect signs that show entry is allowed only after signing the entry permit.

ENVIRONMENTAL PROTECTION REQUIREMENTS

Our environment is important to us. Any work done in a confined space should not have a negative effect on the environment. Some environmental requirements are:

- Organisational/project environmental management plans.
- Waste management.
- Water quality protection.
- Noise, vibration, dust and clean-up management.

Contact the EPA for more information on how to work safely without impacting on the environment and remember, before any work is carried out you must make sure the relevant environmental protection requirements are in place according to site procedures.

Check the confined spaces work permit for details of what is required to maintain the lowest possible impact on the environment.

SAFETY EQUIPMENT

Examples of safety equipment include:

- Lifting and lowering gear.
- Ventilation equipment.
- Fire suppression equipment.
- Personal Protective Equipment.
- Breathing apparatus and respiratory equipment.
- Atmospheric testing and monitoring equipment.

It is vital that any safety equipment is inspected regularly, calibrated and tagged correctly (if applicable).

Note: Ensure you adhere to manufacture specifications for the selection and use of breathing apparatus and respiratory equipment. Not all breathing apparatus or respiratory equipment is suitable for all conditions and environments.

Figure 9 – Tripod

Figure 10 – Ventilation

Figure 11 – Half respiratory mask

Figure 12 – Gas tester

Figure 13 – Isolation hasp and locks

Figure 14 – Self Contained Breathing Apparatus (SCBA)

REPORT FAULTS

If you find anything wrong during your checks you must:

- Tag and isolate the damaged or defective item to stop anybody using it.
- Record the problem in the logbook or on the inspection checklist. Give as much detail as possible.
- Report the fault to your supervisor or other authorised person.

LIFTING AND LOWERING DEVICES

Lifting and lowering devices include safety belts, harnesses, tripods, ropes and lifelines.

FIRE SUPPRESSION EQUIPMENT

Fire suppression equipment could include fire blankets and fire extinguishers.

PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment (PPE) may include:

- Eye protection (e.g. goggles).
- Ear protection.
- Gloves.
- High visibility clothing.
- Hard hats.
- Safety footwear such as steel capped boots.
- Respirators and masks.

Correctly Fitting Personal Protective Equipment

There is no purpose in wearing PPE if it does not fit, or is worn incorrectly. Let's face it we all come in different shapes and sizes and PPE come in a variety of brands and sizes. Correct fit and comfort are just as important as technical effectiveness and the wearer must be shown how to fit it.

When using respirators or masks correct fit of a mask requires contact with smooth skin – this makes masks unsuitable for men with beards or moustaches. Even a one day growth of a beard has been shown to allow nearly 1% penetration of a full face-piece.

This is unacceptable with very toxic or carcinogenic substances. Small beards or moustaches which fit inside the face-piece are also unacceptable as they may cause an exhalation valve to fail if a hair lodges in it.

Glasses must not be worn inside a face-piece unless they are specially designed for the purpose, as the ear pieces will prevent a good seal.

These face-pieces are also unsuitable for people who wear contact lenses. Workers who wear glasses or contact lenses should be supplied with air-supplied hoods or helmets.

Respiratory Equipment

Where the hierarchy of hazard control measures cannot provide a concentration of oxygen in the confined space greater than 19.5%, or any airborne contaminant cannot be safely reduced or removed, workers must be equipped with supplied-air respiratory protection and PPE. All respiratory equipment should supply air at a pressure of at least 170L/min and have an oxygen level between 19.5% and 23.5 %.

Respiratory protection devices include:

- Air purifying respirators.
- Self-contained compressed air breathing apparatus (SCBA).
- Supplied airline breathing apparatus.
- Escape breathing apparatus.

Before you use any kind of breathing apparatus you need to make sure it is in proper safe working order and that you are competent and authorised to use it.

All equipment inspections should adhere to procedures such as;

- Relevant workplace procedures.
- Work instructions.
- Temporary instructions.
- Relevant industry and government codes and standards.

Check with your supervisor if you are unsure about any workplace procedures. You should check the following items before using any breathing apparatus:

- Serviceability and integrity of components (check for damage, wear, leaks, cracks, tears, functionality).
- Cylinder pressure (check the manufacturers specifications for correct air pressure).
- Integrity of air flow system (make sure there is a proper supply of air).
- Serviceability of any ancillary equipment (harness, regulator, pressure gauge).
- Seals (rubber must be in good condition).
- Inlet and exhaust valves (correct operation, particularly for blockage or sticking – sweat and saliva often cause them to clog up).

GAS TESTING ATMOSPHERES

Understanding atmospheric hazards, the detection and means of overcoming is important for all who work in confined spaces. The risks must be properly identified and the correct precautions taken, so that personnel can be confident that any atmospheric hazards have been accounted for.

EXPOSURE STANDARDS

Time Weighted Average (TWA)
The average airborne concentration of a substance when calculated over a normal 8 hour workday for a 5 day working week.

Most gas detection instruments have alarms fitted and are set to trigger when concentrations of the gas reach the TWA for that particular gas. If a calibrated gas detection instrument is in use and it alarms, it is a warning that the concentration of the gas has exceeded its TWA. Instruments measure at the inlet to the device and may not give sufficient warning if you are moving into a high concentration or if a slug of gas suddenly enters the area.

Some of the more common gas TWA's are shown below:

- Ammonia 25
- Carbon Dioxide 5000
- Carbon Monoxide 30
- Chlorine 1Time
- Hydrogen Sulphide 10

Short Term Exposure Limit (STEL)
A 15 minute exposure level which should not be exceeded at any time during a work day even if the 8 hour TWA average is within the TWA exposure standard. STEL exposure should not be repeated more than 4 times per day. There should be a minimum 60 minute break between STEL exposures.

