1. Introduction

The Department of Environmental Health and Safety has implemented this Respiratory Protection Program to provide information on all aspects of the use of respiratory protection equipment.

This program is designed to help reduce exposures to excessive levels of dusts, fumes, mists, gases, vapours. Where feasible, exposures to contaminants will be eliminated or reduced by engineering controls. For situations where engineering controls are not feasible or during emergencies, respirators shall be used for protection from inhalation hazards.

2. Scope

This SOP applies throughout the University and all off campus sites. This SOP also applies to all faculty, staff, and students who are undertaking studies, doing research, or carrying out any other work that takes place off-campus and is under the purview of the University

3. Applicable Legislation

Occupational Health and Safety Act (OHSA), R.S.O. 1990, Sections 25 to 28
O. *Reg. 851, R.R.O. 1990, Industrial Establishments*, 79, 127, 128 (2) (b), 130, 137, 138
O. Reg. 833.90, Control of Exposure to Biological or Chemical Agents, Sections 3, 7 and Schedule [1}

Canadian Standards Association (CSA)
Z94.4.11 Selection Use and Care of Respirators
Z180.1-M85: Compressed Breathing Air and Systems

National Institute for Occupational Safety and Health
Standard 42 CFR 84 (1996)
Standard 30 CFR 11 (1972)

4. Responsibilities

4.1 Responsibilities of Directors, Department Heads and Managers

Each has the following responsibilities under this standard operating procedure

- Identify situations where respirator protection is required and in conjunction with the Department of Environmental Health and Safety determine the type of respirator protection required for the hazards present.
- Ensure that this SOP is implemented in all facilities under his/her authority.
- Ensure that all pertinent supervisors, employees and students are aware of this SOP and have

been informed of the proper use care and maintenance of respirators.

4.2 Responsibilities of Supervisors

Supervisors must be knowledgeable about the hazards in their area. They must:

- Ensure that all staff and students are aware of the hazards present and have been informed of the proper use care and maintenance of respirators
- Ensure that workers wear appropriate respirators at all times in areas where respiratory protection is required.

4.3 Responsibilities of Users (Faculty, Staff and Students)

Faculty Staff and Students must:

- Wear respirators at all times in areas where respiratory protection is required.
- Inspect the respirator prior to each use in accordance with the training received.
- Maintain respirators in good condition.

5.0 Definitions

Accepted respirator – a respirator tested and certified by procedures established by the National Institute for Occupational Safety and Health (NIOSH).

Aerosol - a particulate suspended in a gaseous medium.

Air-purifying respirator – a respirator with an air-purifying filter, cartridge, or canister that removes specific contaminants by passing ambient air through the air-purifying element.

Atmosphere-supplying respirator – a respirator that supplies the respirator user with breathing air/gas from a source independent of the ambient atmosphere.

Fit test – the use of qualitative or quantitative method to evaluate the fit of a specific make, model, and size of a respirator on an individual.

Fume - solid particles generated by condensation from the gaseous state, generally after volatization from melted substances (eg. welding) and often accompanied y a chemical reaction, such as oxidation.

Hazardous atmosphere – any atmosphere that is oxygen-deficient, exceeds occupational exposure limits, presents a fire/explosion hazard, and/or contains an airborne toxic or disease-producing contaminant in concentrations deemed to be hazardous.

Health Care Professional – an individual who is licensed by a provincial licensing authority or equivalent to practice medicine or nursing and who possesses relevant experience and knowledge in the field of occupational health and safety.

Helmet/Hood - that portion of a respirator which completely covers the head and neck, may cover portions of the shoulders and may offer head and/or eye protection. They are used with powered air purifying respirators.

High-efficiency particulate filter (He) - a filter that has been tested to ensure an efficiency equal tp or exceeding 99.97% for removal of particles having a mean aerodynamic diameter 0.3 microns.

Immediately Dangerous to Life and Health Atmosphere (IDLH) – an atmosphere that poses an immediate threat to life, would cause adverse health effects, or would impair an individual's ability to escape.

Loose Fitting Facepiece/Visor - that portion of a respirator that forms a partial shield with the face, does not cover the neck and shoulders and may or may not offer head and/or eye protection. They are used with powered air purifying respirators.

