MSMWHS216
Operate Breathing Apparatus

LEARNER GUIDE
This Book Contains:

☐ Course Information.

☐ Learner Theory and Practical Assessment instructions. (How you will be assessed on the theory practical assessment on day of assessment)

☐ Overview and Instructions.

❖ All theory assessment questions must be completed successfully, to be deemed competent in the theory assessment. Theory assessment will be given after the completion of knowledge pre-study questions and training. Practical assessment must be completed successfully, on a minimum of 2 occasions. You must successfully complete all assessments to be deemed competent. We will cover the theory prior to undertaking formal practical training and assessment. This is to ensure that you understand the WHS risks associated with the equipment prior using it.
2.4 Maintain Personal Safety at All Times

2.3 Implement Entrapment Procedures

2.2 Operate Breathing Apparatus

2.1.2 Communicating in Breathing Apparatus

1.6.1 The Entry Control Officer

1.5.5 Torch

1.5.4 Gas

1.5.2 Distress Signal Unit

1.4.2.1 Select the Right Breathing Apparatus for the Situation

1.3 Report and Record Faulty Equipment

1.2 Inspect the Breathing Apparatus

1.1.3 The Effect of Irrespirable Atmospheres on the Respiratory System

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1.1.1.1 Components of a Breathing Apparatus

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1.1 Introduction

These resources are based on the unit of competency MSMWHS216 Operate Breathing Apparatus.

You will learn about:

- Conducting pre-donning checks and tests on breathing apparatus.
- Operating breathing apparatus.
- Concluding operations in accordance with procedures.

Work Safely Health and Safety Rules

Every workplace has to follow laws and rules to keep everyone safe. You must follow all safety rules and instructions. Ask your boss or supervisor if you are not sure of anything there are 4 main parts which are show in the table below:

<table>
<thead>
<tr>
<th>Acts and Legislation</th>
<th>These are laws that you have to follow.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulations</td>
<td>These explain the laws.</td>
</tr>
<tr>
<td>Codes of Practice</td>
<td>Instructions on how to follow the law.</td>
</tr>
<tr>
<td>Australian Standards</td>
<td>The minimum requirement for a job, product or hazard (AS2865).</td>
</tr>
</tbody>
</table>


Australian Standards - [https://www.standards.org.au/](https://www.standards.org.au/)
1.1.1 What is a Breathing Apparatus?

A Self-Contained Breathing Apparatus (SCBA) is a device worn by workers required to operate in an irrespirable atmosphere, including maintenance workers, rescue workers, fire fighters and other groups.

The purpose of a breathing apparatus is to provide breathable air in an atmosphere that poses danger to health and life.

There are 2 kinds of SCBA, Open-Circuit Breathing Apparatus and Closed-Circuit Breathing Apparatus.

Open-Circuit Breathing Apparatus

Open-circuit breathing apparatus contain filtered, compressed air rather than pure oxygen. When this air is exhaled it is vented into the surrounding atmosphere.

Typical open-circuit systems have 2 regulators – a first stage to reduce the pressure of air to allow it to be carried to the mask, and a second stage regulator to reduce it even further to a level just above standard atmospheric pressure.

This air is then fed to the mask in 1 of 2 ways:

- With a demand valve (activating only on inhalation).
- OR
- With a continuous positive pressure valve (providing constant airflow to the mask).

An open-circuit system has a full-face mask, regulator, air cylinder, cylinder pressure gauge, and a harness with adjustable shoulder straps and waist belt which allows it to be worn on the operator’s back.

Closed-Circuit Breathing Apparatus

The ‘closed-circuit’ type breathing apparatus filters, supplements, and re-circulates exhaled gas. It is used when a longer lasting supply of breathing gas is needed, such as in mine rescue, and working in spaces too narrow for an air cylinder.

1.1.1.1 Components of a Breathing Apparatus

The components of an open-circuit breathing apparatus system include:

- Backplate – holds the cylinder.
- Harness – attaches the backplate to the wearer.
Pressure reducer – used to reduce the pressure coming from the cylinder to ensure breathability.

Chest pressure gauge – gives the user an indication of the level of cylinder pressure.

Regulator – used to deliver and control the flow of air.

Mask – used to cover the face. Most will have communications systems built into them.

Cylinder and valve unit.

Airline equipment.
1.1.2 Irrespirable Atmospheres that Require Breathing Apparatus

Dusts, gases, fumes, mists and vapours are common hazards in workplace air. These can seriously affect the health of workers. For example, breathing in asbestos fibres can lead to asbestosis and lung cancer while crippling lung diseases can be caused by the inhalation of certain dusts.

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.

