



Respiratory Protection



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1. INTRODUCTION

This guide manual sets out procedures for the selection, use and maintenance of Respiratory Protection Equipment. The guide follows the requirements of the *Standard ASNZ1715 Selection, Use and Maintenance of Respiratory Protection Devices*.

These procedures shall be followed to ensure the correct use of respiratory protection equipment in accordance with the respiratory hazards present and the expected activity of the user.

When selected and worn correctly, respiratory protection equipment will give protection against the following types of atmospheric hazard:

- Oxygen deficiency or excess.
- Air contaminants in particulate form.
- Air contaminants in gaseous or vapour form.

Respiratory protective equipment devices are classed as either:

- Supplied-air devices, designed to give respiratory protection against atmospheric contaminants, and in oxygen deficient atmospheres.

Note: Supplied-air devices must always be used when the type or extent of the atmospheric hazard is unknown.

- Air purifying devices, designed to give respiratory protection where safe levels of oxygen exist and where the type and concentration of atmospheric hazard is known.

Note: A safe level of oxygen is defined as above 19.5% and below 23.5% by volume at atmospheric pressure.

2. RESPIRATORY PROTECTION POLICY

A guiding principle for respiratory protection is that no person shall be exposed to an atmosphere that is, or could be injurious to health, without suitable protection.

To ensure this is achieved the following principles shall be observed:

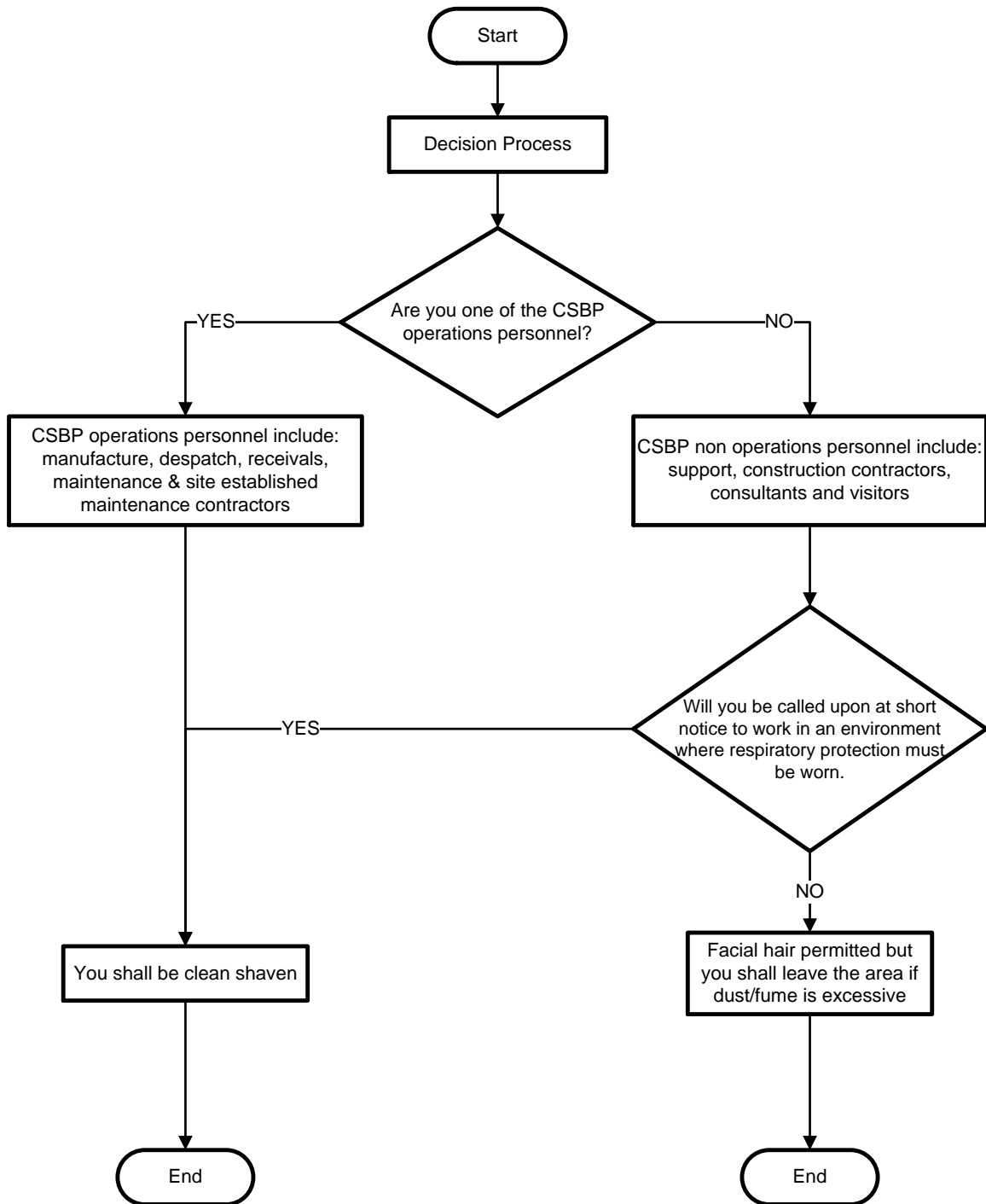
- Effort shall be made to prevent the release of harmful substances into the working environment.
- Efforts shall be made to clear the working environment of harmful substances, to make respiratory protection unnecessary.
- Where an atmosphere may become contaminated, regular testing by properly trained personnel, using suitable equipment, shall be undertaken.



