UBC Respirator Protection Program

1. Introduction and Background

Working in environments with air contaminants and/or oxygen deficiencies can have serious long-term implications in an individual's health. These adverse health effects can result after either a short or long period of exposure to the airborne hazard. Using the hierarchy of controls, UBC works towards eliminating or minimizing respiratory hazards. Engineering or administrative controls should always be considered prior to the implementation of respiratory protection.

The purpose of this program is to ensure that respirators used at UBC provide effective protection against airborne contaminants to which a person may be exposed. This program applies to all UBC faculty, staff, and students who may use a respirator, in any UBC related activities, to protect against the inhalation of hazardous contaminants.

2. Scope

This Exposure Control Plan (ECP) is designed for all UBC faculty, staff, and students who carry out work, both on campus and off, where there is the potential for exposure to hazardous respiratory airborne contaminants.

3. References

- Occupational Health and Safety Regulation and Guidelines Part 8: Personal Protective Clothing and Equipment
- CSA Standard
  - Z94.4-02 Selection, Use, and Care of Respirators
  - Z180.1-13 Compressed Breathing Air and Systems
- WorkSafeBC Breathe Safer Publication
- Canadian Centre for Occupational Health and Safety
  - Respirator Selection
  - Respirator Care
  - Wearing a Respirator
- UBC Health and Safety Policy - SC1

4. Legal Requirements

Occupational Health and Safety Regulation (OHSR) Part 8 outlines the regulatory requirements for personal protective equipment. Part 8 also offers related guidelines that help to interpret and implement the requirements. In addition to Part 8, the OHSR also references the implementation of CSA Standard Z94.4-02, Selection, Use, and Care of Respirators, which mandates the need to have a respiratory protection program when respirators are used. Both the OHSR and CSA Standard provide the foundation on which the

UBC Respirator Protection Program is written. This document outlines the minimum requirements for respiratory safety. All UBC faculty, staff, and students are expected to understand the legislative requirements and what must be done to protect from noise exposure in the workplace. Additional requirements may be applicable depending on the nature of the work being performed.

This program focuses on providing guidance on the following key aspects of respirator safety:

1. Identifying areas within the workplace where respiratory hazards exist
2. Implementing the appropriate respiratory protection for the workplace or task
3. Explaining the requirements and techniques for fit testing
4. Providing information on the proper use and limitations of respirators
5. Educating on the maintenance, storage and cleaning of respirators
6. Highlighting the importance of medical screening
7. Outlining the expectations of record-keeping

5. Definitions

8-hour TWA Limit: The time weighted average (TWA) concentration of a substance in air that cannot be exceeded over an 8-hour workday (40-hour work week).

Aerosol: Particulate matter, such as dust, fumes, and mists, suspended in the air.

Air Purifying Respirator: A style of respirator that uses a filter or cartridge to clean the air of any contaminants before it enters the breathing zone.

Breakthrough: The penetration of contaminant through a cartridge, and into the breathing zone, as a result of the cartridge being saturated or "used-up".

Cartridge: A case or container that holds a filter, sorbent, catalyst, or combination and functions to trap or react with specific contaminants and remove them from the air.

Compressed Air: Air under pressure that exceeds 15 pounds per square inch or 103 kPA.

Filter: Functions to trap particles and remove them from the air.

End of Service Life Indicator: A built-in indicator on a cartridge that changes color to show when a cartridge is saturated and needs to be replaced. This indicator should be present for contaminants that have poor warning properties (ie. mercury vapor).

Filtering Facepiece Respirators: A respirator where the entire facepiece acts as a filtering medium. These respirators must have two straps and should be disposed at the end of its service life.

Fit Test: A qualitative or quantitative test that evaluates the effectiveness of a seal from a tight-fitting respirator on an individual. Fit tests must be performed in accordance with the procedures outlined in *CSA Standard CAN/CSA-Z94.4-02 Selection, Use, and Care of Respirators.*

High Efficiency Particulate Air (HEPA) Filters: Filters that are capable of removing 99.97% of particles that are 0.3 micrometers (*u*m), or larger, in diameter. For respirators, a HEPA filter is a NIOSH 100 series filter (N, R, or P class).