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

Irrespirable atmospheres include:

<table>
<thead>
<tr>
<th>Atmosphere Type</th>
<th>Description and Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heated Atmospheres</td>
<td>High temperature air can burn the airways. The respiratory system can be damaged even if the temperatures are not high enough to be unbearable to the skin.</td>
</tr>
<tr>
<td></td>
<td>Anything over approximately 50 degrees Celsius could result in irreversible damage to the lungs.</td>
</tr>
<tr>
<td>Asphyxiating Atmospheres</td>
<td>Asphyxiating atmospheres are oxygen deficient. Any atmosphere that has less than 19.5% oxygen is not going to be able to support breathing activities.</td>
</tr>
<tr>
<td></td>
<td>Hypoxia is the result of inadequate oxygen. Signs of hypoxia include rapid breathing, gasping for air, blueness of skin, confusion, irritability, unconsciousness and death.</td>
</tr>
<tr>
<td>Toxic Atmospheres</td>
<td>Toxic atmospheres can occur due to the release of toxins and poisons in materials that have been burnt in a fire.</td>
</tr>
<tr>
<td>Air Contaminated with Smoke or Suspended Particles</td>
<td>Air that is contaminated with smoke or particles is unbreathable.</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
</tbody>
</table>

1.1.3 The Effect of Irrespirable Atmospheres on the Respiratory System

The respiratory system is comprised of the mouth, nose, windpipe, lungs and pulmonary blood vessels that surround the lungs.

In this body system oxygen is exchanged into the blood while carbon dioxide is breathed out. Without the respiratory system working efficiently and effectively, the human body 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 sustain the breathing in of 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, which can be deadly.

It is for these reasons that breathing apparatus is used when dealing with irrespirable atmospheres.
1.1.4 Work Method Statements

Many worksites require a work method statement before any high risk work can start. A work method statement is a list of steps that outlines how a job will be done and includes details for any hazards that occur at each step, and what you need to do about them.

These statements can also be known as a Safe Work Method Statement (SWMS), Job Safety Analysis (JSA) or Standard Operating Procedure (SOP).

Make sure you understand all of the information in the work method statement before you start the work. It will help you to complete the work as safely as possible.

Operational procedures and safe work practices may include the procedures to be followed for:

- Donning and starting breathing apparatus.
- Performing operational checks on the equipment.
- Following control procedures.
- Selecting ancillary equipment.
- Identifying and controlling hazards.
- Maintaining communications.

1.2 Inspect the Breathing Apparatus

Before you use any kind of breathing apparatus you need to make sure it is in proper safe working order. You are relying on this equipment to keep you alive – DON’T TAKE ANY CHANCES!

All equipment inspections should adhere to procedures. These may include:

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

Check with your supervisor if you are unsure about any workplace procedures.

1.2.1 Pre-Use Checks

Pre-use tests and checks must include:
1.2.2 Donning the Breathing Apparatus

Once all pre-use tests and checks have been conducted, it is time to don the breathing apparatus.

There is no point in wearing a respirator if it does not fit, or is worn incorrectly.

Faces are different shapes and sizes and respirators come in a variety of brands and sizes to match.

Correct fit and comfort are just as important as technical effectiveness.

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 per cent 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.

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.

Breathing apparatus should always be donned in a specific order to ensure all components are attached and working correctly. Your organisational procedures and manufacturer’s specifications will provide you with this order.

Breathing apparatus must be donned and started in fresh air.

Breathing apparatus can be donned using an over-the-head method, coat method, or other methods approved by the manufacturer.

The over-the-head method should be similar to the following:

1. Lay the breathing apparatus out with the cylinder valve in the required position and the shoulder straps extended.
2. Open the valve, lift the breathing apparatus over your head.
3. Slip into the shoulder straps. Tighten all straps and secure all buckles.
4. Ensure that the pressure indicator is in a position so the dial is easy to read.
5. Don the mask and check the seal, airflow and safety devices.
6. Ensure the helmet is in place and every strap is connected.

The coat method follows a similar procedure, except you are required to swing the system onto one shoulder then the other, as you would to don a jacket.

Some organisations require a second person to check that all equipment has been donned correctly.

1.2.2.1 Donning the Facemask

While the exact process will depend on the type of equipment being used and your organisational requirements, the procedure for donning the facemask may be similar to the following:

1. Extend the straps on the facemask.
2. Put your chin in the chin pocket or place.
3. Bring the mask up and cover your face.
4. Pull the straps or webbing over the head.
5. Tighten the straps in order, the lower straps first.
6. Check the seal.
7. Don the hood and helmet.
8. Place/Connect the regulator to the facemask.
9. Ensure there is correct airflow and adequate pressure.

At all times the manufacturer’s specifications and organisational requirements must be followed.
1.2.3 Starting and Checking Breathing Apparatus

Each breathing apparatus set will have a variety of components which need to be started and checked in accordance with your organisation’s and the manufacturer’s procedures.

Once you have correctly donned the breathing apparatus you will need to perform a negative test, a positive test and an audible alarm test.

1.2.3.1 Negative Test

Prior to attaching the supply air tube to the facemask, block the end of the inhalation tube on the mask with the palm of your hand while trying to inhale.