Respiratory Protection



- Where efforts to remove, prevent or control the hazard are unsuccessful, or the task is such that there may be a release of a harmful substance, suitable respiratory protection shall be provided and used.
- Training and instruction in the proper use of respiratory protection shall be given prior to the issue and use of the equipment.
- As facial hair (beards, stubble growth, long sideburns and moustaches) trapped between the sealing surface of a respirator face piece (e.g. dust mask, half face piece or full face piece respirator) and the wearer's skin will prevent a good seal, the general rules on facial seal of respirators (as shown in Figure 2 - extracted from AS/NZ Standard 1715) shall be followed.
- It is therefore required that the decision process shown in Figure 1 shall be followed at all times.



Note: A visitor is defined as any person who is escorted around the site by a responsible CSBP by an employee for a short period of time to view plants (ie inspectors, industry representatives, or persons on work tours).

Figure 1 Respiratory Protection - Facial Seal Requirement

2.1.1 Extract from AS/NZ 1715

General	Beard growth and other facial features prevent an adequate seal between the wearer's face and the fitting surfaces of the face piece or mouthpiece. Facial hair may also interfere with the inhalation and exhalation valve operations.
Beards	Bearded persons cannot expect to achieve adequate respiratory protection when wearing a full face respirator or a half face piece respirator. Accordingly, no one who requires respiratory protection shall attempt to wear either a full face respirator or a half face respirator over a beard.
Moustaches	Moustaches may spoil the fit of a half piece respirator and may interfere with the peripheral seal of a full face respirator. Moustaches should not protrude beyond projected lines, drawn vertically from the corner of the mouth.
Sideburns	When a full face respirator is being worn, sideburns shall not extend below a line drawn through the top of the tragion (the notch in the cartilage of the ear just above and immediately in from the ear hole) and the canthus (corner) of the eye.
Stubble growth and long hair	Stubble growth, depending on its length and stiffness, interferes to some degree with proper sealing of a face piece and it is necessary that male wearers of respirators shave daily.
Mouthpiece and nose clip	<p>A mouthpiece and nose clip may not provide adequate protection to a bearded person.</p> <ul style="list-style-type: none"> • When the person at risk has a 'bushy' facial hairstyle, hair trapped between the lips and the mouthpiece may prevent a satisfactory seal being obtained. • Because of the varying amount of cartilage in an individual's nose, there is the added difficulty of obtaining a satisfactory seal of the nasal passages with a nose clip. This problem is worsened by the presence of perspiration which may cause difficulty in maintaining the nose clip in position.