Immediately Dangerous to Life and Health: An atmosphere that contains hazardous contaminants at a concentration that places an individual in immediate danger because it impairs their ability to escape without serious injury or irreversible health effects.

Maximum Use Concentration (MUC): The maximum airborne concentration of a hazardous contaminant that an individual can be protected from when using a respirator. The MUC is determined by the assigned protection factor of the respirator and the exposure limit of the hazardous contaminant.

National Institute of Occupational Safety and Health (NIOSH): An agency that tests and certifies respirators. Only NIOSH approved respirators may be used in the workplace.

Negative Pressure Respirator: A respirator where the air pressure inside the face piece becomes negative during inhalation. This style of respirator may be a N-95, half-face elastomeric respirator, or full-face elastomeric respirator.

Powered Air Purifying Respirator (PAPR): A respirator that uses a battery-operated blower to pass contaminated air through a HEPA filter that will remove particulates so that clean respirable air is provided to the facepiece. The facepiece style may be half-face or full-face.

Protection Factor: A value assigned to a respirator that shows the anticipated level of respiratory protection, that when properly fitted, the respirator can provide to employees. Also referred to as Assigned Protection Factor.

Respirator: A type of personal protective equipment that provides respiratory protection against hazardous airborne contaminants or oxygen deficient air. All respirators used in the workplace must be NIOSH certified.

Self-Containing Breathing Apparatus (SCBA): A respirator that provides air from a cylinder containing compressed air. The cylinder is worn by the individual and the exhaled air is released into the surrounding atmosphere.

Seal Check: A negative or positive pressure check performed as per manufacturer's directions to confirm respirator fit. Also referred to as a fit check.

Supplied Air Respirator: A respirator that supplies individuals with air through a hose (airline) that is attached to a source of clean respirable air. The air can be supplied by either a compressor or a pump that provides ambient air.

6. Roles and Responsibilities

The roles and responsibilities described in this program are in accordance with the OHSR and University Health and Safety Policy - SC1.

6.1 Employer Responsibilities

- Ensuring employees are protected from respiratory hazards in the workplace through the implementation of the hierarchy of controls, in order of effectiveness, with respiratory protection only being used when other control options are not feasible or adequate at mitigating risk
- Ensuring that respirators are available and the appropriate type of respirator and filter/cartridge is provided for the task
- Ensuring that medical screening and fit testing is completed annually for all respirator users

- Ensuring the resources and supplies that make up the respiratory program (including exposure assessments, safe work procedures, fit testing equipment, respirators, cleaning materials, etc.) are accessible
- Ensuring compliance with British Columbia's OHSR

6.2 Department Manager/Supervisor Responsibilities

- Attending education and training sessions provided by the employer
- Identifying and assessing workplaces or tasks where there is the potential for respiratory hazards to be generated
- Ensuring the hierarchy of controls are considered and implemented accordingly
- Actively participating and promoting the UBC Respiratory Protection Program
- Developing site specific safe work procedures against respiratory hazards
- Investigating incidents of exposure to respiratory hazards and communicating findings to prevent similar occurrences
- Ensuring employees are trained and educated on the respiratory hazards in their workplace and are able to recognize the health signs and symptoms associated with airborne contaminant exposure
- Ensuring employees requiring respirators are successfully fit tested
- Ensuring employees use respirators in designated areas and/or when carrying out tasks with respiratory hazards

6.3 Employee Responsibilities

- Actively participating in the UBC Respirator Protection Program
- Attending education and training sessions provided by the employer
- Understanding the different respiratory hazards that exist in the workplace
- Wearing the appropriate respiratory protection depending on the worksite or task
- Participating in a respirator fit test session annually
- Inspecting the respirator for damage prior to donning and reporting a respirator that is deformed or malfunctioning to the supervisor
- Ensuring there is no facial hair that interferes with the seal of a tight-fitting respirator
- Performing positive and negative pressures checks after donning a respirator and periodically thereafter
- Cleaning, disinfecting and storing the respirator as per manufacturer's instructions
- Understanding and following safe work procedures and immediately reporting any additional hazards identified to the supervisor
- Reporting to UBC first aid and the supervisor any occupational exposure incidents to airborne respiratory hazards
- Reporting to the supervisor any medical concerns from using a respirator

