

Maintaining respiratory protective equipment used to minimise silica exposure

The guidance assists PCBUs to comply with their requirements under the WHS Regulations relating to respiratory protective equipment (RPE) to minimise the risk of respirable crystalline silica (RCS) exposure.

The information is based on Section 9 of AS/NZS 1715:2009 - MAINTENANCE REQUIREMENTS. It has been modified from the source text to reflect RPE used to minimise exposure to RCS. Other formatting changes have been made. The word “shall” indicates a statement is mandatory as per AS/NZS 1715:2009.

Section 2 of AS/NZS 1715:2009 also provides detailed requirements and procedures for implementing a respiratory protection program, including the disposal of equipment.

Refer to the full AS/NZS 1715:2009 to ensure compliance with all requirements.

Under the WHS Regulations (regulations 37 and 44), if personal protective equipment is to be used to minimise a risk to health and safety in the workplace, the person conducting a business or undertaking (PCBU) must ensure the equipment is maintained, repaired, replaced, clean and hygienic, and in good working order. For more information, see Appendix C of model Code of Practice: Managing risks of respirable crystalline silica in the workplace.

Where a person is at risk of exposure to RCS after higher order control measures have been implemented, the PCBU must provide the person with RPE and the person must wear it while the work is carried out (regulation 529B). RPE means personal protective equipment that:

- a) is designed to prevent a person wearing the equipment from inhaling airborne contaminants; and
- b) complies with:
 - (i) AS/NZS 1716:2012 (Respiratory protective devices); and
 - (ii) AS/NZS 1715:2009 (Selection, use and maintenance of respiratory protective equipment).

GENERAL

RPE needs to be maintained to ensure that it functions properly and provides its designed respiratory protection. The system of maintenance should be commensurate with the scale of use and the type of RPE used. A system of maintenance should generally include the following elements as applicable:

- a) Cleaning and disinfection.
- b) Inspection.
- c) Repair and replacement of components.
- d) Proper storage.

Repair and replacement of parts of air-purifying RPE¹ should, in most cases, be fairly simple. Equipment manufacturers supply literature which details the components of their respirators and also includes servicing information. In the case of simple items such as outlet valve rubbers and head harnesses, this should be done by the wearer or RPE maintenance personnel. However, the repair and maintenance of complex parts such as demand and reducing valves should be performed by trained personnel authorised by the manufacturer.

All parts should be inspected, and faulty RPE components (including spent or expired filters) should be replaced with those approved by the manufacturer of the RPE.

CAUTION: MIXING AND MATCHING COMPONENTS SUCH AS FILTERS AND FACEPIECES MAY NOT ONLY INVALIDATE ANY MANUFACTURER'S WARRANTY BUT MAY NOT PROVIDE THE RESPIRATORY PROTECTION REQUIRED.

SUBSTITUTION OF COMPONENTS IS NOT ACCEPTABLE UNLESS THE COMPONENTS HAVE BEEN TESTED AS A WHOLE, COMPLY WITH AS/NZS 1716 AND THERE IS AN ONGOING QUALITY ASSURANCE PROGRAM TO ENSURE THAT RELEVANT PERFORMANCE REQUIREMENTS CONTINUE TO BE MET.

CLEANING AND DISINFECTION

Non-disposable RPE shall be cleaned after each use. The cleaning and disinfection should be according to the manufacturer's instructions or, where these are not available, refer to the [Appendix](#) below. Disassembly and reassembly of RPE shall be carried out in accordance with the manufacturer's instructions. Every effort should be made to obtain such instructions.

A centralised cleaning program may be suitable where there is extensive use of RPE but may not be appropriate where there is infrequent or low use of RPE.

Persons who are required to maintain RPE should be trained in cleaning and disinfection procedures.

¹ An air-purifying respirator is a device that filters contaminants from inhaled air.

After removal of any filters, the cleaning shall be performed in the workplace. This may be done in a number of ways:

- a) The RPE should be washed with detergent in warm water using a soft brush, thoroughly rinsed in clean water, and then air-dried in a clean place. Care should be taken to prevent damage from rough handling. This method is an accepted procedure for a small workplace or where each worker cleans his or her own RPE.
- b) A dedicated domestic type clothes washer or dishwasher may be used if a rack is installed to hold the facepieces in a fixed position. (If the facepieces are placed loose in a washer, the agitator may damage them.) This method is especially useful in large programs where RPE usage is extensive. Alternatively, facepieces may be placed in mesh bags and then placed into the washing machine.

