

## **“Info Sheet” for Respiratory Protection**

Workers should use respirators for protection from contaminants in the air only if other hazard control methods are not practical or possible under the circumstances. Respirators should not be the first choice for respiratory protection in workplaces. They should only be used:

- when following the "hierarchy of control" is not possible (elimination, substitution, engineering or administrative controls)
- while engineering controls are being installed or repaired
- when emergencies or other temporary situations arise (e.g., maintenance operations)

Other control methods include:

- mechanical ventilation
- enclosure or isolation of the process or work equipment
- proper control and use of process equipment, and
- process modifications including substitution of less hazardous materials where possible.

Employers should have a written respirator program that describes the proper procedures for selecting and operating respiratory protective equipment. The correct use of a respirator is just as important as selecting the proper respirator. Parts of the respirator program deal with finding out what hazards are present and how much protection that the workers will need. Other parts should describe how to wear and look after the respirator.

Without a complete respiratory protection program, people will probably not receive the best protection from a respirator even if it is the correct choice for a specific job. A respiratory protection program includes several components such as:

- hazard identification and control
- exposure assessment
- respirator selection
- respirator fit-testing
- training program
- inspection and record keeping
- cleaning and sanitizing respirators
- repairing and maintaining respirators
- proper storage of respirators
- health surveillance
- standard operating procedures (available in written form)
- program evaluation

Workers with beards, long sideburns, or even a two-day stubble may not wear respirators because the hair breaks the seal between the skin and the respirator mask. Wearing eyeglasses

would also break the respirator seal. This break means that the respirator mask will "leak" and will not provide the needed respiratory protection. Also, if a worker has facial scars or an acne problem, the facial skin may not be able to form a good seal with a respirator mask.

#### Types of Respirators

The two main types are air-purifying respirators (APRs) and supplied-air respirators (SARs).

Air-purifying respirators can remove contaminants in the air that you breathe by filtering out particulates (e.g., dusts, metal fumes, mists, etc.). Other APRs purify air by adsorbing gases or vapors on a sorbent (adsorbing material) in a cartridge or canister. They are tight-fitting and are available in several forms:

- mouth bit respirator (fits in the mouth and comes with a nose clip to hold nostrils closed - for escape purposes only)
- quarter-mask (covering the nose and mouth),
- half-face mask (covering the face from the nose to below the chin), or
- full facepiece (covering the face from above the eyes to below the chin)

Respirators with a full facepiece also protect the eyes from exposure to irritating chemicals.

Supplied-air respirators (SARs) supply clean air from a compressed air tank or through an air line. This air is not from the work room area. The air supplied in tanks or from compressors must meet certain standards for purity and moisture content (e.g., CSA Standard Z180.1-00 (R2010): Compressed Breathing Air and Systems).

Supplied-air respirators may have either tight-fitting or loose-fitting respiratory inlets. Respirators with tight-fitting respiratory inlets have half or full facepieces. Types with loose-fitting respiratory inlets can be hoods or helmets that cover the head and neck, or loose-fitting facepieces with rubber or fabric side shields. These are supplied with air through airlines.

Examples of these classes of respirators include:

#### Air-purifying respirators (APRs):

- particulate respirators (previously called dust, fume, and mist respirators or masks),
- chemical cartridge respirators that can have a combination of chemical cartridges, along with a dust prefilter: this combination provides protection against different kinds of contaminants in the air
- gas masks (contain more adsorbent than cartridge-type respirators and can provide a higher level of protection than chemical cartridge respirators)
- powered air-purifying respirators

#### Supplied-air respirators (SARs):

- self-contained breathing apparatus (SCBA),
- airline supplied-air respirators,
- protective suits that totally encapsulate the wearer's body and incorporate a life-support system

There are some combinations of airline respirators and SCBAs that allow workers to work for extended periods in oxygen-deficient areas or where there are airborne toxic contaminants. The auxiliary or backup SCBA source allows the worker to escape with an emergency source of air if the airline source fails.

There are also combination air-purifying and atmosphere supplying respirators. These will offer worker protection if the supplied-air system fails, if the appropriate air-purifier units are selected.

These cannot be used in oxygen-deficient areas or where the air concentration of a contaminant exceeds the IDLH level (i.e., immediately dangerous to life or health).

Since filters capture particles, caution must be exercised to always check that these filters are not clogged as it makes it harder for air to pass through and increase the likelihood of contaminated air entering the mask. Cartridges can also become "full" or saturated. It will stop working and "breakthrough" will occur – this term means that the gases or vapors will leak through the cartridge.

Both cartridges and filters must be replaced on a regular basis by using the manufacturer's recommendations (usually determined by using warning properties or end-of-service indicators).

There are 9 classes of particulate filters, depending on the particulate material. They are also classified based on levels of oil resistance and filter efficiency. Oil can break down certain types of filters which means it is important to know the materials you are working with at all times and always select the right cartridge for your respirator.