6.4 Safety & Risk Services (SRS) Responsibilities

- Ensuring the UBC Respirator Protection Program is complete and current with the OHSR requirements
- Assisting with the implementation of this program, where applicable
- Assisting with air quality sampling and exposure assessments to determine the need for respiratory protection, where necessary
- Assisting with the appropriate selection of respirators and cartridges/filters
- Organizing and delivering fit test sessions for respirator users
- Assisting in the interpretation of the OHSR and providing appropriate recommendations or guidance
- Consulting with supervisors, employees, JOHSC members during the updating of this program
- Participating in incident investigations involving exposures to respiratory hazards
- Responding to respiratory health related inquiries

6.5 Joint Occupational Health & Safety Committee Responsibilities

- Consulting with the employer and employees on topics related to respiratory protection
- Providing recommendations on the improvement of the health and safety of workers that are participating in the UBC Respirator Protection Program
- Participating in incident investigations relating to respiratory exposures to hazardous contaminants

6.6 Occupational & Preventive Health (OPH) Responsibilities

- Providing Nurse and/or Physician assessments, when warranted, for safe respirator use to employees with pre-existing medical conditions
- Notifying the employee, their supervisor, and SRS when OPH clears the employee to proceed with respirator fit testing

7. Respiratory Hazards

Examples of harmful environments, where respiratory hazards exist, include situations in which the occupational exposure limits (OEL) are exceeded, there is an oxygen deficient atmosphere, or specific disease-causing airborne contaminants are present. More details on the types of respiratory hazards that can be found at UBC are described below. Note that more than one respiratory hazard can be present at the same time.

7.1 Particulates

Particulate matter can include aerosols, dusts, fibers, mists, fumes and smoke. Particle sizes between 0.1 µm and 10 µm, also referred to as the respirable fraction, are especially concerning respiratory hazards because of their ability to enter the gas exchange regions of the lungs and cause adverse health effects. Activities that can generate particulates include sanding, crushing, drilling, or cutting solids. In addition,

shaking, stirring, or spraying liquids can also produce airborne particulates. Filters can be used to remove particulate hazards from the air.

7.2 Biologicals

Common biological hazards include bacteria, viruses, mold, and animal allergens (ie. animal dander). Similar to particulates, if biological hazards become airborne and are inhaled, they can cause a variety of health problems. Filters can also be used to removed biological hazards from the air.

7.3 Gases & Vapors

Gases and vapors differ from particulates because they cannot be removed from the air by filtration alone. Chemical bonding or reacting is necessary to trap this form of contaminant. Cartridges are effective at protecting individuals from hazardous gases and vapors in the air.

7.4 Oxygen Deficiency

Respirable air consists of approximately 20.9% oxygen. When the oxygen levels in air become less than 19.5%, the atmosphere is considered oxygen deficient. Oxygen deficiency can immediately affect brain and heart function and is potentially lethal within minutes. This is a serious concern in confined or enclosed spaces where respirable air can easily be displaced.

Unlike most other respiratory hazards, there is no cartridge or filter that can protect individuals from an oxygen deficient atmosphere. Respirators that control this hazard must be able to supply air to the user from a clean source. Any work to be performed in an oxygen deficient environment needs to first be assessed by UBC SRS.

8. Controlling Respiratory Hazards

Once a risk to a respiratory hazard has been identified and assessed, the hierarchy of controls must be implemented to ensure exposure to the contaminant is eliminated or mitigated. The hierarchy of controls is a systematic approach to control for the risks in a workplace from most effective to least effective. A visual of the hierarchy of controls can be seen below:

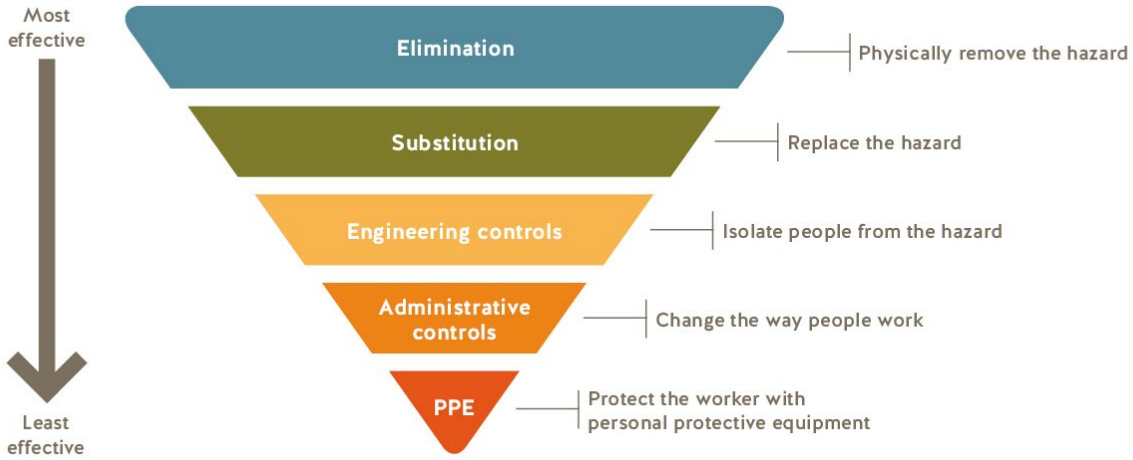

Figure 1: Hierarchy of Controls Inverted Pyramid from Controlling Risks - WorkSafeBC

Based on Figure 1, eliminating or substituting a hazard is the most effective control option. Next, engineering controls are ideal for mitigating a hazard as no additional precautionary steps are needed by the worker. If engineering controls are not feasible, administrative controls should be implemented. Finally, only when all other options are exhausted should personal protective equipment (PPE) be used as it ranks lowest on the hierarchy of controls. Whenever possible, the use of PPE should always be done in conjunction with other more effective controls. At minimum, the use of PPE will involve administrative controls such as training and education.

Listed below are example methods for controlling respiratory hazards without using PPE:

- Elimination Controls: Removing the hazardous substance or process from the workflow
- Substitution Controls: Replacing a hazardous substance or process with one that is non-hazardous or less hazardous.
- Engineering Controls: Enclosing the process so that contaminants are not released into the workspace, improving ventilation, and changing the equipment for a given process. For example, carrying out processes in fume hood or biological safety cabinet, increasing mechanical ventilation rates, or using equipment with local exhaust.
- Administrative Controls: Restricting access to contaminated areas, limiting the total time workers are exposed to respiratory contaminants and establishing housekeeping procedures to control exposure.

Most respiratory hazards in the workplace can be eliminated or reduced through substitution, engineering, and administrative controls. The more effective controls, based on the hierarchy of controls, should always be considered before relying on respirators to minimize exposure. Properly used, respirators can protect the worker from hazards. However, if the respirator fails or is not suitable for the task, the worker will still be at risk of exposure.

9. Respirator Types

There are many different types of respirators available however, it is important that only those respirators that have been tested and certified by the National Institute for Occupational Safety and Health (NIOSH) be used at UBC for occupational purposes. A description of some common styles of respirators are provided below.

9.1 Air Purifying Respirators

Air-purifying respirators use a filter or a cartridge to decontaminate the air as it passes into the respirator. The specific type of filter or cartridge required will depend on the contaminant that needs to be removed. Note that air purifying respirators, and their associated cartridges and filters, must never be used in situations that are immediately dangerous to life and health (IDLH). IDLH is an environment that poses an immediate threat to life and can result in negative health effects that prevent an individual from being able to safely escape. An example of an IDLH environment is an oxygen deficient atmosphere.

9.1.1 N, R, or P 95, 99, or 100 Filtering Half-Face Particulate Respirators

These respirators belong to a class of air purifying respirator where the entire facepiece acts as a filtering medium. The respirators are designed with two elastic straps and some may have an exhalation valve. Each respirator will have an alphabetical (N, R, or P) and a numerical (95, 99, or 100) value that corresponds to the respirator's ability to withstand specific atmospheres.

- N = Not resistant to oil and should be used only when there are no oil particulates in the atmosphere
- R = Resistant to oil and can provide protection in an atmosphere with oil particulates
- P = Oil-proof and can provide protection in an atmosphere with oil particulates
- 95 = 95% efficient at removing particulates that are at least 0.3 µm in diameter
- 99 = 99% efficient at removing particulates that are at least 0.3µm in diameter
- 100 = 99.97% efficient at removing particulates that are at least 0.3µm in diameter

Particulate respirators are also designed for one-time-use and should be disposed of, at minimum, by the end of the shift.