Peak
The maximum or peak exposure to an airborne concentration of a particular substance. Exposure cannot exceed 15 minutes.

Immediately Dangerous to Life or Health (IDLH):
(as used in the United States)
Exposure to airborne contaminants which is "likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from such an environment".

Cautions
There are many toxic contaminants which may be present in a confined space. Not all substances have established Workplace Exposure Standards (sometimes called Permissible

Exposure Limits). Some substances may have a TWA but not a STEL; or may have a TWA and STEL but not a peak limitation.

Workplace Exposure Standards do not represent an absolute line between safe and unsafe. Workplace Exposure Standards apply to an average person – some workers may be more susceptible to exposure to toxic contaminants – due to illness or health conditions.

They do not take into account *combinations* of airborne chemical substances which may have a synergistic effect.

Workplace Exposure Standards change over time. What is considered safe today may not be considered safe in the future.

Although AS 2865:2009 requires that atmospheric testing of a confined space be conducted for concentration of airborne contaminants, toxic contaminants may also exist in solid or liquid form, and contact may be harmful. Exposure to all toxic contaminants should be minimised as much as is practicable. Other contaminant and environmental sampling equipment may be required.

ATMOSPHERES

There are a number of atmospheric hazards that may need to be identified to ensure the correct control measure is implemented:

- Oxygen Enrichment, Deficiency and Asphyxiates.
- Toxic Gases.
- Combustible Atmospheres.
- Irritant Gases – Hydrogen Sulphide.
- Dust.
- Mists.

Oxygen Enrichment

Air containing oxygen greater than 23.5% is considered to be oxygen rich. Oxygen enriched atmospheres may be produced by certain chemical reactions, but in a confined space they are typically caused by leaking oxygen hoses and torches.

Oxygen enriched atmospheres present a significant fire and explosion risk. Oxygen supports and accelerated combustion with almost any material/substance. Hence oxygen is never used to purge or ventilate a confined space.

If the oxygen levels are above 23.5%, entry is not be permitted and the confined space is to be purged to bring the level below 23.5%.

Oxygen Deficiency

Air containing oxygen less than 19.5% is considered to be oxygen deficient. Oxygen deficiency can occur in confined spaces as a result of a chemical reaction, poor air circulation, displacement and slowly by a chemical reaction such as rusting.

People have died as a result of entering a vessel or space to assist when they have seen someone working inside that has collapsed for no apparent reason. A person can be rendered unconscious almost immediately if entry is made into an atmosphere that is immediately dangerous to life and health, even though there are no obvious visible signs. Death is due to asphyxiation.

If the oxygen levels are below 19.5%, entry is not be permitted unless entrants are equipped with appropriate air supplied respiratory protective equipment.

Symptoms of Oxygen Deficiency

Oxygen Content	Symptoms
21 – 18%	None
18 – 14%	Increased breathing volume. Accelerated heartbeat. Impaired attention. Impaired coordination
14 – 10%	Very faulty judgment. Very poor muscular coordination. Muscular exertion causes rapid fatigue.
10 – 6%	Nausea, vomiting Inability to perform vigorous movement or loss of all movement. Unconsciousness in minutes, followed by death
6 – 0%	Spasmodic breathing. Convulsive movements. Death in minutes

Table 4 – Symptoms of Oxygen Deficiency

Causes of Oxygen Deficiency

Organic Decomposition - In sewage and water systems, because of the decomposing waste by organisms, oxygen is consumed in the aerobic chemical decomposition, hence reducing the oxygen level.

Oxidation of Metals - In metal pipes and tanks, the oxidization reaction leads to corrosion or rusting of the metal, consuming oxygen from the surrounding air.

Displacement - Some gases are heavier than air and their presence can displace air (and Oxygen) from confined spaces leading to an atmosphere that is oxygen deficient. One example is carbon dioxide (CO_2) that is heavier than air. Other inert (ie. non-reactive) gases

such as nitrogen can be used for purging confined spaces to remove flammable vapours to prevent ignition. Unless adequately ventilated, the atmosphere after purging will be oxygen deficient.

Fatal accident investigations cited by the National Institute for Occupational Safety and Health (NIOSH) 1994 revealed that the oxygen concentration levels in pits at depth decreased dramatically.

At the surface:	O_2 level is 20.9%
1.5m below the surface:	O_2 level is 20.5%
2.1m below the surface:	O_2 level is 20.0%
2.7m below the surface:	O_2 level is 14.0%
3.3m below the surface:	O_2 level is 6.5%
3.9m below the surface:	O_2 level is 4.0%

That within a vertical distance of 2 meters, the O_2 concentration dropped from 20.0% to 4.0% Therefore evaluation of conditions in a confined space must always include atmospheric testing at all vertical levels prior to entry.

Combustion - Fire consumes oxygen very rapidly and in confined areas where there is insufficient ventilation, available oxygen may be used up very quickly. In many fires, victims are asphyxiated or die from smoke inhalation before being burnt.

Asphyxiates

Asphyxiate gases are dangerous in that they relate to oxygen deprivation and /or asphyxiation in the body. The following gases may be encountered in confined spaces and are classified as Asphyxiates.

Methane - A simple Asphyxiate, which means that it has no effect on the human body other than to deprive it of oxygen. At sufficient levels of concentration will displace enough oxygen to asphyxiate any person in the area.

It is lighter than air, and therefore it is most likely to be found at higher levels of confined spaces. Its flammability also poses a hazard which can lead to explosions in confined spaces.

Carbon Dioxide - Is also a simple Asphyxiate, causing asphyxia by displacing oxygen from the air. Carbon dioxide is a colourless and odourless gas that is heavier than air and will therefore displace oxygen in the lower areas of confined spaces.

Carbon Monoxide - Is a chemical Asphyxiate as it renders the body incapable of utilizing an adequate oxygen supply. The body has approximately 200 times greater affinity for carbon monoxide than oxygen.