The main categories are:

- N series (Not resistant to oil) - May be used in any atmosphere where there is no oil particulate.
- R series (Resistant to oil) - May be used in any atmosphere where there is no oil particulate, or up to one shift where there is oil particulate present. "One shift" means eight hours of continuous or intermittent use.
- P series (Oil-Proof) - May be used in any atmosphere, including those with oil particulates, for more than one shift. If the filter is used in atmospheres with oil particulates, contact the manufacturer to find out the service life of the filter.

Equally important is the selection of the correct type of cartridge or filter.

Filters are made of material that is designed to trap particles as you breathe. Cartridges contain a material that absorbs gases and vapors. It is very important to make sure you are using the right filter or cartridge for the chemicals or substances present in the workplace.

### **Selecting the Right Respirator**

Choosing a respirator is a complicated matter. Experienced safety professionals or occupational hygienists, who are familiar with the actual workplace environment, are the staff who should select the proper respirator. They can choose a suitable respirator only after they have evaluated all relevant factors. This includes considering the limitations of each class of respirator.

Before the proper respirator can be selected for a job, be sure you have already:

- identified the respiratory hazard
- evaluated the hazard
- considered whether engineering controls are feasible

There are too many types of situations to cover them all fully here. However, the following questions represent part of "decision logic" that a safety professional or occupational hygienist can use when selecting a respirator:

- Is it to be used in firefighting or emergencies?
- Is it to be used in oxygen-deficient atmospheres (less than 18% oxygen in air; some jurisdictions say below 19.5%)?
- What is the nature of the hazard (chemical properties, concentration in the air, warning properties)?
- Is there more than one contaminant (i.e. a mixture or more than one chemical is present)?
- Is the airborne contaminant a gas, vapor or particulate (mist, dust or fume)?
- Are the airborne levels below or above the exposure limit, or are they above levels that could be immediately dangerous to life or health?
- What are the health effects of the airborne contaminant (carcinogenic, potentially lethal, irritating to eyes, absorbed through the skin)?
- What are the characteristics of the operation or the process (e.g., hot temperature, confined space)?
- What activities will the worker be doing while wearing the respirator (e.g., strenuous work)?
- How long will the worker need to wear the respirator?
- Does the selected respirator fit the worker properly?
- Where is the nearest safe area that has respirable air?

Use the MSDS/SDS for guidance on requirements of the particular respiratory hazard. The CSA Standard Selection, Use and Care of Respirators Z94.4-11 outlines a respirator selection decision logic model in more detail.

## **How to care for your respirator; and samples of what you might include on a care checklist.**

### **Checklist for care of respirators**

- Inspect the respirator before and after each use and during cleaning.
- Inspect equipment designated for "emergency use" at least monthly, and after each use.
- Replace all parts that are cracked, torn, broken, missing or worn.
- Follow the manufacturer's instructions and consult CSA Standard Z94.4-11 Selection, Care and Use of Respirators for information on the care, maintenance, and storage of respirators.

### **Facepiece**

- Ensure that no holes or tears are present.
- Inspect for cracked, scratched or loose-fitting lenses. For a full facepiece respirator, check for missing mounting clips.
- Ensure that the metal nose clip forms easily over the bridge of the nose on disposable respirators.
- Make sure the facepiece edges are not rippled or distorted.

### **Head strap/harness**

- Check webbing for breaks.
- Look for deterioration of elasticity or fraying edges.
- Test excessively worn head harness.

### **Inhalation and exhalation valves**

- Ensure the valve and valve seat are free of dust particles or dirt that may cause a poor seal or reduce efficiency.
- Replace any missing or defective valve covers.

### **Filter elements**

- Ensure that the filter and mask are certified for use together.
- Check the filter to see that they are approved for the hazard.
- Inspect both the filter threads and facepiece threads for wear, make sure they are screwed together properly, and there is no cross threading.
- Check the filter housing for cracks or dents.
- Check the end of service life indicator for gas masks. Check the expiration date.

### **Air supply system**

- Inspect the air-supply hose and end-fitting attachments for breaks, cracks, or kinks.
- Test the tightness of connections.
- Ensure the proper operation and condition of all regulators, valves or other airflow device
- Monitor the operation of air-purifying elements and carbon monoxide or high-temperature alarms.
- Check seams in suit or blouse for rips and tears.
- Ensure that protective screens are intact and fit correctly over facepiece (abrasive blasting hoods and blouses).

### **Respiratory battery pack**

- Follow the manufacturer's instructions for charging/discharging.
- Before recharging nickel-cadmium (NiCad) batteries, fully discharge them with a discharger designed for those batteries. If this is not done regularly, the NiCad batteries may not provide power for as long as the specifications state.
- Ensure that the batteries are fully charged before using them.