Mist - liquid particles in a gaseous medium.

Particulate - airborne contaminants other than gas and vapour, but including dusts, fumes, mists, fibres, fog, pollen, smoke and spores.

Pressure Demand Respirator - a respirator where the pressure in the facepiece or hood remains positive with respect to the ambient pressure during both inhalation and exhalation.

Qualified Person – an individual who possesses the knowledge, experience, and training to fulfil the competencies of the roles defined in this Program.

Quantitative fit test – a test method that uses an instrument to assess the amount of leakage into the respirator in order to assess the adequacy of respirator fit.

Qualitative fit test – a pass/fail test method that relies on the subject's sensory response to detect a challenge agent in order to assess the adequacy of respirator fit.

Respirator – a device to protect the user from inhaling a hazardous atmosphere.

Service Life – the period of time during which a respirator provides adequate protection to the user.

Smoke - aerosols, gases and vapours resulting from incomplete combustion.

Tight-fitting facepiece – a respirator inlet covering that forms a complete seal with the face. This includes a half-facepiece that covers the user's nose and mouth under the chin; and a full-facepiece that covers the user's nose, eyes, and mouth under the chin.

Type N particulate filter - NIOSH classification for particulate filter effective against particulate aerosols free of oil; time-use restrictions may apply.
Note: Three filter efficiency levels are tested and certified: 99.97%, 99% and 95%, referred to as classes 100, 99 and 95 respectively.

Type P particulate filters - NIOSH classification for particulate filter effective against all particulate aerosols.
Note: Three filter efficiency levels are tested and certified: 99.97%, 99% and 95%, referred to as classes 100, 99 and 95 respectively.

Type R particulate filters - NIOSH classification for particulate filter effective against all particulate aerosols; time-use restrictions may apply.
Note: Three filter efficiency levels are tested and certified: 99.97%, 99% and 95%, referred to as classes 100, 99 and 95 respectively.

User seal check – an action conducted by the respirator user to determine if the respirator is properly sealed to the face.

Vapour - the gaseous state of a substance that is a solid or liquid at ambient temperature and pressure.

6. Hazard Assessment

In order to determine the presence of a respiratory hazard and to assist in selection of an appropriate respirator, a hazard assessment of the work area shall be conducted by the supervisor in consultation with the Department of Environmental Health and Safety. The hazard assessment of a respiratory hazard includes the following:

- Identify what contaminants (chemical, biological, radiological) that may be present in the workplace;
- Identify the physical states of all airborne contaminants;
- Determine for particulate hazards if there is oil present;
- Measure or estimate of the concentration of the contaminants;
- Determine if the atmosphere is potentially oxygen deficient;
- Identify an appropriate occupational exposure limit for each airborne contaminant;
- Determine whether the atmosphere is immediately dangerous to life and health (IDLH);
- Determine if the contaminant can be absorbed through, or is irritating to the skin or eyes;

In instances where exposure cannot be identified or reasonably estimated, the atmosphere shall be

considered IDLH.

7. Selection of Respirators

7.1 Respirators shall be selected based on the following criteria:

- Health of the worker and ability to wear a respirator;
- Review of the hazard assessment;
- Existing legislation and standards;
- Work requirements and conditions;
- Duration of exposure;
- Characteristics and limitations of respirators;
- Respirator assigned protection factors (Appendix B).

7.2 Only accepted respirators shall be selected and used.

7.3 Respirators shall be selected by supervisors in consultation with the Department of Environmental Health and Safety.

7.4 Respirator Selection Chart (Appendix C) can be used to assist in the selection of an appropriate respirator.

7.5 Workers shall be issued only those respirators for which they have been fit tested and medically approved.

7.6 For air-purifying respirators for gases and vapours with no end-of-service- life indicator, the supervisor shall establish a change-out schedule for the replacement of the cartridges. Should the need arise, the Department of Environmental Health and Safety can assist the supervisor with setting up the change-out schedule.

7.7 Where an IDLH atmosphere is identified, only pressure-demand self-contained breathing apparatus (SCBA) or a combination pressure-demand supplied air respirator with auxiliary self-contained air supply, with a minimum rated service time of 15 minutes shall be used.