Carbon monoxide combines chemically with haemoglobin and red blood cells reducing the ability of blood to carry oxygen to the brain and the rest of the body. It is a colourless, odourless and tasteless gas that is formed by the incomplete combustion of carbonaceous material. It is virtually the same weight as air.

Sulphur Dioxide (SO_2)

SO_2 is a colourless gas that smells like burnt matches. It can be oxidized to sulphur trioxide, which in the presence of water vapour is readily transformed to sulphuric acid mist. SO_2 can be oxidized to form acid aerosols. SO_2 is a precursor to sulphates, which are one of the main components of respirable particles in the atmosphere.

TOXIC GAS

Hydrogen Sulphide (H_2S):

Hydrogen Sulphide is commonly referred to as "rotten egg gas" due to its strong odour. Although the smell is very strong at first (some people may be able to detect H2S at concentrations less than 1 ppm), it quickly deadens the sense of smell. H2S is produced by bacteria breaking down organic matter. It is **toxic**, poisoning and affecting the central nervous system, and high concentrations of H2S may lead to pulmonary oedema. H2S is also **corrosive**, **combustible**, and **heavier than air**. Being heavier than air, it tends to accumulate at the bottom of poorly ventilated spaces, where it is also **water soluble**, and collects in sludge's and pools until disturbed.

H_2S	
TWA:	10ppm
STEL:	15ppm
Peak / IDLH:	100ppm

Potential Effects of Hydrogen Sulphide Exposure:

Concentration (ppm)	Effects	Time
05	Moderate odour - easily detectable	8 Hours
10	Mild Eye and Respiratory irritation	1 Hour
30	Pungent "rotten egg" odour	1 Hour
100	Coughing, gradual loss of smell	1 Hour
200 - 300	Breathing irritation, rapid loss of smell	1 Hour
500 - 700	Unconsciousness, possible death	30-60 minutes
700 - 1000	Rapid unconsciousness, respiratory failure	30-60 minutes
1000 - 2000	Instant unconsciousness and death	Minutes

Table 5 – Hydrogen Sulphide Exposure

Carbon Monoxide (CO)

Carbon Monoxide is a colourless, odourless, and tasteless gas which is impossible to detect with human senses. It is produced as a by-product of combustion, particularly the combustion of fossil fuels such as oil and coal. It is **toxic**, and binds to the haemoglobin in blood cells, preventing the delivery of oxygen throughout the body. In low concentrations, CO may cause a headache, nausea, vomiting, and lethargy; but in high concentrations, unconsciousness and death may occur. CO can be **combustible**, but only in very high concentrations. CO is just a little **lighter than air**, but readily mixes in a confined space with normal air.

CO	
TWA:	30ppm
STEL:	200ppm
Peak / IDLH:	1 200ppm

Carbon Dioxide (CO_2)

Carbon Dioxide is a colourless and odourless gas, which is produced as a by-product of respiration. CO_2 is necessary for life as breathing is stimulated by CO_2 levels in the lungs. CO_2 is non-flammable and non-toxic at low levels. It is however, a **simple asphyxiant**, which may replace oxygen, causing asphyxiation. CO_2 is **non-flammable**, and is used in some fire extinguishers. It is **heavier than air** and **water soluble**, and accumulates in low- lying areas in confined spaces.

CO_2	
TWA:	5 000ppm
STEL:	30 000ppm
Peak / IDLH:	40 000ppm

Ammonia (NH_3):

Ammonia is a colourless gas with a strong odour that irritates the eyes, throat, nose, and skin. It is produced and used in many industrial processes, including fertiliser manufacturing, cleaning and sterilising, refrigeration, and in metal refining processes as a solvent. NH_3 is **combustible**, **toxic** and in high concentrations is corrosive, causing burns to the eyes and skin on contact. As a gas, NH_3 is **lighter than air**, but is also **soluble in water**. NH_3 is also **dangerous to the environment,** especially marine life.

NH_3	
TWA:	25ppm
STEL:	35ppm
Peak / IDLH:	300ppm

COMBUSTABLE ATMOSPHERES

Flammable contaminants are any dust, fume, mist, vapour or gas present in the air at concentrations that can propagate a flame on contact with an ignition source.
Some gases and vapours are flammable under certain conditions. For combustion and/or an explosion to occur, three components are necessary to be present simultaneously. They are:

1. Fuel (Gas, fumes or vapour).
2. Oxygen (in the air).
3. Heat.

Each gas requires a certain percentage of fuel mixed with oxygen to burn. This is known as its flammable range which is significant in confined spaces because:

- the right fuel/air mixture can build up gradually due to poor ventilation
- when flammable gases are confined they are more likely to explode if ignited

The range of air/fuel mixture at which flammable gases will ignite/explode is defined by the following two parameters:

- Lower Explosive Limit (**LEL**)
- Upper Explosive Limit (**UEL**)

Lower Explosive Limit (LEL)

Concentrations below the LEL need to be considered as a potential hazard. Due to layering a combustible gas may be concentrated in the upper areas of the confined space but once the space is entered the gases are mixed to increase the overall explosive level. To ensure the level should not rise into the flammable range Australian standards set a limit of 5% of the LEL.