If the face-piece is fitted correctly it will collapse against your face. If not, make adjustments and try again.

When you exhale through the exhalation valve no sticking should be evident.

1.2.3.2 Positive Test

The positive test is also known as the leak test. While breathing normally, place a finger under the edge of the facemask. This should create a high airflow from this point.

Your organisation may have different procedures to be followed in starting and checking the breathing apparatus. Always follow your procedures, and do not use any equipment that fails any testing.
1.2.3.3 Audible Alarm Test

To conduct an audible alarm test:

1. Turn the airflow controller fully clockwise, and press the air saver switch.
2. Open the cylinder valve fully, then close it a quarter turn to pressurise the line. The cylinder pressure should read greater than 250 bar. If the pressure is less than 250 bar it should not be used — tag the cylinder for refilling.
3. Close the cylinder valve, and purge the line by pressing the purge valve. The whistle alarm should sound at around 50 bar.
4. Turn the cylinder valve back on, ensuring that the airflow controller is turned fully clockwise and the air saver switch has been pressed.
5. Attach the second-stage regulator to the facepiece and inhale. The regulator should work without excessive effort.

1.3 Report and Record Faulty Equipment

When inspecting your breathing apparatus you are looking for anything that will affect the operational serviceability or usefulness of that piece of equipment.

If any fault or damage is found with the equipment it will need to be recorded and logged, and reported to the appropriate personnel in the manner that is required by your organisation.

Once the damage has been reported, your supervisor or other appropriate personnel will decide on the action to be taken. This will often include repair or replacement.

1.4 Hazard Identification and Control

Before starting work on a site you should consult with safety officers, supervisors, site engineers, managers responsible for the site or other relevant workplace personnel.

They can inform you of any site-specific hazards and ground conditions and ensure that you adhere to any workplace policies and site-specific procedures.

It is important that suitably knowledgeable personnel are involved in the hazard identification process.
## 1.4.1 Identify Hazards

It is essential that you are aware of the possible hazards that can occur on site, and know the procedures to monitor and control them.

Hazard related to the use of breathing apparatus could include:

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Failure to Maintain a Face Seal</strong></td>
<td>Without an adequate seal air will leak and fumes and toxic gases could leech into your mask area.</td>
</tr>
<tr>
<td><strong>Running Out of Air</strong></td>
<td>Low air warnings are built into most breathing apparatus. You need to be aware of the warnings or alarms and regularly check your gauge so you are aware of the amount of time you have left.</td>
</tr>
<tr>
<td><strong>Malfunction of Equipment</strong></td>
<td>Malfunction is a constant threat to users of breathing apparatus, but regular maintenance can help to overcome this.</td>
</tr>
<tr>
<td></td>
<td>If you have equipment that is malfunctioning you will need to leave the work area immediately.</td>
</tr>
<tr>
<td></td>
<td>Never evacuate the scene without notifying your team leader and do not evacuate by yourself. Always have a two-person team. If your team is a three-person team, you should all evacuate.</td>
</tr>
<tr>
<td><strong>Unsafe Oxygen Levels</strong></td>
<td>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:</td>
</tr>
<tr>
<td></td>
<td>◆ The combustion of flammable materials (e.g. welding or cutting).</td>
</tr>
<tr>
<td></td>
<td>◆ Slow bacterial reactions of organic substances (e.g. sewerage).</td>
</tr>
<tr>
<td></td>
<td>◆ Reaction of inorganic substances (e.g. rust).</td>
</tr>
<tr>
<td></td>
<td>◆ Oxygen absorbed by materials (e.g. grain in silos).</td>
</tr>
<tr>
<td></td>
<td>◆ Oxygen displaced by another gas (e.g. nitrogen used to remove toxic fumes).</td>
</tr>
<tr>
<td></td>
<td>◆ High oxygen consumption rate (e.g. many people working in a small confined space).</td>
</tr>
<tr>
<td><strong>Fires and Explosions</strong></td>
<td>'Hot work' such as welding and thermal/oxygen cutting can create hazards like excessive heat, sparks and the risk of fires or explosions. Fires and explosions can be caused by:</td>
</tr>
<tr>
<td></td>
<td>◆ Open flames (e.g. welding torches).</td>
</tr>
<tr>
<td></td>
<td>◆ Hot surfaces (e.g. steam lines).</td>
</tr>
<tr>
<td></td>
<td>◆ Frictional sparks (e.g. a metal tool striking another object).</td>
</tr>
<tr>
<td></td>
<td>◆ A spark or heat produced by electrical equipment (e.g. a mobile phone, flashlight).</td>
</tr>
<tr>
<td></td>
<td>◆ Incorrectly installed wires or overloaded fittings.</td>
</tr>
<tr>
<td></td>
<td>◆ Static electricity sparks (e.g. from synthetic clothing).</td>
</tr>
<tr>
<td></td>
<td>Combustible/flammable dusts can often be found in a confined space such as a storage bin or grain silo. Fire also poses dangers due to smoke, as well as causing disorientation or structural instability of the work area.</td>
</tr>
<tr>
<td><strong>Disorientation</strong></td>
<td>In smoke, darkness and confinement, disorientation can cause hazards. This could include becoming confined or entrapped within an area, or losing touch with your team.</td>
</tr>
<tr>
<td></td>
<td>The extensive use of guidelines and working together as a team will minimise this risk.</td>
</tr>
<tr>
<td><strong>Entrapment</strong></td>
<td>Some materials stored in or around a confined space (e.g. grains, sawdust, or soil) can engulf (completely surround and trap) a person in seconds. If the person is not rescued immediately they can die within a few minutes.</td>
</tr>
</tbody>
</table>
### Hazard Risks