Figure 2 Facial Seal of Respirators

3. PRINCIPLES OF RESPIRATORY PROTECTION

3.1 GENERAL PRINCIPLES

The following general principles shall be observed in the use of respiratory protection:

- No person shall be knowingly exposed to an atmosphere that is or may be injurious to health.
- There are substances which are an irritant to or which can be absorbed through the skin. Where an atmosphere containing such substances is to be entered, respiratory protection alone is not sufficient and the whole body shall be protected.
- In all cases where it is possible for the atmosphere to be contaminated by toxic substances, a regular system of testing the atmosphere surrounding the workplace shall be undertaken by a properly trained person, using suitable equipment (Refer to Gas Testing (CSBP-GM-11-031-33)).
- Every effort shall be made to prevent the release of harmful substances into the working environment. This may be achieved by the correct design of buildings, plant, equipment, by correct working methods and conditions and by appropriate controls at their source.
- If efforts to prevent or control the respiratory hazard are unsuccessful, suitable respiratory protective devices shall be provided and used.
- Wearers shall be taught the correct way to use respiratory protection devices before entry into a hazardous or potentially hazardous atmosphere.

3.2 FACIAL SEAL

Good facial fit is a prime factor in obtaining appropriate and proper protection from respiratory protective devices whether of half or full face piece design. Protection obtained will be influenced by such variables as whether the person:

- Wears prescription glasses.
- Has facial hair (including stubble growth) that interferes with the facial seal.
- Adjusts the face piece and straps correctly.

If a person is required to wear full face piece protection and needs to wear prescription spectacles to complete the task, fitted prescription lenses and special adaptor is available for the Auer full face pieces.

Note: Full face piece respirators shall not be worn with side arm (normal) spectacles, as an effective seal cannot be obtained

Safe working standards require that half or full face piece respiratory devices, which depend on an effective seal between the face and the face piece, shall not be worn over a beard or a hairstyle which interferes with the proper sealing of the face piece.

Positive pressure face pieces diminish the effect of poor facial fit, however, it should be recognised that any leakage from the facial seal increases air consumption and decreases service time. This is an important factor to consider when wearing Self-contained Breathing Apparatus (SCBA), as the reduction in safe service time when worn over facial hair is uncertain, and may vary widely between individuals.

Note: A positive pressure device shall not be relied upon to compensate for a potentially poor facial seal.

Note: A negative pressure fit test shall be carried out before each respirator is used. Chemical ampoules or specialised fit test equipment may be used to determine the proficiency of mask fitment during training.

3.3 ATMOSPHERIC CONTAMINANTS

Atmospheric contaminants are substances, either gaseous or particulate, which are not constituents of the normal atmosphere. They can further be described as follows:

- Particulate - the generic name for dusts, mists, smokes and fumes.
- Dusts - solid particles suspended in the air as a result of the disintegration of matter. The disintegration usually results from cutting, crushing or handling of solid materials. Dusts can be further classified depending on whether or not they are a health hazard:
 - Inert or Nuisance Dusts - generally only a discomforting nuisance, to be avoided.
 - Toxic Dusts - dusts which are capable of producing injury when sufficiently concentrated, e.g. asbestos, silica, arsenic trioxide and trace element dusts such as copper sulphate.
 - Mists - airborne droplets that may carry substances in solution or particles in suspension. Mists are usually formed by the condensation of vapour but may be produced by the atomisation of a liquid, e.g. paint spray or acid mist.
 - Fumes - airborne suspension of solid particles or metallic oxides formed by the volatilisation and condensation of matter, e.g. acid fume, process fumes, or welding fumes.
 - Smokes - particles of low pressure vapour suspended in the air. Smokes settle slowly under gravity and are characterised by their mode of formation which may include combustion,

destructive distillation, volatilisation and condensation, and chemical and photochemical reactions.

- Toxic gases and vapours - gases and vapours capable of producing injury when they reach a susceptible site in or on the body, in a sufficient concentration, e.g. chlorine, ammonia, hydrogen cyanide, nitrogen oxides, sulphur oxides and solvent vapours.

Note: When used in this guide manual, the word 'gas' includes vapours.

3.4 OXYGEN DEFICIENCY AND ENRICHMENT

An Oxygen deficient atmosphere is one in which the oxygen content is below 19.5%. This deficiency occurs in poorly ventilated areas, typically confined spaces and enclosed vessels, where the oxygen has been displaced by another gas, e.g. nitrogen purging or has been consumed by some chemical reaction, e.g. combustion.