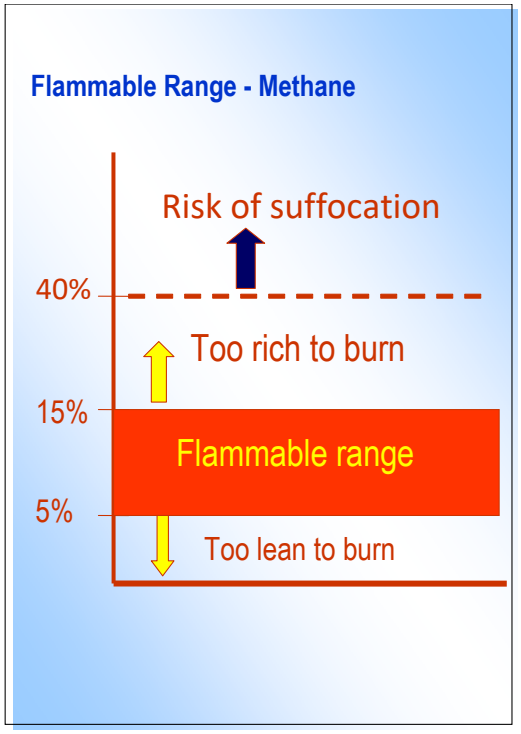
No entry into a confined space is permitted unless the LEL is below 5%.

If the concentration prior to entry is above 5% then the space must be purged or/and ventilated to reduce the explosive level to below 5%.

Upper Explosive Limit (UEL)

Concentrations above the UEL should not be considered safe for two reasons:

1. The gas may have displaced oxygen causing an oxygen deficient atmosphere;
2. At some point the concentration of flammable gas may be diluted thus bringing it down below the upper explosive limit and into the flammable range.



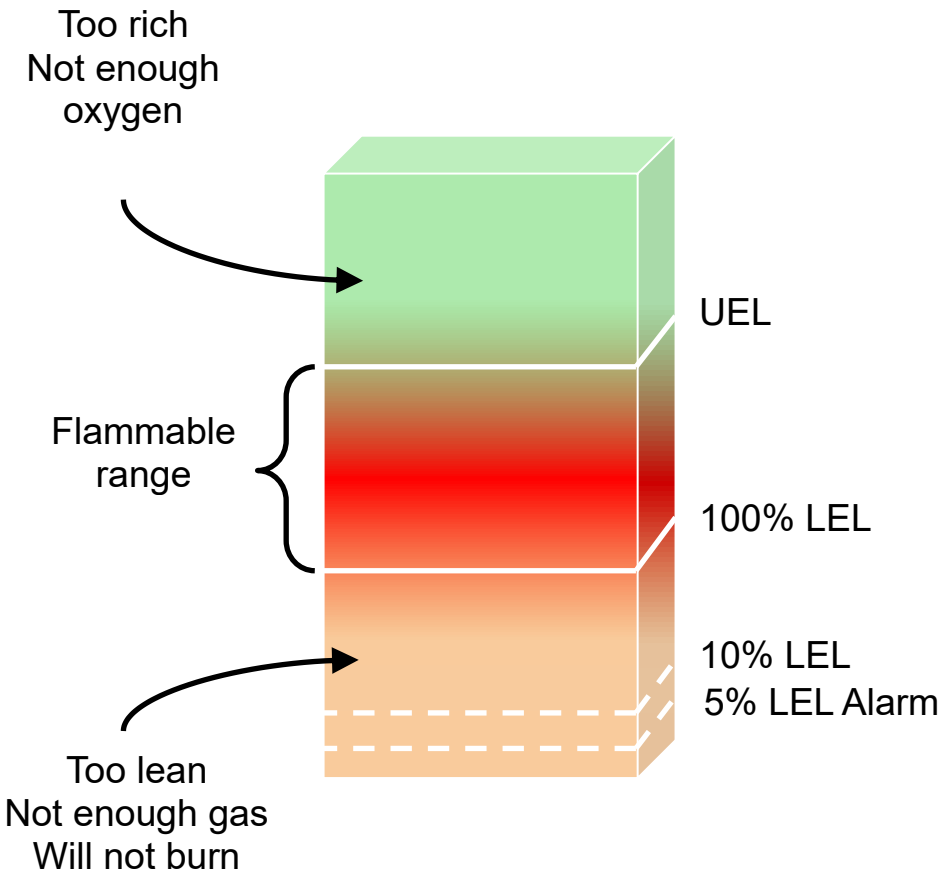


Figure 15 – Combustible Atmospheres

DUSTS

Organic

Organic dusts include particles formed by living organisms or materials that contain carbon. Flour, hay fibres, sawdust and mould dust are all part of this category.

These materials are not normally poisonous, but may cause discomfort in the form of eye and throat irritation and allergic reactions.

Organic dusts may be dangerous if associated with respiratory disease. Respiratory conditions in farmers are very common because of organic dusts and many professional areas have to use protection against these dusts.

It is also vital to be aware that dust resulting from flour, Soya beans and the like, can become highly explosive within a confined space. Therefore, all sources of ignition need to be strictly controlled in this environment.

Inorganic

Inorganic dusts are usually dusts derived from minerals or metals. These are dusts that do not contain carbon. Often these dusts may enter the blood stream and be transported by the blood to many body organs.

Two of the best known hazardous dusts are silica and asbestos. These and many other inorganic substances may cause severe damage to the lungs and other organs. Many dusts accumulate in the body causing serious damage after many months or years of working in contaminated atmospheres.

MISTS

A mist is formed when a liquid is forced through a narrow nozzle. Many chemicals are relatively harmless in liquid form. In spray form, however, they may become highly dangerous due to the increased flammability/explosive risk.

GAS DETECTION

Gas detection plays an important part of any safe operation for Confined Space Entry. Testing for gases will be needed to ensure the safety of personnel and to ensure that the correct control measures are taken.

Information on the oxygen content, toxicity levels and explosive ranges of gases in the area provides important information about existing conditions and indicates what measures are required to improve the quality of the atmosphere.

It may not be possible to atmospheric test remote regions without entering the space. For example, basement distribution substations and vault distribution substations are configured with entry chambers and a main chamber consisting of equipment. The chambers are separated by fire doors. In these substations, the procedure for atmospheric testing shall involve testing the small entry chamber before entry. Once the entry chamber is tested to be safe and entered, the fire door is gradually opened while atmospheric testing continues around the opening. By continually increasing the size of the opening and testing the atmosphere, eventually, the fire door is fully opened and the main chamber is entered. The atmosphere should be continuously monitored and tested when inside the space.