Caution should be observed with respect to the addition of soaps and detergents to the cleaning water. Some of these may damage the equipment or cause irritation to the wearer.

Disinfection may be achieved by using a broad-spectrum disinfectant. The choice of preparation should be made based on recommendations of the RPE manufacturer and medical authorities. Such information should also assist where protection against the transmission of a specific pathogen is required. With all disinfectants, particular attention should be paid to the manufacturer's instructions regarding their use, e.g. dilution, temperature, exposure time.

The cleaned and disinfected RPE should be rinsed thoroughly in clean water to remove all traces of cleaning agent and disinfectant. This is very important to prevent dermatitis or irritation. After rinsing, an anti-fog preparation may be applied to lenses and visors.

The RPE should be allowed to air dry away from direct sunlight, on a clean surface, or dried in a low-temperature oven. They may also be hung from a horizontal wire, like drying clothes, but care should be taken not to damage the facepieces.

Wherever practicable, exhalation valves should be removed from valve seats and cleaned each time the RPE is serviced. Valves and valve seats may be cleaned in cold or warm water; hot water (i.e. greater than 40°C) should be avoided. Valve seats may need to be scrubbed with a suitable brush.

Generally, cleaning and disinfecting solutions used should not be hotter than 40°C as higher temperatures can permanently distort facepieces and cause premature deterioration of individual components or the whole assembly.

Although it is essential that water does not enter adjustment valves, reducing valves, demand valves, pressure gauges and other controlling devices, component parts should be appropriately washed or cleaned in accordance with the manufacturer's instructions.

Clean RPE should be clearly identified as such.

INSPECTION

General

An important part of a RPE maintenance program is inspection of the devices. When performed properly, inspections will identify damaged or malfunctioning RPE.

Inspection schedules

All respiratory protective equipment shall be inspected before and after each use and during cleaning.

REPAIR AND REPLACEMENT OF COMPONENTS

General

The table below itemizes some of the primary defects to look for when inspecting RPE, with suggested action where appropriate under the maintenance subheading. In many cases the manufacturer or supplier of the equipment may need to be contacted.

CHECKLIST FOR DEFECTS

Inspection	Maintenance action
Disposable RPE (see Note 1)	
Physical damage (e.g. holes) to filter	Obtain new RPE
Straps for elasticity and deterioration	Obtain new RPE
Metal nose clip for deterioration	Obtain new RPE
Air-purifying RPE (re-usable full/half facepiece)	
<i>Facepiece</i>	
Dirt	Clean all dirt from the facepiece
Cracks, tears, holes, hardening or tackiness	Obtain a new facepiece
Cracked, scratched or loose-fitting lenses	Contact manufacturer to see if a replacement is possible; otherwise obtain new facepiece

Distortion	Allow facepiece to 'sit' free from any constraints and see if distortion disappears; if not, obtain a new facepiece
<i>Head straps</i>	
Breaks or tears	Replace head harness
Loss of elasticity	Replace head harness
Broken or malfunctioning buckles or attachments	Obtain new parts or replace head harness
Excessively worn serrations on head harness which may cause facepiece to slip	Replace head harness
<i>Inhalation & exhalation valves (see Note 2)</i>	
Detergent residue, dust particles, or dirt on valve or valve seat	Clean residue with soap and water and rinse thoroughly
Cracks, tears, or distortion in the valve material or valve seat	Contact manufacturer for instructions
Missing or defective valve cover	Obtain new valve cover
<i>Filter elements</i>	
Increased filter resistance	Replace filter
Missing or worn gaskets	Replace gasket
Worn filter and facepiece connections	Replace filter or facepiece, as applicable
Cracks or dents in filter housing	Replace filter
Deterioration of gas filter support harness	Replace the harness
Service life indicator or end of service date	Replace filter
Clogged pre-filter	Replace pre-filter to extend life of main filter

<i>Breathing tube</i>	
Hardening, cracks or holes	Replace tube
Missing or loose hose clamps	Obtain new clamps
Broken or missing end connectors	Obtain new connectors
Powered Air-Purifying Respirator (PAPR)²	
<i>General</i>	
Leaks in RPE assembly including worn or missing gaskets	Tighten filter clamps and replace damaged parts
Fan and motor flow rate prior to and after use	If flow rate is below minimum specified by manufacturer, check battery and recharge if necessary or replace filter or both. If still below minimum, check for major faults and consult manufacturer
Facepiece – as above for air-purifying RPE Head covering/bib in place and free from defects e.g. holes and tears, worn elastic seals	Repair or replace defective or missing parts in accordance with the manufacturer's instructions
<i>Rechargeable batteries</i>	
External damage or corroded terminals	Consult manufacturer's care and use instructions

NOTES:

1. Disposable RPE is not intended to be repaired. Any attempted repair of disposable RPE is to be actively discouraged.
2. Permissible leakage of outlet valves may be exceeded after a relatively short life. This valve defect is not always recognizable by observation and frequent checks should be made for valve leakage and valve be regularly replaced.