The most frequently requested particulate respirators are N95 and P100. N95 respirators are sufficient for health care setting as per the guidance from Health Canada.

Note: N95 respirators designed with an exhalation valve have the benefit of being easier to breathe in and keep the face cool. However, any respirators with an exhalation valve should not be used in an environment required to be sterile, as the exhaled air is not filtered.

9.1.2 Elastomeric Respirators

Half-Face Respirators

A half-face respirator will cover the nose, mouth, and chin of an individual's face. Elastomeric half-face respirators are made of silicone with attachment slots for filters and/or cartridges and plastic straps that go on the crown of the head and behind the neck.

Elastomeric Full-Face Respirators

A full-face respirator is similar to a half-face respirator but covers the entire face from the hairline to below the chin. These types of respirators have straps similar to the half-face style, but may have additional ones to ensure a more secure seal around the face. The transparent face cover on these respirators protects against contaminants that may also pose a hazard to the eyes.

Cartridges & Filters

There are many types of filters and cartridges available for half-face and full-face respirators. Appropriate cartridge and filter selection is important depending on each given application to ensure contaminants are being removed effectively.

Manufacturers can also provide guidance on the best choice of cartridge and/or filter for specific airborne contaminants. If additional assistance is needed in choose the appropriate cartridge and/or filter, users can contact SRS.

One common type of filter used against particulates is the High Efficiency Particulate Air (HEPA) filter. This filter is capable of removing at least 99.97% of hazardous dust, mold, bacteria, and other airborne particles that have a diameter of 0.3*u*m or greater.

9.1.3 Powered Air-Purifying Respirators

A powered air-purifying respirator (PAPR) uses a battery-powered blower to continuously draw air through the filter or cartridge and deliver it to the facepiece. Due to the positive air pressure created inside the respirator facepiece, it is easier to breathe with a PAPR. This respirator style is also more protective than non-powered air-purifying respirators. Since PAPRs are only air-purifying, they should also never be used in oxygen deficient environments.

There are various styles of PAPRs:

- Elastomeric half-face respirators
- Elastomeric full-face respirators
- Loose-fitting facepiece respirators (ie. hoods)

Half-face and full-face respirators form a tight seal with the face of the user. Loose-fitting respirators do not require a tight seal and can be worn with facial hair. The protection level being provided by a respirator varies depending on the style of facepiece.

9.2 Supplied Air (Airline) Respirators (SARs)

Supplied-air respirators (SARs) supply clean air with the help of a NIOSH approved airline. The airline may be resting in an area where clean ambient air is present and the respirable air can be collected with a low-pressure pump. Alternatively, the airline could be attached to a compressed air tank or compressor. The air supplied in tanks or from compressors must meet the standards for purity and moisture content that can be found in CSA Standard Z180.1-13, Compressed Breathing Air and Systems. The quality of air provided by a supplied air respirator must be tested annually through an accredited laboratory.

9.2.1 Positive Pressure (Pressure Demand) SARs

Positive pressure SARs are designed to keep the inside of the facepiece under positive pressure. When the worker inhales or there is leakage, the reduced pressure inside the respirator opens a regulator valve so

that more clean air can be supplied. The supply of clean air into the respirator prevents contaminated air from entering into the breathing zone. This style of respirator is often used in combination with a compressed air tank.

9.2.2 Continuous Flow SARs

Continuous flow SARs are either tight or loose fitting on the face. A continuous flow of fresh air is supplied to the respirator, which is always under positive pressure. This style of respirator is best when the clean air supply is unlimited (e.g. in conjunction with an air compressor).