Atmospheric Detection must be done by an authorized person who is trained, accredited and experienced. The authorised tester will perform a gas test, and then state any ventilation requirements that must be in place prior to anyone entering the confined space. They will also state the type of respiratory protection that that is to be worn by anyone who enters the confined space.

ATMOSPHERIC TESTING AND MONITORING EQUIPMENT

Portable Gas Detectors

There are many different manufacturers and models of portable gas detectors.
Gas detectors contain a number of sensors, each of which can detect a different gas.
Four gas detectors are the most common, and the sensors that are usually fitted are:

- Oxygen
- Carbon Monoxide
- Hydrogen Sulphide
- Flammable gas

Different sensors can be added or substituted if required, in accordance with the gases that may be present in a particular confined space. Generally, gas detectors cannot detect a contaminant if they do not contain a sensor that is designed to detect that contaminant. It is important to remember that even if a gas detector shows no levels of the contaminants being tested for, it is in no way a guarantee that the atmosphere is completely safe for entry. Other contaminants may be present.

Always follow the manufactures instructions for the particular gas detector/equipment being used.

On detecting a hazardous substance, the units will activate warning alarms on reaching the levels outlined in the following table.

Gas	Hydrogen Sulphide H_2S	Carbon Monoxide CO_2	Oxygen O_2	Combustibles LEL
Measuring Range:	0 – 100 ppm	0 – 500 ppm	0 – 30%	0 – 100% LEL
LOW Alarm Level	10ppm	30ppm	19.5%	5%
HIGH Alarm Level	15ppm	200ppm	23.5%	10%
TWA Alarm Level	10ppm	30ppm	N/A	N/A

Table 6 – Alarm Levels

Each gas testing instrument needs to be:

- Calibrated according to the manufacturer's instructions. Instruments that are out of calibration or that fail field checks cannot be used for atmospheric testing until they are properly calibrated.
- Calibrated by the manufacturer annually.
- Field checked immediately prior to use. The field check needs to include checking with a test gas as per the manufacturer's instructions.

Gas Detector Use

1. Inspect the device and the accessories to be used, check for damage and date of calibration.
2. Turn on and conduct self-tests
3. Zero sensors / fresh air calibration
4. Bump test (*if part of site procedures*)
5. Check peaks / max values
6. Clear peaks / max value

Care of the Detector – After Use

- Conduct an after-use inspection (check for water damage / condensation).
- Report any defects to the maintenance supervisor.
- Put battery back on charge.

Gas detectors must also be calibrated at regular intervals by a competent person as the sensors may drift or lose their sensitivity over time.

Detectors are to be calibrated in accordance with manufacturer's instructions.

Figure 16 – Portable Gas Detector (example)

Figure 17 – Organic Vapour Air Monitor

Figure 18 – Gas Sampling Pump with Glass Tube fitted

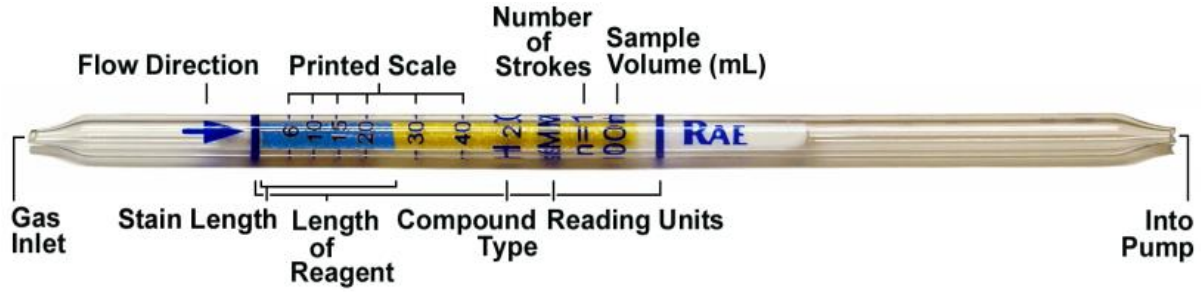


Figure 19 – Gas Detection Tube

CONDUCT ARTMOSPHERIC TESTING

The air inside a confined space should be tested before any workers enter. If work stops for a long period of time (e.g. over an hour) the space will need to be tested again.

Entry is defined as when a person's head or upper body is within the boundary of the confined space. Inserting an arm for the purpose of atmospheric testing is not considered as entry to a confined space.

Before a person enters a confined space make sure:

- The confined space contains an oxygen level between 19.5% and 23.5%.
- The atmospheric contaminants in the confined space are reduced to a safe level.
- There are no temperature extremes.
- The concentration of flammable gasses in the atmosphere is below 5% of its LEL.

What if Readings Pose an Unacceptable Risk

If initial testing shows that the space is contaminated in any way you will need to take action. This could be done a number of ways such as:

- Purging the atmosphere by blowing air through the space; or
- Extracting toxic gases with a suitable exhaust system; or
- A combination of blowing and exhausting.

Care should be taken to prevent people outside the confined space from being exposed to gas while the atmosphere inside the confined space is being purged. Care must also be taken when purging flammable gases.

Do not use pure oxygen or gasses with a higher oxygen level of 21% for purging purposes. Ventilation such as exhaust fans can be used to remove hazardous gasses and contaminants. Any purging of a confined space needs to be followed up with proper ventilation procedures. Alternatively, people can enter the space if they wear an approved air-supplied respirator (self-contained breathing apparatus), so long as there are no flammable gases present in the confined space. Testing should be done prior to entering the confined space and needs to be done on a continuous basis while confined spaces operations are conducted, or in accordance with the confined spaces permit.