7.8 Respirators approved for escape only shall not be used for non-emergency applications.

7.9 Atmosphere-supplying respirators that make use of compressed air for breathing shall meet the standards set out in Table 1 of CSA Standard Z180.1-00, Compressed Breathing Air and Systems (March, 2000).

7.10 Atmosphere-supplying respirators that make use of ambient breathing air system shall have the air intake located in accordance with Appendix B of CSA Standard Z180.1-00, Compressed Breathing Air and Systems (March, 2000).

8. Respirator Fit Testing

8.1 The worker must pass an appropriate quantitative or qualitative fit test when using a respirator with a tight-fitting face piece.

8.2 The fit testing shall be conducted by the Department of Environmental Health and Safety.

8.3 A fit test shall be carried out

- prior to initial use of a tight-fitting respirator
- every 2 years
- whenever there is a change in respirator facepiece (make, model, or size)
- whenever the employee reports, or the health care professional, supervisor, or EHS makes visual observations of changes in the employee's physical condition that could affect respirator fit. Such conditions include, but not limited to:
    - facial scarring
    - dental changes
    - cosmetic surgery
    - obvious change in body weight
    - facial rash (dermatological condition)

8.4 The worker shall be fit tested with the same make, model, style and size of respirator to be used.

8.5 The fit test shall be performed only on workers who are clean-shaven where the facepiece seals to the skin.

8.6 When a worker is required to wear other personal protective equipment, such as eye, face, head and hearing protection during his/her course of work, the same protective equipment shall be worn during the fit test to ensure that they are compatible with the respirator and do not break the facial seal.

9.0 Training

9.1 All workers whose work requires the use of a respirator shall receive appropriate training and education.

9.2 The workers shall receive training prior to the initial use of the respirator.

9.3 Training shall be provided by the Department of Environmental Health Safety prior to the fit test.

9.4 The training shall include the following:

- Why respiratory protection is necessary;

- The limitations and capabilities of respiratory equipment;
- Respiratory hazard assessment;
- Logic for selecting a particular type of respirator;
- How to inspect, put on and remove a respirator, and how to perform user seals checks;
- Procedures for maintenance and storage of respiratory equipment;
- How to recognize medical signs and symptoms that may limit or prevent the effective use of the respirator;
- General requirements of the Respiratory Protection Program.

9.5 Refresher training shall be provided every two years to all respirator users.

9.6 Records of the training shall be updated and maintained by the Department of Environmental Health and Safety.

9.7 Training in the use of self-contained breathing apparatus (SCBA), if required, shall be provided by a qualified trainer.

10.0 Use of Respirators

10.1 Prior to being assigned any task that requires the use of a respirator, the worker shall complete all the health screening, fit testing and training requirements.

10.2 Workers with facial hair that may interfere with the facepiece seal or valve function on tight-fitting respirators cannot use a tight-fitting respirator.

10.3 Other personal protective devices or equipment shall not interfere with the seal of the facepiece to the face of the worker.

10.4 Side arms on eyeglasses or any other material such as hair, cloth, tissue, straps and jewellery shall not pass between the face and the sealing surface of the facepiece or interfere with the seal of the tight-fitting facepiece to the face or with the operation of the respirator. Workers who must have corrective eyewear, where the eyewear interferes with the respirator seal, shall be provided with respirator spectacle kits by their department.

10.5 The worker shall check the seal of the facepiece immediately after putting on the respirator.

10.6 The worker should never break the respirator face-to-facepiece seal to communicate.

10.7 Workers shall not remove their facepieces at any time while working in an IDLH atmosphere.

10.8 Workers shall be permitted to leave the hazardous area for any respirator- related reason. The worker shall leave the hazardous area when:

- The respirator fails to provide adequate protection;
- The respirator malfunctions;
- He/she detects air leakage around the face seal;
- He/she detects an odour or tastes a chemical;
- He/she has increased breathing resistance;
- He/she experiences any illnesses or discomforts such as dizziness, nausea, weakness, breathing difficulties, sneezing, fever, chills, confusion, etc.;
- He/she experiences extreme discomfort from wearing the respirator;
- He/she needs to wash his/her face and facepiece to minimize skin irritation;
- Components (including air tanks) or purifying devices need change-out.