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural Hazards</td>
<td>Structural hazards are the hazards caused by the physical characteristics of the environment such as restrictions to movement or visibility caused by obstructions. The structure you have entered may also be unstable due to damage, age or use.</td>
</tr>
</tbody>
</table>
| Atmospheric Hazards     | Hazardous dusts, gases, fumes, mists and vapours can arise in a confined space because of:  
  - The storage or transfer of materials (e.g. grain).  
  - The work processes being undertaken (e.g. spray painting producing mists).  
  - Spills or leaks from pipes or machinery.  
  - Disturbance of materials.  
  - Gases in stormwater drains and sewers.  
  - Chemical reactions between substances.  
  - Exhaust gases from pumps or other machinery.  
  Residue left in confined spaces such as empty tanks and containers can cause a build-up of toxic or explosive gases. |
| Hazardous Materials     | Hazardous materials could be any substance that is listed as dangerous goods, which could be toxic, corrosive, flammable or radioactive.                                                                   |

### 1.4.2 Hazard Controls

After you have found hazards or dangers you need to work out how bad they are. You need to think about:

- What is the chance that the hazard will hurt someone or cause damage?
- If it does happen, how bad will the injury or damage be?

Thinking about these things will help you to choose how to control the hazards.

Hazards controls need to follow:

- Legislation (laws).
- Australian Standards.
- Codes of Practice.
- Manufacturers’ specifications.
- Industry standards.

The best way to control hazards is to use the Hierarchy of Hazard Control. The Hierarchy of Hazard Control is the name given to a range of control methods used to eliminate or control hazards and risks in the workplace.

You start at the top of the list and see if you can take away (eliminate) the hazard or danger.

If you can’t take it away you move down the list to see if you can swap it for something safer (substitution).

Keep working through the list until you find something that controls that hazard or danger.
This table shows you the 6 different types of controls in order from best to worst:

<table>
<thead>
<tr>
<th>Hierarchy Level</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Elimination</td>
<td>Completely remove the hazard. This is the best kind of hazard control.</td>
</tr>
<tr>
<td>2. Substitution</td>
<td>Swap a dangerous work method or situation for one that is less dangerous.</td>
</tr>
<tr>
<td>3. Isolation</td>
<td>Isolate or restrict access to the hazard.</td>
</tr>
<tr>
<td>4. Engineering Controls</td>
<td>Use equipment to lower the risk level.</td>
</tr>
<tr>
<td>5. Administrative Controls</td>
<td>Site rules and policies attempt to control a hazard.</td>
</tr>
<tr>
<td>6. Personal Protective Equipment</td>
<td>The least effective control. Use PPE while you carry out your work.</td>
</tr>
</tbody>
</table>

Hazard control measures need to be put in place before you start your work, or as soon as you see a hazard while you are doing your work. Hazard controls can sometimes be listed in your work instructions or you can ask your boss or supervisor for help.

The most important defence against respiratory hazards is to control the contamination at its source and prevent it from entering the air.

This can be done by either substituting dangerous substances with less hazardous ones (particularly where chemicals are used), by isolating or enclosing hazardous operations, or by providing adequate local exhaust ventilation.

However, in some situations it may be necessary to wear breathing apparatus.

This may be because it is not immediately practical to implement alternative measures, or because access to a contaminated area is needed for a short period. In addition, breathing apparatus may need to be worn in some emergency situations.

Once a hazard control is in place you will need to check it regularly to make sure it is working well to control the hazard or danger. If the situation changes the control may no longer be enough and further action may need to be taken.

Talk to your supervisor or safety officer if you are not sure if it is safe enough to carry out your work. If you think the hazard is still too dangerous you should not try to do the work.

1.4.2.1 Select the Right Breathing Apparatus for the Situation

Selection of the right protective equipment is easy, once the hazard is identified. Breathing apparatus should not be selected unless there is accurate information regarding the working environment.

It is therefore essential that air monitoring is regularly carried out, even when breathing apparatus is used.

If the contaminant levels in the air increase, a different type of respirator or other controls may have to be used for the work to be carried out safely.

The Australian Standard AS/NZS 1715 Selection, use and maintenance of respiratory protective devices should be referred to before selecting respiratory protection.