An Oxygen enriched atmosphere is one in which the oxygen content is above 23.5%. This condition can exist in poorly ventilated areas such as confined spaces and enclosed vessels when excess oxygen has been allowed to accumulate ie. a leaking oxygen bottle.

4. SUPPLIED-AIR DEVICES

There are two types of supplied air devices:

- Supplied-air Breathing Apparatus (SABA),
- Self-contained Breathing Apparatus (SCBA).

4.1 SUPPLIED-AIR BREATHING APPARATUS (SABA)

There are a number of types of SABA available, offering varying degrees of protection. At CSBP only one type is used:

4.1.1 Full Face Piece Positive Pressure

This is used mainly in maintenance situations where there is a possibility of toxic gas/fume and/or oxygen deficiency in the work area. Air is supplied to the user on demand through a positive pressure demand valve fitted to the face piece.

4.1.2 Air Supply

Air shall be supplied from:

- G-sized medical air cylinder with a nominal working capacity of 2.5 hours when full (7 m³ at 15 500 kPa). Supplied-air trolleys, consisting of two G-sized medical air cylinders, two positive pressure full face piece respiratory masks, regulators and two 30 metre airlines, are maintained in the manufacturing sections.

4.2 SELF-CONTAINED BREATHING APPARATUS (SCBA)

SCBA units permit the wearer to move relatively unrestricted in atmospheres that are contaminated or oxygen deficient. The wearer relies on clean, respirable air supplied to the face piece from a compressed air cylinder.

4.2.1 Auer SCBA

These units have a 300-bar/4-litre cylinder with a nominal use capacity of 30 minutes. Duration depends on the level of activity and fitness of the wearer. The face piece incorporates an automatic (first inhalation) positive pressure demand valve.

4.2.2 Emergency Life Support Apparatus (ELSA)

This unit has a 200-bar/2-litre cylinder, giving only 10 minutes of respirable air. ELSA units are intended for escape purposes only.

4.3 SELECTION OF SUPPLIED-AIR DEVICE

Note: If any doubt exists regarding the selection of the correct respiratory device for a particular situation, advice should be sought from the OSH department.

The selection of respiratory protective devices will be influenced by the following factors:

- the adequacy of the warning given by the contaminant,
- the nature of the hazard, whether a particulate, gas or vapour, oxygen deficiency, or a combination of these,
- the concentration of the contaminant,
- acuteness of the hazard, if failure of the device for a short time can cause serious harm (eg. IDLH conditions),
- the probable length of time during which the wearer will be in the contaminated atmosphere,
- the location of the contaminated atmosphere relative to a source of air suitable for breathing,
- the access to and the nature of the working environment in which the device is to be used,
- the expected activity of the wearer,
- the mobility of the wearer, and
- whether the device is for regular use, emergency or rescue purposes.

Note: For requirements governing entry into and work in confined spaces, see CSBP document Confined Spaces (CSBP-GM-11-031-52). Other hazards, such as noise and heat stress, may be more harmful when they occur in confined spaces.

4.4 USE OF SUPPLIED-AIR DEVICES

Untrained personnel shall not be required to wear supplied-air or self-contained breathing apparatus.

The wearer shall be aware of the correct method of fitting the device and ensure that it is worn in accordance with its design purpose.

Training of employees in the use of supplied-air devices is authorised and controlled by each department and shall be conducted by the CSBP Safety & Compliance Trainer or other persons competent in the equipment and its use.

Note: A competent person is one who has, through a combination of training, education and experience, acquired knowledge and skills enabling that person to perform a specified task correctly (i.e. to train a person in specific respiratory equipment, to perform maintenance on respiratory equipment).

Training shall cover the following:

- how to recognise when there is a need to wear the device,
- the importance of conscientiously wearing the device,
- the essential parts of the device and the principles of operation,
- the applications and limitations of the device,
- symptoms by which a deteriorated performance or improper functioning of the device may be recognised,
- the approximate duration of air supply when using cylinders,
- the importance of supplied-air quality standards being maintained,
- the procedure to be adopted if an emergency condition arises while the device is being worn,
- the importance of not removing the face piece, until the wearer is certain that this can be done without danger,
- the importance of taking care of the device, including prompt and regular cleaning, service and storage.