Confirm Atmospheric Testing Results before Entering the Confined Space

Always confirm that the results from the atmospheric testing show that the confined space is safe for entry before you begin work.

If the test results are inconsistent or inconclusive you must make sure further testing is completed with different and/or re-calibrated equipment.

Figure 20 – Atmospheric Testing

Confirming the Confined Space Is Ready For Entry

Before entering the confined space check the following:

- Isolations are complete and appropriate.
- Isolation provides positive isolation.
- Atmosphere is safe (or if necessary relevant measures are in place to ensure safe entry into an unsafe atmosphere).
- Safe entry and exit methods are in place.
- Access points are large enough for people (including emergency personnel/workers) and equipment to pass through. Access points should also be adequately provided with ladders, platforms or walkways, should not be obstructed by equipment and should be adequate in number for emergency rescue and ventilation requirements.
- Other items to ensure compliance with procedures, permits, relevant legislation and AS2865 are in place.

If you find that the confined space is not ready for entry you must report the deficiencies to an authorised person so that they may be fixed. You may also refuse to enter the confined space until the situation is corrected.

Figure 21 – Barricade example

RESCUE EQUIPMENT

It is vital that you have a plan in place and adequate incident response equipment on hand to cover any incidents that may occur, with all rescue personnel/workers trained in their use. Anybody involved in an emergency response must be made aware of the conditions and the number of people in the confined space before attempting to enter it. Rescue equipment, first aid kits, fire suppression equipment and spill kits should also be set up and ready for use near the confined space.

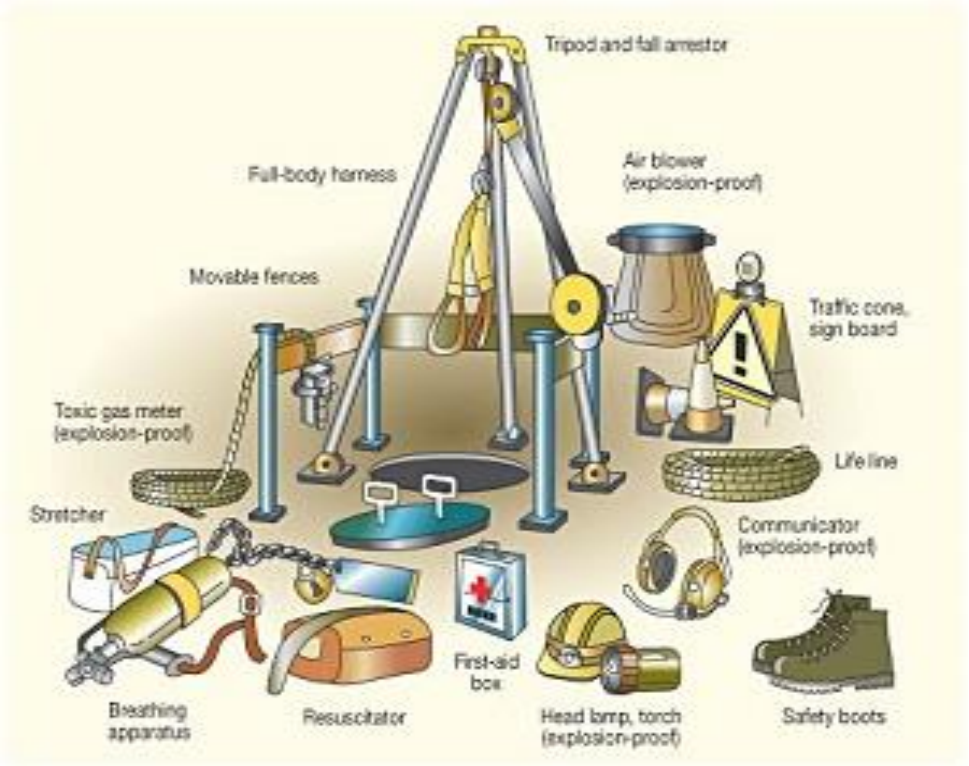


Figure 22 – Confined Space Equipment examples

EMERGENCY RESPONSE

- It is important to stay calm and focused in a crisis to ensure a positive outcome.
- Immediately raise the alarm if there is an emergency.
- If all procedures, equipment and personnel/workers are prepared, a rescue can be attempted without delay.
- It may be necessary for a trained person to apply first aid.
- Emergency services may need to be telephoned. Dial 000 immediately.

Figure 23 – Entering a Confined Space

ENTER THE CONFINED SPACE

No person may enter a confined space unless:

- The risk assessment has been reviewed.
- They have written authority to enter the confined space.
- The written authority includes any risk control measures or precautions necessary (including the number of standby people required) for the safe entry and execution of the work.
- They are made aware of, understand and comply with the written authority.
- A record of their presence in the confined space is made.
- Signs and protective barriers are erected to prevent unauthorised access.
- Appropriate and sufficient arrangements have been made for emergency response and rescue of persons in the confined space.

Preparations for entry to a confined space should accord with Australian standards and local procedures. All tagging and lock-out requirements listed in the work permit must be applied before the confined spaces work may begin. Once all the preparation has been completed you may begin entering the confined space.

WORK IN CONFINED SPACE

You should always comply with permit conditions while working in a confined space and follow all safety procedures while carrying out work in the confined space. If permit conditions and requirements are deviated from the permit may be revoked. Any deviations should be reported and corrected and the permit re-authorised and re-issued by an appropriately qualified and competent person.