The Standard explains the general principles of respiratory protection and different types of respirators and breathing apparatus as well as effective risk management processes.
1.5 Select Ancillary Equipment

Ancillary equipment includes the items that help to maintain safety during the completion of the work.

Depending on the situation, ancillary equipment that may be required when using breathing apparatus includes:

- Distress signal unit.
- Tally and control board.
- Guidelines.
- Guideline tallies.
- Torch.

1.5.1 Distress Signal Unit

A distress signal unit (DSU) is used as a signal in distress situations, such as when you are trapped or need assistance.

Distress signal units can be automatic, manual, or have a combination of both features:

- An automatic unit will sound an alarm after a set period of time with no movement. This allows for unconscious personnel to be found.
- A manual unit allows the operator to activate the alarm when they need assistance.
- Units with both features allow the operator to trigger an alarm manually, while the machine will trigger the alarm if no movement is occurring.

1.5.2 Tally and Control Board

A tally is a yellow plastic strip normally attached to the distress signal unit.

The tally is given to the breathing apparatus Entry Control Officer who will ensure the required details are on the strip.

The control officer then places the tally on the control board.

The details required to be on the tally could vary between organisations but will generally include the name of the operator, time in the work environment and the contents of the cylinder.

Other details could include deployment area and estimated exit time.
1.5.3 Guidelines

A guideline is a small diameter line that is used by the breathing apparatus team to stay together in areas of reduced visibility.

The main guideline is up to 60m long with markings at set distances. These markings allow workers to tell by touch if they are heading in or towards the exit.

The main guideline will also be marked with a tally at the start of the line, lettered either A or B.

A personal line is attached to the main guideline.

1.5.4 Guideline Tallies

Guideline tallies are used to identify main or branch lines that are being used and are usually yellow.

Main lines use round tallies with either A or B on both sides and are attached to the start of the line.

For ease of identification branch line tallies have a number of holes punched through them. As each member of the breathing apparatus team attaches a personal line. They will need to attach a guideline tally as well.

1.5.5 Torch

Torches are used for illumination of the work area. Make sure they are operating correctly and that there is no restriction on using them within the space before you enter.

1.6 Control Procedures

Organisational procedures will detail exactly how you are required to carry out any task that requires a breathing apparatus. It is essential that you follow those procedures in every situation.

Whenever a person is working with breathing apparatus there must be adequate controls in place to ensure their safety.

The decision to undertake breathing apparatus operations must be made after a risk analysis has been completed.

The risk analysis will assess the risk and available resources to apply the appropriate level of control procedures.

Controls to be implemented can include:

- Determining the requirements for and use of control equipment.
- Determining the correct entry point procedures, and personnel in charge.
- The use of timing devices to ensure the safety of personnel.
1.6.1 The Entry Control Officer

An Entry Control Officer is a person who is placed at an entry/exit point to:

- Determine the donning location.
- Receive tallies from the personnel wearing the breathing apparatus.
- Enter the tally information on the tally board.
- Enter the time-in on the tally board.
- Check the cylinder content for each person wearing breathing apparatus.
- Ensure personnel tallies are kept together on the board or as required by the operational procedures.
- Calculate the time-out for each person.
- Place the time-out time on the tally board.
- Record which location personnel are moving to.
- Return the tallies to the appropriate person when they have left the area.
- Keep your supervisor (or authorised person) informed of any concerns or developments that may affect the work being carried out.

In some organisations the Entry Control Officer, supervisor or standby person will also be responsible for attaching main guidelines and tallies to the guidelines, maintaining communication with personnel, and responding to emergency or rescue activities.

1.6.2 Entry Point Procedures

Entry points are the focal points for the effective management of activities where breathing apparatus is used, and for the safe control of access to and egress from the work area.

Entry points are selected based on factors such as:

- The size of the work area.
- Location of access points to the work area.
- Physical limitations of the site.

1.6.3 Timing Devices

Timing devices are used to calculate the amount of time a worker has been using the breathing apparatus.

Often timing devices will be attached to the entry control board so that the Entry Control Officer can monitor times.

A person who is using breathing apparatus has an effective work cycle of between 30 to 60 minutes depending upon factors such as respiration rate, size of cylinder, environmental conditions and individual factors.
2.1 Establish and Maintain Communications

Communications within the workplace are essential to your safety and the safety of all others around you.

It is essential that you are able to understand and use the communication systems that apply to the situation.

This includes establishing your communications initially, and maintaining communications with appropriate personnel throughout the operation.