10.9 The respirator shall not be altered in any manner.

10.10 All cartridges, replacement parts, etc., shall be from the same manufacturer as the respirator .

10.11 Where respirators are used for HAZMAT response, confined space entry etc.; the appropriate existing legislation, regulations, standards and guidelines shall be consulted.

11.0 **Cleaning, Inspection, Maintenance, and Storage of Respirators**

11.1 The University shall provide each worker requiring a respirator with a respirator that is clean, sanitary and in good working order.

11.2 Each worker issued a respirator shall properly maintain his/her respirator to retain its original effectiveness. The maintenance shall include:

- Cleaning and sanitizing
- Inspection and testing
- Proper storage

11.3 The respirator shall be cleaned and sanitized according to the respirator manufacturer's instructions and/or according to procedures found in Appendix D – Procedures for Respirator Maintenance.

11.4 The frequency of cleaning shall depend on how many workers use the respirator and what it is used for.

- Respirators issued to individual workers shall be cleaned and disinfected as often as necessary to maintain proper hygiene.
- A single respirator issued to multiple workers must be cleaned and disinfected before each use.
- Respirators designated for emergency use only must be cleaned and disinfected after each use.

11.5 The worker shall inspect his/her respirator before and after each use. The procedure for respirator inspection is found in Appendix D – Procedures for Respirator Maintenance.

11.6 The SCBA cylinders shall be inspected by a qualified person according to the requirements of CSA Standards CAN/CSA-B339 and CAN/CSAB-340, the appropriate CGA publications C-6, C-6.1, and C-6.2 the Transport Canada Regulations under the Transportation of Dangerous Goods Act, and the manufacturer's instructions.

11.7 The emergency SCBA shall be inspected on a schedule to ensure readiness for the anticipated emergency use.

11.8 The records of all inspections and service performed on an SCBA respirator and cylinder shall be maintained by the person responsible for the unit.

11.9 The worker shall report defective or non-functioning respirators to his/her supervisor. These respirators shall be tagged and removed from service by the supervisor until repaired or replaced.

11.10 Any respirator and cylinder repairs, and subsequent tests and checks shall be performed by the unit manufacturer or by a qualified external contractor. Defective or non-functioning half mask facepieces shall not be repaired but will be disposed and replaced instead.

11.11 The worker shall store their respirators in a clean and sanitary location, in boxes or in plastic bags, marked with each worker's name. The respirators shall be stored in a manner that will protect them from dust, ozone, sunlight, heat, extreme cold, excessive moisture, vermin, damaging chemicals, oils, greases, or any other potential hazard that may have a detrimental effect on the respirator.

11.12 When packed or stored, each respirator should be positioned to retain its natural configuration.

11.13 Used cartridges/filters to be reused shall be stored in a manner to prevent contamination of the respirator facepiece.

12.0 Medical Surveillance

12.1 Prior to fit testing and respirator use, it shall be confirmed that the worker is free from any physiological or psychological condition that may prevent him or her from being assigned the use of the selected respirator. This shall be achieved through the use of the *'Health Screening Questionnaire for Respirator Users'* Form (Appendix E).

12.2 The worker and his/her supervisor shall complete their respective parts of the *Health Screening Questionnaire for Respirator Users* Form and send the form to the Department of Environmental Health and Safety prior to fit testing.

12.3 Where, based on the Respirator User Screening Form, the Department of Environmental Health and Safety is concerned that a physiological or psychological condition exists that may preclude the use of a respirator, the Department of Environmental Health and Safety shall refer the worker to Walsh and Associates Occupational Health Services for a medical evaluation.

12.4 The medical evaluation shall consist of a primary assessment conducted by the Occupational Health Nurse and if deemed necessary a further assessment conducted by the Occupational Health Physician.

12.5 The worker, his or her supervisor, and the Department of Environmental Health and Safety shall provide the Walsh and Associates Occupational Health Services with information regarding the conditions of the respirator use and the type of respirator(s) required.

12.6 After the medical evaluation, Walsh and Associates Occupational Health Services shall provide the Department of Environmental Health and Safety with a written opinion regarding the employee's ability to use a respirator. The opinion shall indicate one of the following:

- User meets medical requirements to use the selected respirator;
- User meets medical requirements to use the selected respirator with limitations;
- User does not meet medical requirements to use the selected respirator.