² A device incorporating a half facepiece, full facepiece or head covering which provides the wearer with air filtered through a powered filtering unit, comprising a filter or filters, and an electrically operated blower unit.

REPLACEMENT OF FILTERS

General

There is no overall rule about when filters should be changed. Each situation needs to be treated individually.

Advice should be sought from the manufacturer of the RPE in conjunction with an OHS professional, e.g. an occupational hygienist, on an acceptable change-over time based on likely exposure patterns, so an adequate safety margin is allowed. Based on this advice a filter replacement schedule shall be established and documented.

WARNING: IN SOME FILTER ASSEMBLIES IT MAY BE POSSIBLE TO INSERT THE FILTER IN THE WRONG DIRECTION DESPITE DIRECTIONAL ARROWS OR INSTRUCTIONS. IF A PREVIOUSLY USED FILTER IS REINSERTED THE OTHER WAY ROUND THEN THE USER IS LIKELY TO INHALE CONTAMINANTS DEPOSITED DURING THE EARLIER USE.

Particulate filters

The breathing resistance of the filter will progressively increase in use as it becomes clogged with trapped particles and eventually becomes so high that the filter must be replaced. The time taken for this condition to develop will vary according to the characteristics of the filter, and the type, size and concentration of the particles. If the filter media is of a type that decreases in efficiency when exposed to oil mist, then the filter's performance may degrade without noticeable increase in breathing resistance. Such filters need to be changed frequently.

As a general guide, the breathing resistance can be considered too high when there is a perceived increase in resistance to breathing. Resistance of particulate filters may be considerably increased if used in damp conditions. A damaged or ineffective inlet valve may lead to condensation on the filter, thereby increasing resistance.

In the case of PAPR, clogging of the filters is normally signalled by a fall in the air-flow rate.

The use of a pre-filter is advantageous where coarse particulates would otherwise rapidly clog the filter.

The use of back flushing or other methods to prolong the life of a particulate filter is to be actively discouraged since it will reduce the efficiency of the filter.

STORAGE OF EQUIPMENT

Users should consult manufacturers' instructions, particularly with regard to storage recommendations. The following should be observed for storage and protection:

- a) RPE should be readily available to encourage use.
- b) Cleaned RPE should be clearly identified and separated from used/contaminated RPE.
- c) RPE should be kept clean and dry and away from dust, corrosive atmospheres, oil and exposure to direct sunlight to avoid deterioration.
- d) Facepieces should be stored so that they are not subject to distortion.

Appendix - PROCEDURES FOR CLEANING AND DISINFECTING RPE (Informative)

SCOPE

This Appendix provides a guide for cleaning and disinfecting RPE.

METHOD

To clean and disinfect RPE:

- a) Remove filters from facepiece where applicable
- b) Disassemble facepieces according to manufacturer's instructions.
- c) Replace or repair any defective parts.
- d) Wash components in warm (40°C maximum) water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt.
- e) Rinse components thoroughly in clean, warm (40°C maximum), preferably running, water. Drain and allow to air dry.
- f) When the cleaner used does not contain a disinfecting agent, and disinfection is required, respirator components should be immersed for about two minutes in one of the following:
 - (i) Hypochlorite solution (50 p.p.m. of chlorine) made by adding approximately 2 mL of laundry bleach to one litre of water at a temperature not greater than 40°C.
 - (ii) Aqueous solution of iodine (50 p.p.m. iodine) made by adding approximately 0.8 mL of tincture of iodine (6–8 grams ammonium and/or potassium iodide/100 mL of 40% alcohol (v/v) to one litre of water at a temperature not greater than 40°C.
 - (iii) Other commercially available cleansers of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer. Resuscitators and medical masks should be cleaned by other methods. Check for most up-to-date information.
- g) After disinfection, rinse components thoroughly in clean water, drain and allow to air dry.
- h) Reassemble the facepiece in accordance with the manufacturer's instructions.