2.1.1 Communications Equipment

Communications equipment could include:

<table>
<thead>
<tr>
<th>Communication Equipment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrated Radios</td>
<td>Integrated radios are built into the breathing apparatus.</td>
</tr>
<tr>
<td>Portable Radios</td>
<td>Portable radios will have limited usefulness when using breathing apparatus and may have limited range due to atmospheric conditions.</td>
</tr>
<tr>
<td>Communication Sets</td>
<td>This is the name given to the complete communication equipment. Communication sets are made up of a microphone, battery, cables, amplifier and built-in speakers. The way communication sets are used depends on the type of equipment and the manufacturer’s operating guidelines. These instructions can vary so it is important that you check the manufacturer’s operation manual for the equipment you are using.</td>
</tr>
<tr>
<td>Signal Lines</td>
<td>Depending on your organisation, signal lines may be a line similar to the main guideline, which will transmit predetermined signals. It may also be a communications cable, which can be connected to communications equipment.</td>
</tr>
<tr>
<td>Hand Signals</td>
<td>Hand signals must be understood for clear communications to occur. Most organisations will have signals that apply only to their worksites, or that have been designed for a particular task. If hand signals are going to be used during the work make sure you are familiar with them and that you practice them before entering any confined space.</td>
</tr>
<tr>
<td>Distress Signal Unit</td>
<td>Most Distress Signal Units (DSU) will have a dual activation system, which will trigger an alarm automatically if movement is not detected within a certain timeframe (up to 1 minute of no movement), or the alarm can be set off manually. The process for setting off your Distress Signal Unit will depend upon the make and model of equipment.</td>
</tr>
</tbody>
</table>
2.1.2 Communicating in Breathing Apparatus

Verbal communication is not always possible when wearing breathing apparatus. You must be aware of all communication procedures and signals for your organisation so that you can appropriately communicate with all required personnel.

This may include using:
- Hand signals.
- Guideline pulls.
- Physical touch.
- Flashlight.

Always double check what signals will be used and what they mean before donning your breathing apparatus to make sure you can communicate in all circumstance.

2.2 Operate Breathing Apparatus

You should always comply with permit conditions while working.

If permit conditions and requirements are deviated from then they should be reported and corrected and the permit re-authorised and re-issued by a competent person.

Follow all safety procedures to maintain personal safety while doing any work that requires breathing apparatus.

Stay in constant effective communication with other personnel including the standby person. Always use communication equipment correctly.

There should be constant monitoring of equipment and changes in the environment while work is being carried out. Damage to equipment, changes in the atmosphere and movement of workers can all create new hazards.

Atmospheric variables that need to be monitored include:
- Heated atmospheres.
- Asphyxiating atmosphere (oxygen deficient).
- Toxic or poisonous atmosphere (non-skin absorption).
- Smoke or suspended particles/fibres in atmosphere.

New hazards that arise while you are working may require you to use new hazard controls or revalidate a permit.

Do not work past the time allowed for the work to be done. Keep an eye on the amount of time the work is taking.

If you are using a gas monitor and the alarm sounds, all personnel should leave the work area immediately.

Complete any required entry logs, ensuring that all entry and re-entry of persons working within the area are accurately recorded.

2.2.1 Operating in Breathing Apparatus

Undertaking activities while wearing breathing apparatus requires teamwork and attention to detail.

With breathing apparatus on, your vision is limited. You must make more of an effort to look around you and also trust your other senses.

When moving through dark, low-visibility or smoke-filled areas, use your hands and feet effectively.

Activities should be conducted in a methodical manner with one side of your body near a wall where possible. Stick within your designated area unless you receive permission to deviate from this area.
2.2.1.1 Monitoring Working Time

Checking your breathing apparatus gauges regularly is important. You can use the contents of your cylinder more quickly than you think.

To work out your available working time you must first know the total volume of the cylinder/s you are using, the cylinder pressure, your breathing rate and the required safety factor.

You can use the following formula to calculate the total volume of the cylinder:

\[
\text{Total Volume (l) = Nominal Water Capacity (l) \times Pressure (Bar)}
\]

The water capacity can be found by reading the data plate on the cylinder or other location as appropriate to your equipment. The pressure can be found on the pressure gauge.

You must then determine your breathing rate which is the amount of gas you inhale or exhale in one minute. SCBA duration calculations use 40 litres per minute (l/m) as a guide, however if you know yourself to breathe at a higher rate you should use this value.

The total duration of working time available can be calculated using the following formula:

\[
\text{Total Duration (mins) = Total Volume (l) \div Breathing Rate (l/m)}
\]

Available working time can then be determined using the following formula:

\[
\text{Working Time = Total Duration – Safety Factor}
\]

The required safety factor will vary depending on the work you are completing including walk out time and hazards.

Here is an example of how to complete this calculation.

You are using a SCBA set with a Nominal Water Capacity of 9.0ltr and your breathing rate is 40Lmp. The current pressure is 300Bar and you require a safety factor of 10 minutes.

To calculate your current working time:

\[
\begin{align*}
\text{Total Volume} &= \text{Nominal Water Capacity (l) \times Pressure (Bar)} \\
&= 9.0 \times 300 \\
&= 2700 \text{ l} \\

\text{Total Duration} &= \text{Total Volume (l) \div Breathing Rate (l/m)} \\
&= 2700 \div 40 \\
&= 67.5 \text{ mins} \\

\text{Working Time} &= \text{Total Duration – Safety Factor} \\
&= 67.5 \div 10 \\
&= 57.5 \text{ mins}
\end{align*}
\]

You should be able to complete this calculation while working in breathing apparatus so you can always stay aware of your appropriate working time to make sure you do not risk running out of breathable air.