### **Repair, cleaning and storage**

- Do not clean with solvents.
- Follow the manufacturer's instructions.
- Wash with a mild dish detergent or a combination of detergent and disinfectant. Use a brush and warm water (49-60°C or 120-140°F).
- Rinse with clean water, or rinse once with a disinfectant and once with clean water. The clean water rinse removes excess detergent or disinfectant that can cause skin irritation or dermatitis.
- Dry on a rack or clean surface or hang from a clothes line. Position the respirator so that the facepiece rubber will not "set" crookedly as it dries.
- Store the respirator at the end of each shift to protect it from dust, sunlight, heat, extreme cold, excessive moisture, and chemicals.
- Clean and disinfect respirators after each use, where appropriate.
- Permit only trained and qualified personnel to repair respirators.
- Do not mix parts from different manufacturers.
- Record all repairs and inspections.
- Remove dirt.
- Check for distortion caused by improper storage

**What is an example of a checklist for caring for my self-contained breathing apparatus (SCBA)?**

### **Checklist for self-contained breathing apparatus (SCBA)**

- Inspect the SCBA unit before each use. Test and clean after each use.
- Inspect the equipment designated for "emergency use" at least monthly and after each use.

- Follow the manufacturer's instructions and CSA Standard Z94.4-11 for care and maintenance.
- Permit only trained, manufacturer-certified personnel to maintain SCBA.
- Do not mix parts from different manufacturers.
- Maintain a complete record for each SCBA facepiece and cylinder.

### **Facepiece**

- Disconnect the facepiece from the breathing apparatus. Wash alone in warm (49-60 °C or 120-140 °F) soapy water using a mild dish detergent.
- Rinse the water through the facepiece by placing the palm of the hand over the breathing tube connector on the exhalation-valve body.
- Remove excess water with a paper towel or lint-free cloth.
- Allow to air dry.
- Sanitize according to the manufacturer's instructions.
- Check for tears in the rubber.
- Check head strap for deterioration.
- Examine lenses for cracks, excessive scratching or other deformities.
- Check rings and clamps securing the lens for bends or bulges in the metal.
- Check the exhalation valve to ensure that it is properly located and that the valve cover is in place.
- Test the exhalation valve. Block the air intake opening and exhale gently. If the exhalation valve is not working properly, a heavy blow-by will be felt at the temples. Inhale and a partial vacuum will be formed.
- Do not mix demand and pressure-demand facepieces and regulators.

### **Regulator**

- Check the regulator, breathing-tube threads, pressure gauge, and bypass and mainline valves for impact damage.
- Store with the cylinder valve completely closed.
- Bleed off air remaining in the regulator after each use, following manufacturer's instructions.

### **Breathing tube**

- Stretch the breathing tube and check for cracks, tears and punctures.
- Check gaskets.
- Check clamps and rings to ensure that they are tight, properly located, not dented and not excessively corroded.
- Wash the breathing tube separately and allow to air dry. If it is permanently attached to the facepiece, allow the breathing tube to dry for several days before using.

### **High-pressure hose**

- Check the hose for cuts, bubbles and abrasions.
- Check the fitting between the high-pressure hose and the regulator for damage.

## **Audible alarm**

- Check the audible alarm for damage.
- Clean bells or whistles.
- Ensure that the alarm is working. If the alarm does not go off when the pressure reaches 20-25% of service time, the unit is defective. Remove the unit from service.

## **Backpack**

- Inspect the straps of the backpack for excessive wear, broken stitching, and damaged or missing hardware.

## **Cylinder**

- Ensure cylinders are hydrostatically tested as set out in CSA Standard Z94.4-11, Selection, Care and Use of Respirators.
- Inspect for cuts or gouges that can cause the unraveling of the composite fibers of the cylinder overwrap.
- Check unwrapped cylinders for impact damage.
- Check for evidence of exposure to heat. Look for discoloured paint or melted gauge lenses.
- Ensure air meets air quality set out in CSA Standard Z180.1-00 (R2010), Compressed Breathing Air and Systems.

## **Cleaning the rest of the unit**

- Remove backpack, cylinder and regulator assembly.
- Clean with water, or soapy water.
- Wipe the regulator, high-pressure hose, audible alarm, air cylinder, backpack and harness with a damp cloth.
- Dry with a cloth.

## **For more information;**

Contact the governmental [occupational health and safety officials](#) in your jurisdiction to obtain additional information on regulatory requirements for respiratory protection.

In addition, Canadians can also contact the Canadian Standards Association (CSA) at 416-747-4044 or 1-800-463-6727 to purchase the CSA Standard Selection, care, and use of respirators (CSA Standard Z94.4-11).

## **Reference Material Sources**

- <http://www.ccohs.ca/oshanswers/prevention/ppe/respslct.html>
- <http://www.ccohs.ca/oshanswers/prevention/ppe/respcare.html>



- CSA Standard Selection, Use and Care of Respirators Z94.4-11