Common safety procedures for carrying out work in confined spaces are:

- Ensure gas monitoring is carried out prior to entry.
- Ensure all isolations are in place and effective.
- Stay in constant effective communication with other personnel/workers including the stand-by person.
- Use communication equipment correctly. Where necessary you may have to rely on hand signals. Make sure you have worked out these hand signals before entering the confined space to work.
- There should be constant monitoring of equipment and changes in the environment (including atmosphere) while work is being carried out. Damage to equipment, changes in the atmosphere and movement of workers can all create new hazards.
- New hazards that arise while you are working within a confined space may require you to implement new hazard controls and request the re-issue of a permit.
- If you are using a gas monitor and the alarm sounds all personnel/workers should leave the confined space immediately.
- Do not work past the time allowed for the work to be done within the confined space. Keep an eye on the amount of time the work is taking. The allocated time will be shown on the confined spaces work permit.
- Complete confined space entry logs, ensuring that all entry and re-entry of persons working within the confined space are accurately recorded.

Figure 24 – Entering a Confined Space

Figure 25 – Working in a Confined Space

CHANGES TO RISK LEVEL DURING CONFINED SPACE OPERATIONS

If there is a change to the risk level during the confined space operation you will need to take appropriate action depending on the situation.

This may include:

- Organising for the re-validation or re-issue of the work permit to reflect the change to the situation.
- Evacuating the confined space according to procedures.
- Undertaking further testing of the confined space atmosphere and environment.
- Raising the alarm with other personnel/workers and isolating the confined space (depending on the circumstances).
- Initiating the emergency/incident response plan and carrying out your own role and responsibilities according to procedures.
- Any other relevant action as determined by your supervisor.

EXIT CONFINED SPACE

Exit the confined space safely and take appropriate measures to address hazards created by sharp edges or when exiting a confined space at height. Wherever possible use fixed ladders, platforms and walkways to exit from the confined space.

Figure 26 – Exiting from a Confined Space

RETUERN THE CONFINED SPACE TO SERVICE

Once the confined space work has been completed in accordance with the work permit you will need to:

- Conduct an inspection of the confined space.
- Recover all tools, equipment and materials from the confined space.
- Replace or close the access cover as required.
- Remove hazard control measures including tagging and lock-out systems as required.
- Complete confined space entry log.
- Notify the appropriate personnel/workers that the work in the confined space has been completed.

INSPECTION AND SITE CLEAN UP

The confined space must be inspected to ensure that all tools, equipment and materials have been recovered, and that there has been no damage done to the environment. Also check to make sure that no personnel/workers remain in the confined space.

The work area will need to be adequately cleared and cleaned after work has been completed. Make sure you wear effective PPE whilst doing this.

Dispose of, or recycle leftover materials in accordance with project environmental management plans.

DOCUMENTATION

You will need to complete all appropriate documentation, including the confined space entry log, withdrawal of permits, and any records related to use and servicing of equipment. Generally the withdrawal from a confined space operation requires the following information to be signed off:

- Names of all workers who have exited from the confined space.
- Date and time of all exits from the confined space.
- All workers and equipment are accounted for.
- All equipment has been checked and stored in accordance with procedures.

The person in direct control of the confined space operation will need to make the final sign-off of the withdrawal of written authority (confined spaces work permit) once all of the above information has been confirmed.

You should also report any issues that may have arisen such as:

- Feedback on the work and methods of improving the work process.
- Signs and symptoms of operational stress.
- Equipment malfunctions.

- Wear and tear of equipment and tools.
- Condition of safety and rescue equipment.
- Observations of the condition of the confined space.

CLEAN WORK AREA

As part of returning the confined space to serviceable the work area must be clean which includes:

- All materials, recyclable, hazardous waste etc. removed and disposed of as per site procedures.
- Tools, equipment and materials should be cleaned, checked, maintained and stored in accordance with manufacturers' recommendations and standard work practices.
    - Cleaned by removing all dirt, mud moisture or other contaminants, in accordance with manufacturers' specifications.
    - Checked for any damage – If anything is wrong, apply tagging and lock-out procedures and report it to your supervisor.
    - Maintained in line with manufacturers' recommendations or your worksite procedures/standard work practices, e.g. greasing of metal surfaces or lubricating moving parts.
    - Stored correctly in the appropriate location – Most equipment will have designated storage instructions to ensure the items are kept free from damage and can be easily found the next time they are needed.

The procedures for cleaning, maintenance and storage should be followed regardless of the type of equipment and tools being used. Keeping them in the best possible condition prolongs their working life and ensures they are safe to use.

REMOVING HAZARD CONTROLS AND SECURING ACCESS

If hazard control measures (e.g. barriers and signs) are no longer required they should be removed, cleaned and stored away according to procedures. The access cover of the confined space must also be replaced or closed, as required.

APPENDIX A: CONFINED SPACE DETERMINATION (EXAMPLES)

• Description of the space and activity	Confined Space criteria						Confined Space?
	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 space enclosed or partially enclosed	Is the space not designed or intended to be occupied by a person	Is the space designed or intended to be, at normal atmospheric pressure while any person is in the space	Does the space present a risk from:			
				Harmful airborne or flammable contaminants	An unsafe oxygen level	Engulfment	
Sewer with access via a vertical ladder	✓	✓	✓	✓	✓	✓	Yes
Dislodging grain from a silo with sole access through a manhole at the top	✓	✓	✓	✓	✘	✓	Yes
Cleaning spilled cadmium pigment powder in a shipping container	✓	✓	✓	✓	✘	✘	Yes
Inspecting a fuel tank in the wing of an aircraft	✓	✓	✓	✓	✘	✘	Yes
Dislodging a sludge blockage in a drain pit	✓	✓	✓	✓	✓	✓	Yes
Internal inspection of a new, clean tank prior to commissioning	✓	✓	✓	✘	✘	✘	No
Internal inspection of an empty cement silo through a door at ground level	✓	✘	✓	✘	✘	✘	No
Stocktake using an LPG forklift in a fruit cool store	✓	✘	✓	✓	✘	✘	No
Installing insulation in a roof cavity	✓	✓	✓	✘	✘	✘	No