4.5 MAINTENANCE AND ISSUE OF SUPPLIED-AIR DEVICES

Supplied-air devices (SCBA and ELSA) shall be:

- Retained in designated locations for maintenance or emergency use, as appropriate.
- Maintained, cleaned and controlled by a competent, designated person.

- Inspected monthly by a competent, designated person to ensure readiness for use.
- Serviced according to manufacturer's recommendations.

Note: Servicing of supplied air devices is only to be performed by persons competent in respiratory equipment maintenance servicing.

5. AIR PURIFYING DEVICES

Air purifying devices provide personal respiratory protection by purifying the air supplied to the wearer. The air is drawn through a filter medium that removes the harmful substances. The filter medium used depends on the composition and physical state of the contaminating agent.

5.1 TYPES OF AIR PURIFYING DEVICES

There are three main types of air purifying devices:

- Particulate respirators, which filter out dusts, mists, smokes and fumes, e.g. disposable masks.
- Gas respirators, which only filter out certain gases and vapours, e.g. half/full face with ABEK filters.
- Combined particulate and gas respirators, with combination filters that filter out particulates and certain gases and vapours, e.g. half/full face piece ABEK+particulate filters.
- Particulate Respirators

There are three classes of particulate respirator suitable for filtering finely divided solid or liquid particles from the inhaled air. These are classified as follows:

- Class P1 - low efficiency type (particulate penetration not exceeding 20%).
- Class P2 - medium efficiency type (particulate penetration not exceeding 6%).
- Class P3 - high efficiency type (particulate penetration not exceeding 0.05%).

Particulate respirators of Classes P1 and P2 usually consist of either a half face piece respirator with a valve system and replaceable cartridge filter(s), or the disposable type that has the filter incorporated within the face piece.

Class P3 particulate respirators have a full face piece to ensure that the effectiveness of the facial seal is comparable with that of the filtering medium. This also protects the eyes from exposure to the airborne contaminants.

Powered particulate respirators provide filtered air to the face piece (full or half) or hood under a slight positive pressure.

5.1.1 Gas Respirators

Gas respirators remove certain gases or vapours from the inhaled air by means of filters. Filters are effective only for a limited time. They have a limited life in use that varies with the volume of absorbent and the conditions under which they are used. Filters are affected by such factors as the concentration of the contaminant in the atmosphere, humidity and the rate of breathing of the wearer.

The basic types of gas respirators are as follows:

- Half face piece, which has a valve system and head harness, and incorporates a filter that removes low concentrations of certain gases from the air.
- Full face piece, which has a valve system and head harness, and incorporates a replaceable filter containing absorbent material. The filter is attached to the face piece, directly or by a breathing tube. The filter removes limited concentrations of certain gases or vapours from the air, for a specified time, after which the filter must be replaced.
- Escape respirators are designed for minimum exposure in low to medium gas concentrations, and are used for escape purposes only.

5.1.2 Combined Particulate and Gas Respirators

Combination particulate and gas respirators are available in two basic types:

- Half face piece, in which the integral particulate filter protects against gases of low toxicity. The filter complies with Class P1 or Class P2 for particulates. An external pre-filter may also be used to remove coarse particulates.
- Full face piece, in which the filter incorporates an absorbent for gases and vapours, and an element for the removal of particulates.

5.2 SELECTION OF AIR PURIFYING DEVICES

Note: The atmosphere in which air purifying devices are used shall have an oxygen content of between 19.5% and 23.5% by volume.

Selection will be influenced by the following factors:

- concentration of the contaminant,
- adequacy of the warning given by the contaminant (eg. smell or lack of smell),
- nature of the hazard, particulate, gas or vapour, oxygen deficiency, or a combination of these,
- acuteness of the hazard, if failure of the device for a short time can cause serious harm,
- probable length of time the wearer will be in the contaminated atmosphere,
- location of the contaminated atmosphere, relative to a source of fresh air suitable for breathing,

- access to and from and the nature of the working environment,
- expected activity of the wearer,
- mobility of the wearer, and
- whether the device is for regular use or for emergency or rescue purposes.

For entry in confined spaces, additional requirements, as detailed in Confined Spaces ([CSBP-GM-11-031-52](#)) procedure, must be complied with.

