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1.1 Introduction

These training materials are based on the National Unit of Competency **RIIWH5202E Enter and work in confined spaces**



1.1.1 Overview

You will learn about:

- ◆ Planning out confined spaces work.
- ◆ Confined spaces entry permits.
- ◆ Choosing and checking safety equipment.
- ◆ Preparing and working safely in a confined space.
- ◆ Exiting the confined space and finishing the work.



1.1.2 What is a Confined Space?

"A space in any vat, tank, pit, pipe, duct, flue, oven, chimney, silo, reaction vessel, container, receptacle, underground sewer, shaft, well, trench, tunnel or other similar enclosed or partially enclosed structure.



The Code of Practice 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.
- ◆ Has a restricted means of entry and exit.
- ◆ Is, or is designed or intended to be, at normal atmospheric pressure while any person is in the space.
- ◆ Presents a risk to health and safety from:
 - ◆ An atmosphere that does not have a safe oxygen level, or
 - ◆ Contaminants, including airborne gases, vapours and dusts, that may cause injury from fire or explosion, or
 - ◆ Harmful concentrations of any airborne contaminants, or
 - ◆ 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.
 - ◇ Duct keels.
 - ◇ Ballast.
 - ◇ Oil tanks.
 - ◇ Void spaces (not including dry cargo holds).



1.1.3 Confined Space Hazards

There are a range of hazards that may exist in confined spaces:

- ◆ Unsafe oxygen levels.
- ◆ Fires and explosions.
- ◆ Atmospheric hazards.
- ◆ The effect of irrespirable atmospheres on the respiratory system.
- ◆ Other hazards.



You need to be aware of the different hazards that can exist in a confined space and the effect they can have.

1.1.3.1 Unsafe Oxygen Levels

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

The oxygen levels inside a confined space may fall below a safe level for the following reasons:



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

1.1.3.3 Atmospheric Hazards

Dusts, gases, fumes, mists and vapours are common hazards in workplace air. These can seriously affect the health of workers.

Atmospheric hazards are the leading cause of death in confined spaces.



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

- ◆ The work processes being done (for example spray painting).
- ◆ Spills or leaks from pipes or machinery.
- ◆ Disturbance of materials (for example walking through a shallow liquid substance).
- ◆ The storage or transfer of materials (for example 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.

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.

Inhaling some chemicals, such as solvents, can damage many parts of the body including the brain. Welding fumes, smoke and mists from spray painting are also serious respiratory hazards and workers should be adequately protected from exposure to any of them.



Confined spaces must be monitored for dangerous gases or unsafe oxygen levels, which cause irrespirable atmospheres.

Irrespirable atmospheres are atmospheres that are unfit for breathing, or are incapable of supporting life.

Types of Irrespirable Atmospheres	Description:
Asphyxiating Atmospheres	Asphyxiating atmospheres have low levels of oxygen. You will not be able to breath properly in any atmosphere that has less than 19.5% oxygen. Hypoxia is the result of inadequate oxygen. Signs of hypoxia include rapid breathing, gasping for air, blueness of skin, confusion, irritability, unconsciousness and death.
Toxic Atmospheres	Toxic atmospheres can occur due to the release of toxins and poisons in materials that have been burnt in a fire.
Air Contaminated with Smoke or Suspended Particles	Air that is contaminated with smoke or particles is unbreathable. Particles can settle in the lungs and will restrict the amount of oxygen that can be taken into the body. These particles within the lungs may then develop into other respiratory problems.

Many toxic substances are commonly encountered in industry. The presence of toxic substances may be due to materials being stored or used, the work being performed, or may be generated by natural processes.

Exposure to toxic substances can produce disease, bodily injury, or death in unprotected workers.

1.1.3.4 The Effect of Irrespirable Atmospheres on the Respiratory System

The respiratory system is made up of the mouth, nose, windpipe, lungs and pulmonary blood vessels that surround the lungs. In this body system, oxygen is put into the blood while carbon dioxide is breathed out. Without the respiratory system working properly you will die.

Respiration in healthy adults is normally approximately 16-20 breaths per minute. However, breathing rates can increase significantly when the body is exercising, stressed, or in poor atmospheres.

The lungs cannot keep breathing in irrespirable atmospheres for long periods (depending upon the type of atmosphere). Some atmospheres can burn the lungs, while others can cause problems such as hypoxia (a lack of oxygen), which can be deadly. It is for these reasons that a breathing apparatus is used when you need to work in an irrespirable atmosphere.



1.2.2 Technical and Safety Information

Like laws and rules, technical and safety information is an important part of all procedures and practices for working safely.

Before starting any work in a confined space you need to make sure you have all technical and safety information for the job. This will help you to do your work in the safest way.



Technical and Safety Information	Description
Site Details	The information and safety requirements of the workplace environment (where you will be working) including isolation of services.
Hazard Details	Any hazards in the work area or related to the confined space. This could also include instructions on how to handle dangerous or hazardous materials.
Task Details	Instructions of what the work is or what you will be doing (this includes confined space work permits).
Manufacturers' Guidelines and Specifications	How to use and maintain tools, equipment and safety devices and systems.
Faulty Equipment Procedures	Isolation procedures to follow or forms to fill out.
Signage Requirements	Site signage used to warn others that some areas are not safe to be in, or that work is being completed.
Emergency Procedures	Instructions on what to do in emergency situations, for example if there is fire, or if first aid is needed.
Communication Procedures	Technical and safety information could also include workplace procedures for communication.