Using the previous example, if you had been working for 30 minutes you might assume you still have 27.5 mins of working time remaining, however if the pressure had dropped to 100 bar you would actually only have 12.5 minutes of working time remaining.

Calculations:

\[
\begin{align*}
\text{Total Volume} &= \text{Nominal Water Capacity (l) \times Pressure (Bar)} \\
&= 9.0 \times 100 \\
&= 900 \text{ L} \\

\text{Total Duration} &= \text{Total Volume (l) \div Breathing Rate (l/m)} \\
&= 900 \div 40 \\
&= 22.5 \text{ mins} \\

\text{Working Time} &= \text{Total Duration – Safety Factor} \\
&= 22.5 \div 10 \\
&= 12.5 \text{ mins}
\end{align*}
\]

You must make sure you return to a respirable atmosphere with sufficient breathable air remaining, regardless of whether you have finished your work or not.

If you are working in a team your working time should be the shortest remaining working time of all team members.
2.3 Implement Entrapment Procedures

Becoming trapped within a confined space can occur quickly and without warning. Knowing your organisation’s requirements and procedures for dealing with entrapment is essential.

Once you recognise that you are trapped it may be necessary for you to:

1. **Cease All Non-Essential Strenuous Activities**
   - Ceasing all strenuous activities assists you to calm your breathing and air consumption, and thus conserves the air in your breathing apparatus.

2. **Activate Your Distress Signal Unit**
   - You will need to activate your Distress Signal Unit manually in accordance with the manufacturer’s guidelines for the unit.

3. **Relocate**
   - By moving to the safest position possible, you will be less susceptible to hazards, and will be able to remain calm.
   - While remaining calm in an entrapment situation may be difficult, it is important that you attempt to do so in order to maintain a clear mind and conserve your oxygen.

4. **Call for Assistance**
   - Using your inbuilt communications equipment to call for assistance allows you to confirm to the rescue team where you are, what the conditions are and if escape units or additional air cylinders need to be brought into the scene.

Entrapment is a situation that can turn deadly without notice. The success of the entrapment procedures depends on regular practice therefore appropriate training is essential.

2.4 Maintain Personal Safety at All Times

Your personal safety should be considered your highest priority while using breathing apparatus.

Maintaining your personal safety may involve the following important points:

- Know, understand and follow the procedures for the activities you will be undertaking. This is the most important safety tool you have.
- Notify your supervisor of anything that may impact your ability to undertake activities.
- Use all equipment for the intended purposes and in the correct manner.
- Check breathing apparatus regularly and remove yourself from any situation if your equipment malfunctions.
- Be observant of the conditions around you. This could help you to avoid hazard or injury.
- Undertake a risk analysis before starting an activity.
- Work with your team members to achieve the goals.
- Keep yourself attached to the guidelines used to guide you back.

Personal safety is something that can be overlooked during situations requiring immediate response. Always take the time to ensure your safety during any activity.
2.5 Remove and Close Down the Breathing Apparatus

Once operations have been completed and you have moved to a safe area, you can remove and close down your breathing apparatus.

2.5.1 Removing the Breathing Apparatus

Actions to take to remove breathing apparatus followed may include:

- Collecting the tally from the entry control officer.
- Turning off distress signal units/alarms.
- Removing your gloves and helmet.
- Loosening head harness straps.
- Removing the facemask.
- Undoing the waist belt and loosening the shoulder straps.
- Slipping off the harness and backplate.

Removal of the breathing apparatus should be done in line with your organisation’s procedures.

If you are unfamiliar with these requirements, speak with your supervisor or other experienced personnel.

2.5.2 Closing Down the Breathing Apparatus

Once you have removed your equipment, you will need to close it down in accordance with your organisational procedures.

Close down procedures could include:

- Shutting valves – ensure that the purge valve is closed, and the cylinder valve is turned to the off position.
- Disconnecting air hoses and removing the second stage regulator from the facemask.
- Releasing any air trapped in the system.
- Listening for the whistle alarm as the air pressure reduces to zero.
- Recording any problems with the system.
- Marking the cylinder or system to indicate that the cylinder requires filling.
The closedown procedures will vary depending on the organisation and the type of equipment being used. Ensure you are able to follow your organisation’s closedown procedures.

### 2.6 Clean and Maintain Breathing Apparatus

It is important for all safety equipment to be maintained. This equipment helps to protect you during dangerous tasks and you want to make sure that it will keep you safe. All breathing apparatus equipment needs to be kept clean, maintained and ready for use.

#### 2.6.1 Cleaning the Breathing Apparatus

Cleaning the breathing apparatus is essential for maintaining the useful life of the equipment and the health and safety of the people using it.