5.3 USE OF AIR PURIFYING DEVICES

The wearer must be aware of the correct method of fitting the device and ensure that it is worn in accordance with its design purpose. With a filter respirator, the user shall check the expiry date of the filter(s) and note the times and date of previous usage, if applicable.

5.3.1 Instruction for Use of Air Purifying Devices

Instruction shall cover the following:

- how to recognise when there is a need to wear the device,
- the importance of conscientiously wearing the device,
- essential parts of the device and the principles of operation,
- applications and limitations of the device,
- symptoms by which a deteriorated performance or improper functioning of the device may be recognised,
- approximate time for which the device should give protection in the particular conditions,
- the procedure to be adopted in the event of an emergency condition arising while the device is being worn,
- the importance of not removing the face piece, or the mouthpiece and nose clip, until the wearer is certain that he/she has retreated to the safety of fresh air conditions.
- The importance of taking care of the device, including prompt and regular cleaning, service and storage, and the application of anti-fogging compound to the visors of full face pieces.

5.3.2 Use of a Particulate Respirator

The breathing resistance of the filter increases as it becomes choked with trapped particles during use. Eventually, the resistance becomes so high that the filter must be replaced. The time taken for this condition to develop varies according to the characteristics of the filter, and the type, size and concentration of the particles.

As a general guide, the breathing resistance of a particulate respirator can be considered too high when there is a perceived increase in resistance to breathing.

The resistance of a particulate filter will be considerably increased if used in damp conditions. Increased resistance can also be caused by a damaged or ineffective inlet valve causing condensation to form on the filter.

The use of a pre-filter is advantageous where coarse particulates rapidly choke the filter.

All masks shall be inspected for visible damage before each use.

5.3.3 Use of a Powered Particulate Respirator

The battery-powered particulate respirator is suitable for use in any situation where a normal particulate respirator could be used. The advantage of the battery-powered particulate respirator is that it provides the user with a plentiful supply of filtered air without any breathing effort. This supply of air may also remove the need for a tight fitting facial seal, thus further increasing comfort.

5.3.4 Use of a Gas Respirator

The breathing resistance through a gas respirator does not normally increase during use (i.e. it does not become harder to breathe). If it does increase, it may be due to:

- particulate matter mixed with the gas or vapour,
- a defective inlet valve,
- binding together of the filter contents.

The breathing resistance of a gas respirator can be considered too high when there is a perceived increase in resistance to breathing.

a. Half face piece:

The gas filter in the gas respirator half face piece has a relatively short service life and once saturated with gas it cannot be reactivated. Once in this condition, the gas filter shall be destroyed to prevent accidental reuse.

The gas respirator half face piece is especially suitable where the contaminant is not really harmful but has a disagreeable odour. It is also suitable for certain harmful contaminants that give warning of danger (i.e. smell/taste) in situations from which the wearer can readily escape.

If, immediately on wearing the respirator, the filter fails to exclude the gas the wearer shall retreat to fresh air conditions, and check the facial fit and outlet valve. Where rapid failure occurs with new filters, the adequacy of this equipment for the application should be reassessed. It may be necessary to use a more effective method of respiratory protection.

b. Full face piece:

This type of respirator is suitable for use for limited periods in concentrations of certain gases, up to limited concentrations and in areas where a safe oxygen level exists. If the concentration of contaminant is found to be excessive, or cannot be quantified, then only supplied-air equipment shall be used.

Filters have a seal over the air entrance opening, which must be removed before use, otherwise the wearer will be unable to breathe. Because the contents of the filter may deteriorate on exposure to moisture in the air, the seals should only be removed immediately prior to use and replaced immediately after use.

If the wearer finds that the apparatus is not functioning correctly or the contaminant is not being absorbed he/she must immediately retreat to an uncontaminated atmosphere. The respirator must not be removed until he/she is in such an atmosphere.

5.4 MAINTENANCE AND ISSUE OF AIR PURIFYING DEVICES

5.4.1 Full Face Piece Filter Respirators

These shall be:

- retained in a designated location for personal loan to trained personnel, when appropriate,
- maintained, cleaned and issued by a trained, competent person,
- returned after use to the designated person for cleaning, and
- numbered and registered.