1.3 Get Your Work Details



You need to be clear about what work you will be doing. Make sure you have everything about the job to apply for a confined spaces permit before you start. This includes what you will be doing, how you will be doing it and what equipment you will be using.

You need to know why you are entering the confined space to identify any dangers and work out the details for a work permit.

There are many reasons why you would need to enter a confined space:

- ◆ Cleaning and removing waste.
- ◆ Repair work, for example welding or cutting.
- ◆ Installing pumps and motors.
- ◆ Painting, sand blasting or applying surface coatings.
- ◆ Reading meters, gauges and dials.
- ◆ Installing, repairing or inspecting telephone, electrical or fibre optic cables.
- ◆ Tapping, coating or testing steam, water or sewage systems.
- ◆ Inspecting plant or equipment.
- ◆ Constructing a confined space, for example an industrial boiler.
- ◆ Rescuing people from a confined space.



1.3.2.1 Safety Data Sheets

A Safety Data Sheet (SDS) has important information about a hazardous chemical (which may be hazardous substance and/or dangerous goods) and must include details about:

- ◆ The 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 manufacturer's or importer's name, Australian address and telephone number.



The SDS gives you information on what to do if there is exposure to the hazardous material, for example if there is a spill, or if you are working with the substance.

1.5 Confirm the Emergency Response Plan



An emergency response plan needs to be finalised before any confined space operations are done. The emergency response plan includes the roles and responsibilities of all workers involved in the confined spaces work.

Before starting any confined spaces work you need to make sure the emergency response plan is right for the work situation and that the stand-by person understands the emergency response procedures.

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.

It is important to confirm your own role in an emergency so that you know what to do and how to react quickly before the situation gets worse. Talk to your supervisor about what you will need to do in an emergency and make sure that you have been trained to carry out the task.

1.6 Isolate the Confined Space

The confined space needs to be isolated from other workers who are not involved in the confined spaces work.



Signage and barriers can be used to stop unauthorised entry into the confined space.

Signage may include:

- ◆ Site safety signage.
- ◆ Temporary signage for motorists and pedestrians.
- ◆ Barricades.

2.1 Select and Inspect Equipment



The equipment you use while working in a confined space will depend on the job, hazards and hazard controls that are put in place.

Equipment used for confined spaces work includes:

- ◆ Safety equipment.
 - ◆ Rescue equipment.
 - ◆ Atmospheric testing equipment such as portable gas detectors and monitors.
 - ◆ Communication devices.
- ◆ Tools and equipment relevant to the work to be performed.

You need to make sure any torches or communication equipment is safe to use in a confined space.

2.1.4 Personal Protective Equipment

Personal protective equipment (PPE) may include:

- ◆ Eye protection (e.g. goggles).
- ◆ Ear protection.
- ◆ Gloves.
- ◆ Protective clothing.
- ◆ Helmets.
- ◆ Safety footwear.
- ◆ Respirators and masks.

2.1.5 Respiratory Equipment



Where a confined space has an unsafe concentration of oxygen, or any airborne contaminant cannot be safely reduced or removed, workers must be equipped with supplied-air respiratory protection and PPE.

Respiratory protection devices include:

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

Cylinder pressure, inlet & exhaust valves should be checked on breathing apparatus before use, as well as checking the mask for damage.

2.1.5.1 Limitations of Breathing Apparatus

There are limitations associated with all types of respiratory equipment and breathing apparatus. Some general limitations for different types of breathing apparatus include:

Equipment Type	Possible Limitations
Self-Contained Breathing Apparatus (SCBA)	<ul style="list-style-type: none"> ◆ Weight of the equipment: <ul style="list-style-type: none"> ◇ Can cause wearer to become fatigued more quickly. ◇ Can affect balance of wearer. ◆ Bulk/size of the equipment can cause issues in confined spaces and limit movement and mobility in and through spaces. ◆ Harness straps can limit movement and mobility of the wearer. ◆ Do not prevent contaminants being absorbed through the skin (a full protective suit and mask/facepiece can provide this protection). ◆ Reduced visibility caused by the facepiece. ◆ Limited time period for use based on: <ul style="list-style-type: none"> ◇ User's respiratory rate. ◇ Amount of air/oxygen in the apparatus.
Supplied Airline Breathing Apparatus	<ul style="list-style-type: none"> ◆ No protection for the user if the air supply fails. ◆ Hose can be pinched or severed, affecting air supply. ◆ User is limited to working within the length of the hose. ◆ User must exit the space by retracing steps/route of hose. ◆ Must be donned in respirable air.
Escape Breathing Apparatus	<ul style="list-style-type: none"> ◆ Limited air supply with a short duration of use.

Always check and follow the manufacturer's specifications to make sure you are aware of and work within the limitations of the equipment you are using.