Most organisations will require you to clean the equipment regularly.

**Clean the Harness, Backplate and Hoses**

When cleaning the harness, backplate and hoses you will need to follow the manufacturer’s specifications.

These specifications will normally require you wipe the surfaces clean with a damp cloth which has been wet in a cleaning solution.

Once the unit has been washed, wipe it over to remove any detergent residue.

**Clean the Facemask**

Cleaning the facemask will require disinfectant made up to the manufacturer’s specifications, or the use of non-alcoholic wipes.

Wipe over the mask inside and out with a damp cloth. Once the mask has been washed in accordance with the procedures for your organisation, the mask will need to be dried. Air drying is the most common method.

Facemasks may then need to be placed into protective plastic bags.
2.6.2 Conducting Maintenance Activities

Maintenance activities should be completed in line with the schedule set by your organisation. However, all equipment should undergo a complete inspection and test after each operational use.

All breathing apparatus users should be provided with instructions about how to replace filters, canisters and cartridges and when to do so.

There must be practice drills and periodic refresher training in the use and care of the protective equipment.

Maintenance activities may incorporate:

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Activity</th>
</tr>
</thead>
</table>
| **Daily** | ◆ Visual inspections.  
◆ Checking cylinder connections and valves are in working order.  
◆ Ensuring all straps, harnesses and buckles are in working order.  
◆ Replacement of filters and cartridges. |
| **Weekly** | ◆ Cleaning the units.  
◆ Checking ancillary equipment.  
◆ Ensuring airflow.  
◆ Checking for leaks. |
| **Monthly** | ◆ Full inspection.  
◆ Harness inspection.  
◆ Cleaning and disinfecting.  
◆ Testing of cylinder pressures.  
◆ Testing flows by donning mask and breathing.  
◆ Testing the alarm devices in accordance with the manufacturer’s specifications. |

Refilling of cylinders will need to be completed when required. Depending on your organisation this may be done on site, or at the premises of an authorised service provider.

Any breathing apparatus equipment that is faulty must be taken out of service and reported to the appropriate personnel. They will ensure that the equipment is tagged out for repair or replacement.

2.6.3 Making Equipment Ready for Operational Use

Breathing apparatus equipment needs to be kept in a constant state of readiness, as it may be required with little notice and preparation time.

Following the use of breathing apparatus, the process of removing, cleaning and maintaining the equipment will ensure that it is ready for the next operation.

This process includes the reporting and removal of faulty equipment.

Breathing apparatus equipment may also need to be stored in appropriate locations and storage cabinets, so that all personnel can locate and access all items at short notice.

Each organisation will have specific procedures to ensure that equipment is made ready for operational use.

Make sure that you are familiar with your organisation’s procedures.
Practical Assessment Instructions

The practical assessment consists of 3 individual assessments, which may run in a single sequence from task to task under the guidance of the assessor.

Conditions of Assessment

1. You are required to undertake an assessment for operating breathing apparatus in the manufacturing industry.
2. The assessor will provide you with instructions about what you are required to do.
3. If you are unclear about what you have to do, ask the assessor before you start.
4. Each person must be observed and be assessed as being competent in each task even in situations where the work is completed by a team.
5. You may not use any references, books or course notes during the assessment, unless these resources are common to completing the task when performed in a real work environment.
6. All assessments must be satisfactorily demonstrated. If you do not satisfactorily complete an assessment a result of 'Not yet competent' will be recorded.
7. You should be able to complete all assessments within 99 minutes. The time stated is a guide only. If you cannot complete the assessment in the stated time then this will be considered when assessing overall competency.

Personal Protective Equipment (PPE) Requirements

You must wear safety clothing and equipment as required by the risk assessment of the workplace or assessment environment. This includes:

- Safety helmet (where required).
- Appropriate footwear.
- High-visibility vest or other similar clothing.
- Other protective clothing and equipment as appropriate.

Your assessor will confirm the availability of required PPE when making arrangements to conduct the assessment. If you do not have the appropriate equipment the assessment cannot be undertaken.

Grounds for Stopping the Assessment

If at any time during the practical assessment, you act in a way that puts yourself, other learners, equipment or property in any danger, the assessment will be stopped immediately. Your assessor will identify and record the dangerous act to you and re-schedule the assessment to be attempted again at a later time. You may be required to complete part or all of the practical assessment again at that time, at the discretion of your assessor.

Achieving a Satisfactory Outcome

In order to achieve a satisfactory outcome for the practical assessment you will need to:

- Complete all tasks and assessments in their entirety.
- Complete all tasks and assessments satisfactorily in a timely manner, representative of real world conditions, expectations and outcomes.
- Complete all tasks and assessments safely, using the correct techniques and methods and ensuring your own safety and the safety of others at all times.
- Working with others, where necessary, to safely, effectively and efficiently achieve all outcomes of the tasks and assessments.