5.4.2 Half Face Piece Filter Respirators

These are generally 'personal issue' but shall otherwise be:

- retained in a designated location for personal loan to trained personnel, when appropriate,
- maintained and issued by a designated person,
- returned after use to the designated person for cleaning, and
- numbered and registered.

5.4.3 Disposable Masks

Disposable masks are Store Issue items, which shall be disposed of correctly after use. Team leaders shall ensure that wearers are aware of the limitations of these masks. These are supplied for protection against 'particulates only' and also for protection against 'particulates and nuisance odour'. Ensure you use the correct filter for your need.

5.4.4 Escape Respirators

These shall be inspected regularly, and maintained and replaced as necessary.



6. GUIDELINES FOR WORKPLACE USAGE

Factors governing the selection and use of supplied-air and air purifying devices are detailed in Section 3.3 and 4.2 respectively.

Table 1 describes the minimum level of respiratory protection that shall be worn for circumstances that may occur in the workplace.

Atmospheric contamination levels are classed as follows:

- High - levels in excess of 5 times the exposure standard, or at the Ceiling Limit, where serious disability could occur after short exposure.
- Medium - levels of 2 to 5 times the exposure standard, where disability could occur with continued exposure but would not cause immediate collapse.
- Low - levels at or slightly above the exposure standard, but not at peak levels where continued exposure is possible but not desirable.

Note: If work is to be performed within a confined space, the required level of protection is that stated in Confined Spaces ([CSBP-GM-11-031-52](#)).

The protection required in Table 1 is only for respiratory protection. For any other hazardous material or condition present, appropriate PPE must also be worn.



Respiratory Protection



CONDITION	PROTECTION REQUIRED
Evacuation/escape from a toxic gas eg. chlorine, ammonia, cyanide.	ELSA escape unit, Drager PARAT escape respirator, Duram mask or Auer full face respirator with 89 ABEK NO-CO/ST filter.
a. Working where particulate atmospheric contaminants are present or generated.	P2 disposable respirator for a, b or c.
b. Inert or nuisance dust.	P2 carbon-layered disposable respirator for d.
c. Toxic dusts (e.g. asbestos, Trace Elements) below exposure standard.	<i>Note:</i> The Sunstrom half face respirator with an appropriate filter has also been approved for used in the above situations.
d. Fume/smoke/vapour below exposure standard.	
Welding- Where toxic fumes/gas are generated and/or ventilation is inadequate.	Supplied-air mask with welding attachment or equivalent supplied air protection.
Working where there may be a low level release gaseous atmospheric contaminant, e.g. sample taking, instrument adjustment.	Auer full face respirator with 89 ABEK-CO-NO/ST filter or supplied-air hood.
Working where there may be a medium level release gaseous atmospheric contaminant eg. removing a valve or spool piece from a hazardous/toxic material pipeline, some confined space work.	Supplied-air with positive pressure face piece or supplied-air hood. (Refer Confined Spaces (CSBP-GM-11-031-52))
Working where there may be a high level release gaseous atmospheric contaminant eg. Work on Chlorine Lines and equipment, work in ammonia tank bund area, and some confined space work.	Supplied-air with EBA and positive pressure face pieces or SCBA. (Refer Confined Spaces (CSBP-GM-11-031-52))

Table 1 Respiratory Requirements



7. TRAINING

7.1 SUPPLIED-AIR DEVICES

Training in the use of supplied-air devices for personnel required to use the equipment shall be conducted as follows:

- SCBA units - 12 monthly,
- ELSA units - 12 monthly.

7.2 AIR PURIFYING DEVICES

Training/instruction by competent personnel in the correct use of air purifying devices shall be conducted. Training and instruction requirements are detailed in 4.3.1.

7.3 TRAINING RECORDS

Details of all SCBA respiratory training shall be sent to the Training Department, who shall maintain the records. Training and instruction records for air purifying devices are to be maintained in the work area.

8. REFERENCES

AS/NZS1715 Selection, Use and Maintenance of Respiratory Protection Devices

AS/NZS1716 Respiratory Protection Devices

AS2704 Portable Cylinders for Resuscitators and Self-contained Breathing Apparatus (non-underwater) - Safety Guide

CSBP Confined Spaces (CSBP-GM-11-031-52)

CSBP Gas Testing (CSBP-GM-11-031-33)