10. Risk Assessment and Respirator Selection

Supervisors are responsible for completing a written risk assessment to determine whether respiratory hazards exist in the workplace and respiratory protection is needed. The supervisor may contact SRS for assistance in conducting the assessment as air monitoring may be required. All respiratory risk assessments should include the following details:

- Identifying the respiratory hazards present in the workplace
- Evaluating the concentration of each air contaminant
- Comparing the concentration of each contaminant to OHSR OEL's
- Considering the state of the contaminant
- Evaluating the properties of each contaminant, including warning properties
- Considering skin or eye absorption and irritation properties of the contaminant
- Selecting the appropriate type of filter or cartridge

Only respirators that are NIOSH certified can be used at UBC. No work should be performed in oxygen deficient, IDLH, environments until approval is obtained from UBC SRS.

When selecting a respirator, the protection factor of the respirator should also be considered. All respirators are assigned a numerical value that is referred to as a protection factor. A higher protection factor refers to a higher degree of protection that a respirator can provide against a respiratory hazard. For example, generally, for half-face respirators the protection factor is 10 while for full-face respirators the protection factor is 50. SRS may be contacted for more information on protection factors, their interpretation, and how to select the appropriate respirator for the respiratory hazard present.

If respiratory protection is needed there must be confirmation that the employee is medically fit to wear a respirator as required in section 8.42 of the OHSR. Specific pre-existing health conditions, such as heart disease or lung disease, may prevent an individual from using a respirator safely. In this case, clearance from a medical professional will be needed for the individual to use a respirator. UBC's Occupational & Preventive Health (OPH) can assist with providing this clearance.

Choosing the correct respirator along with filter and/or cartridge is the responsibility of supervisors but a request could be made to SRS for assistance. If the wrong respirator, filter, and/or cartridge is provided, individuals will not be protected from respiratory hazards and they may develop serious health problems. The respiratory hazards present can be determined from reviewing the safety data sheets (SDS) of the products being used. The manufacturer's instructions for filters and cartridges should also be referenced to ensure the correct PPE is chosen for the hazard.

11. Education & Training

Any individual that is required to use a respirator must be educated and trained on the proper use, care, and maintenance of this PPE. Education and training is applicable not only to the employee but also the supervisor. However, the supervisor is not required to be fit tested unless they also required to use a respirator. The education and training will include the following and is covered during the SRS administered fit test session:

- Description of the respirator style and its importance
- Capabilities and limitations of the respirator, filter, and/or cartridge
- Instruction on how to properly don, adjust, and doff the respirator
- Direction on how to perform positive and negative pressure checks
- Appropriate cleaning and storage of respirator
- Instruction on the inspection and maintenance procedures
- Information on factors that can affect respirator seal (ie. facial hair, dental work, surgery, etc.)

Education and training must take place annually, at minimum, but may also occur sooner if needed.

A record must be kept of individuals that have participated in the training.

11.1 Proper Use of Respirators

Respirators must be worn properly to ensure the maximum designed protection is being received. Implementing the following safe work practices will help promote the proper use of respirators:

- There should be no interferences with the seal of a tight-fitting respirator (ie. corrective eyewear, facial hair, etc.).
- Respirators must be inspected prior to use. This inspection will include a check of the straps, filters or cartridges, air intakes, exhaust valves, and other respirator parts. Respirators that are defective must not be used and should be brought to the attention of the supervisor. A new replacement respirator, in good working condition, should be provided to the employee.
- Once a respirator is donned, a positive and negative pressure check must be performed to confirm the seal is adequate.
- High levels of respiratory hazards, high humidity, and other factors could impact cartridges and filters. Ensure users are equipped with the appropriate respirator, cartridge, and/or filter for the environment.
- Respirators should be stored properly, in a clean and dry environment that is away from contaminants, when not being used.

If the following health symptoms are being experienced by individuals wearing a respirator, the area should be immediately evacuated and the supervisor must be notified:

- Dizziness
- Nausea
- Eye irritation
- Extreme fatigue
- Odours or tastes
- Difficulty breathing

With any of the above health symptoms, an investigation needs to be done to confirm the appropriate style of respirator is chosen and the individual is medically fit to wear a respirator. It may be necessary to involve UBC OPH with this investigation.

11.2 Cleaning, Maintenance, and Storage of Respirators

Manufacturer's instructions should be followed to ensure respirators are maintained, cleaned, and stored appropriately. If respirators are shared, they need to be cleaned and sanitized after each use as per the manufacturer's recommendations.