APPENDIX B: GAS CHART

Name & Symbol	Properties	Effects on Humans	Flammable Limits	Occurrence	Detection
Oxygen O_2	• Colourless • Odourless • Tasteless • VD 1	• 21% in air essential to life. • Limits in CS 19.5% to 23.5%	Flammable above 23.5%	• Air. • Deficiency due to oxidation, bacterial action or displacement	Electronic
Nitrogen N_2	• Colourless, • Odourless • Tasteless • VD 0.97	• Toxic in concentrations in excess of 79% therefore will not support life	Non-flammable	• Air. • Used as an inert purging agent.	Electronic
Carbon Dioxide CO_2	• Colourless, • Slight pungent smell • Soda water taste • VD 1.53	• 0.03% in air • >0.5% increases respiration • Toxic above 5% • Exposure Standard 0.5%	Non-flammable	• Fermentation • Engine Exhausts • Combustion • Breathing	Electronic Tube Detector
Carbon Monoxide CO	• Colourless, odourless • Tasteless • VD 0.97	• Highly insidious poison displacing Oxygen from the red blood cells. • Exposure Standard 200ppm	12.5% - 75%	• Engine Exhausts • Combustion • Compressors	Tube Detector Electronic
Methane CH_4	• Colourless, • Odourless, • Tasteless • VD 0.55	• Non-poisonous but will not support life	5% - 15%	• Bacterial Action • Rotting Vegetation • Sewer Lines	Electronic
Sulphur Dioxide SO_2	• Colourless • Acrid taste • Suffocating odour • VD 2.26	• Extremely poisonous • Exposure Standard 2ppm	Non-flammable	• By-product from plastic and Paper manufacturing • Burning of sulphides	Tube detector
Hydrogen Sulphide H_2S	• Colourless • Odour of rotten eggs • VD 1.19	• Poisons the central nervous system • Standard 10ppm	4.5% - 45%	• Stagnant waters • Sewage treatment	Tube detector Electronic
Chlorine Cl_2	• Greenish Yellow • Choking Smell • VD 2.49	• Reacts with mucous • membranes @ 1,000ppm • Fatal Exposure Standard 0.5ppm	Flammable reaction with some organic materials	• Bleach Pool • Chemicals HCl • Manufacture	Electro-chemical cell Tube detector

APPENDIX C: CONFINED SPACE ENTRY PERMIT (EXAMPLE)

CONFINED SPACE ENTRY PERMIT

(PRINT CLEARLY ON PERMIT USING INK)

JSEA No:		**Permit No:**	
Confined Space No:		**Location:**	
Work to be performed:			

- If you answer **NO** to any of the following questions, you must **NOT** continue without seeking advice from your Supervisor.
- If there is no work instruction available for the tasks being performed, then refer to your Supervisor for instructions.

DETAILS OF RELATED PERMITS				
Hot Work:	☐ Yes	☐ No	Permit No:	
Excavation:	☐ Yes	☐ No	Permit No:	
Other:			Permit No:	

ATMOSPHERIC TESTING

☐ Continuous ☐ Initial ☐ Periodic Time intervals, every……mins

Date	Time	Oxygen Between 19.5 -23.5%	Flammables < 5% of its LEL	Carbon Monoxide < 30ppm	Hydrogen Sulphide < 10ppm
/ /	:				
/ /	:				
/ /	:				
/ /	:				
/ /	:				
/ /	:				

If **NO** to any question do not enter confined space and contact supervisor		Yes	No	N/A
1	Have all hazards been identified and the risks assessed?			
2	**Isolation** - consider isolation from location/method and energies / consider fixing locks/tags to isolation points			
3	**Ventilation** - set up appropriate ventilation system to ensure safe atmosphere			
4	**Atmospheric tests** - only calibrated instruments to be used/ensure tests are within the required parameters			
5	**Emergency response** - Are emergency response procedures available and understood/implement emergency plan and rescue procedures and rehearse before entry			
6	**Safety equipment** - equipment may include tripods, harnesses, retrieval ropes, communication equipment, lighting/only use Australian Standard compliance equipment			
7	**Personal protective equipment** - Australian Standards compliance only to be used			
8	**Hot work** - clear area of combustibles/ensure appropriate fire extinguishers available before permitting hot work to commence			

If **NO** to any question do not enter confined space and contact supervisor		Yes	No	N/A
9	**Use of plant & working at heights** - ensure appropriate access & egress and equipment is fit for purpose			
10	**Other controls** - ensure notices & barricades are fixed/erected as required e.g. Prohibition and Danger signage			
11	Is the completed written risk assessment JSEA attached?			

OPEN CONFINED SPACE PERMIT

PERMIT HOLDER

- All hazards have been identified and control measures are in place and effective.
- Initial Atmospheric testing is complete.
- The Confined space is safe to enter.

Permit holders Name:			
Signature:		Date:	/ /

AUTHORISED PERSON

Authorised Peron Name:			
Signature:		Date:	/ /

Permit Valid from:				Permit valid to:			
Time:		Date:	/ /	Time:		Date:	/ /

STANDBY PERSON

Date	Time In	Time Out	Name	Company	Signature
/ /	:	:			
/ /	:	:			
/ /	:	:			
/ /	:	:			

ENTRY LOG

Date	Time In	Time Out	Name	Company	Signature
/ /	:	:			
/ /	:	:			
/ /	:	:			
/ /	:	:			
/ /	:	:			
/ /	:	:			
/ /	:	:			
/ /	:	:			
/ /	:	:			

CLOSE CONFINED SPACE PERMIT

PERMIT HOLDER

- All work has been completed.
- All personnel are out of the confined space and accounted for.
- All control measures have been removed (including isolations).

Permit holders Name:			
Signature:		Date:	/ /

AUTHORISED PERSON

Authorised Peron Name:			
Signature:		Date:	/ /