In general, the following procedures can be used when cleaning and sanitizing most elastomeric respirators:

- Remove filters or cartridges from the respirator
- Wash the respirator, and its associated components, with warm water and mild detergent
- Rinse the respirator in clean warm water
- Wipe the respirator with disinfectant wipes
- Lay the respirator flat to dry in a clean area
- Place the respirator in a clean plastic bag once dried

Storing a respirator properly is necessary to protect it from chemicals, strong sunlight, moisture, and extreme heat or cold that may degrade the respirator and decrease its ability to protect from airborne hazards. The following should be considered for storage:

- Store respirators so that the facepiece, head straps, hoses, and other accessories are not bent or stretched. Do not fold respirators that are not designed to be folded.
- Store respirators in a re-sealable plastic bag. This will stop the cartridges from absorbing contaminants and keep the respirator clean and dust-free.
- Store respirators in a cabinet or locker. Do not store the respirators with any tools.

11.3 Pre-Usage Checks

Prior to donning a respirator, the user must check the respirator's condition.

For N95 respirators, this check includes a visual inspection for:

- Holes or tears in the respirator
- Dirt and contaminate residue on the respirator
- Folds, creases, or distortions in the facepiece
- Absence of nose piece
- Missing or damaged valves
- Worn-out or missing straps

For half-face respirators and full-face respirators, this check includes a visual inspection for:

- Dirt and contaminant residue on the respirator
- Cracks, tears, and holes on facepiece, valves, filters, and cartridges
- Warped surfaces
- Broken fittings
- Functioning filter seal gaskets

- Crack, scratched, or loose-fitting lenses on the full-face respirator
- Worn-out or missing straps

11.3.1 Positive and Negative Pressure Checks

Prior to beginning work, all respirators, with tight-fitting facepieces, must be checked for proper fit through positive or negative pressure checks. Respirators with good fit will form a tight seal on the user's face, preventing airborne contaminants from leaking in past the sides, top, or bottom of the respirator and into the breathing zone of an individual. The steps for positive and negative pressure checks are outlined below.

Negative Pressure Seal Check

During a "negative-pressure" seal check the user creates negative air pressure inside the respirator facepiece by inhaling while covering the air intake valves of the respirator. The following steps are used to carry out a negative pressure seal check:

1. Don the respirator and other associated personal protective equipment. Tighten the head straps until the respirator feels snug but comfortable. Wear the respirator for a few minutes so that it will warm up and conform to the face.
2. Close off the inlet opening of the cartridges or filters by covering them gently with the palms of the hands (in some cases, the cartridges may need to be removed to cover the inlet valves). When carrying out this test while wearing a PAPR or an air-supplied respirator, close off or disconnect the hose to stop the air flow.
3. Breathe in slightly to create a vacuum and hold for 10 seconds.
4. If there is a good seal, the facepiece should collapse slightly against the face and stay collapsed. No air should leak into the facepiece past the sides, top, or bottom.

Figure 2: Negative Pressure Seal Check Demonstration from Breathe Safer - WorkSafeBC

If the facepiece doesn't collapse and stay collapsed, there is an air leak and the respirator is not forming a tight seal causing the individual to be at risk for breathing in contaminants. In this situation, the respirator should be repositioned on the face and the head straps should be adjusted. Another negative-pressure seal check should be performed. If a tight seal cannot be achieved after a few attempts, a different make, model or size of respirator should be chosen. Note prior to a new respirator make/model/size being used at the workplace, the individual must successfully pass a respirator fit test.

Positive Pressure Seal Check

During a "positive pressure" seal check, air is breathed out slightly while gently covering the exhaust valve with the palm of the hand. This creates positive pressure in the facepiece. If there is a good seal, the facepiece will bulge or puff out slightly from the face. The following steps are used to carry out a positive pressure seal check:

1. Don the respirator and other associated personal protective equipment. Tighten the head straps until the respirator feels snug but comfortable. Wear the respirator for a few minutes so that it will warm up and conform to the face.
2. Close off the exhaust valve opening by covering it with the palm of the hand.
3. Breathe out slightly to force air into the facepiece and hold for 10 seconds.
4. If there is a good seal, the facepiece should bulge or puff outwards and stay in that position. No air should leak out of the facepiece past the sides, top, or bottom.

If the facepiece does not bulge outwards and stay in that position, check the inhalation valves, reposition the respirator on the face, and adjust the head straps. Repeat the positive pressure check until the respirator provides the desired result. If a good seal cannot be obtained after a few attempts, another size, make, or model of respirator should be chosen Once again, prior to a new respirator make/model/size being used at the workplace, the individual must successfully pass a respirator fit test.

Figure 3: Positive Pressure Seal Check Demonstration from Breathe Safer - WorkSafeBC

Note that the configuration of some air-purifying respirators may make it difficult to perform an effective positive-pressure check without dislodging the facepiece. In this situation, consult with the manufacturer's instructions to determine whether a positive-pressure seal check applies to that respirator.

11.4 Filter & Cartridge Life

The service life of filters and cartridges is dependent on the type of filter or cartridge, frequency of use, and length of use, and concentration of the contaminant. Check with the product manufacturer for information about the service life of filters and cartridges. Cartridges should be dated when opened, on the hard plastic, and their duration of use recorded. Factors that can change the service life include:

- Work involving fast movement or heavy labour. These types of activities can reduce the service life because more air is expected to move through the cartridge or filter.
- Very low concentrations of contaminants can the increase service life.

12. Fit Testing Methods

All respirators, with tight-fitting facepieces, must be evaluated to ensure proper fit prior to their use. A fit test ensures that the respirator forms a tight seal around the user and that the respirator can offer it's designed level of protection when worn properly. Respirator fit can be affected by surgery, dental work, scarring, weight loss/gain, etc.

All UBC faculty, staff, and students that wear a respirator must be fit tested in all of the following situations:

- Prior to the initial use of a respirator
- When the make, model, or size of a respirator changes
- Annually
- When major physical changes occur on the user's face (e.g. major dental work, facial injury, significant weight loss/gain)

More information on respirator fit testing and the registration process can be found at SRS Respiratory Safety. The two different techniques for fit testing at UBC are described below.

12.1 Quantitative Fit Testing

A quantitative fit test makes use of specialized equipment to measure respirator fit by comparing the particulate count inside a respirator with the particulate count in the room air. A TSI Portacount Pro+ 8038 is used for most fit testing that takes place at UBC.

12.2 Qualitative Fit Testing

Qualitative fit testing makes use of an individual's response to an agent, following exposure, to verify respirator fit. The qualitative test is a pass/fail test relying on the subject's voluntary or involuntary response to that agent; i.e., taste, smell, or irritation.

12.3 Limitations in Fit Testing

12.3.1 Smoking

The principle of the quantitative fit test is to compare the particulate concentration inside a respirator to the ambient air. If the user has smoked 30 minutes prior to their fit test, there will be a large number of particulates inside their respiratory tract, which will give an inaccurate final fit test result.

12.3.2 Facial Hair

Section 8.39 of the OHSR outlines that respirator users with facial hair, that interferes with the seal of the respirator, are not permitted to use a respirator or participate in a fit test. The presence of facial hair can allow airborne contaminants to potentially enter into the respirator. Having facial hair that does not interfere with the seal of the respirator is still permitted (ie. certain goatees, moustaches, etc.).

12.3.3 Medical Surveillance

Respirators may make it harder to breath and can cause physiological health effects such as heat stress or dehydration. This is especially concerning for individuals diagnosed with respiratory conditions (e.g. asthma or lung disease). Relevant health concerns should be self-assessed by workers when filling out the

Respirator Self-Screening Fitness Assessment Form. Workers complete this form online during the respirator fit testing course and in-person during their fit testing session. Concerns or issues identified in the assessment form need to be brought to the attention of a medical practitioner for further assessment before a fit test can be performed and a respirator can be used.

13. Documentation and Record Keeping

Fit testing records are retained with the following information:

- The name and employee/student ID of the person fit tested
- The department where the employee/student works
- The date of the fit test
- The make, model, style, and size of the respirator fitted
- An email contact for the person fit tested
- The type of test done (e.g. qualitative, quantitative)

14. Program Review

The Respirator Protection Program will be reviewed and updated as needed by Safety & Risk Services and UBC stakeholders to include any necessary changes.