12.7 The re-evaluation of the worker shall not be performed on an annual basis. The re-evaluation shall be performed based on one of the following criteria:

- The worker reports signs or symptoms that are relevant to the worker's ability to use a respirator;
- The Occupational Health Physician, supervisor or the department of Environmental Health and Safety considers it necessary for the worker to be re-evaluated;
- A change in workplace conditions occurs that may result in substantial increase in the physiological burden that respirator use places on the worker.

12.8 Workers who do not meet medical requirements to use a selected respirator shall not work in an area where the use of a respirator is required.

13.0 Recordkeeping

13.1 Supervisors shall maintain records of the following:

- Training for workers under their supervision
- Respirator selection
- Inspection, maintenance and storage

13.2 EHS shall maintain the records of the following:

- Fit testing
- Training

- Hazard assessment
- Respirator selection

13.3 The fit testing records shall consist of the following:

- name and identification of the worker tested
- type of test performed
- make, model and size of the respirator fitted
- date of the fit test
- result of the fit test
- name of the person conducting the fit test

13.4 Walsh Associates shall maintain the medical records for the workers that had undergone medical evaluations. These records shall be treated as medically confidential.

11. Revision History

October 2012, Initial Release

APPENDIX A
Classification and Description of Respirators by Mode of Operation

1) Air-Purifying Respirators

Air-purifying respirators can be used to protect against airborne contaminants such as dusts, mists, fumes, smokes, aerosols, gases and vapours. Since these respirators are air-purifying only, this type of respiratory protection must NEVER be used in oxygen-deficient atmospheres or situations that are immediately dangerous to life and health (IDLH).

The general categories of air-purifying respirators are:
- Particulate (dust, fume and mist)
- Gas and Vapour
- Combination of Particulate and Gas/Vapour

The air-purifying respirators are available in two modes of operation: 1) Non-powered and 2) Powered. The non-powered respirators come in two designs: 1) half mask and 2) full facepiece. (Quarter mask and mouthpiece respirators are also available but are not recommended). The powered respirators contain a blower and are equipped with a facepiece, helmet or hood.

2) Atmosphere-Supplying Respirators

Supplied Air Respirators
The supplied air respirator consists of a half-mask, full facepiece, hood or helmet to which respirable air is supplied through a small diameter hose. Two types of flow may be used:
- 1) continuous-flow to the mask in which the flow maintains the mask under positive pressure at moderate work rates; and
- 2) pressure-demand, which keeps the mask under positive pressure at moderately high work rates but limits the air quantity used to that required for breathing. Demand airflow, which allows the pressure inside the mask to become negative during inhalation, is not recommended because it does not provide as much protection. The respirable supplied-air comes from a compressor or compressed air cylinder(s).

Supplied air respirators may be used in IDLH or oxygen-deficient atmospheres only if an auxiliary tank of air is incorporated into the respirator system.

Self-Contained Breathing Apparatus (SCBA)
SCBAs comprise of a full facepiece connected to a source of air carried by the wearer. The SCBAs provide respiratory protection in oxygen-deficient environments and in situations where high or unknown concentrations of toxic gases, vapours or particulates are present. The SCBA can also provide protection in emergency situations. When using an SCBA, the user's respiratory system is isolated from the surrounding atmosphere because no outside air is admitted into the respirator

facepiece.

There are three types:
- 1) open-circuit devices;
- 2) closed-circuit (re-breathing) devices; and
- 3) escape units.

Two types of flow are available:
- 1) pressure demand and
- 2) demand.

The demand SCBAs must not be used in oxygen-deficient atmospheres or IDLH atmospheres because they allow the pressure inside the facepiece to become negative.

3) Combination Atmosphere-Supplying and Air-Purifying Respirators

These devices usually consist of an atmosphere-supplying respirator with an auxiliary air-purifying attachment that provides protection in the event that the air supply fails. A combination atmosphere-supplying respirator with an auxiliary air-purifying element may be used only when the concentration of airborne contaminants in the workplace does not exceed the maximum use concentration of the respirator when used in the air-purifying mode.

APPENDIX B
Assigned Protection Factors (APF)
Hazard Ratio

Calculate a Hazard Ratio (HR) for all of the respiratory components as follows:
HR= Airborne Concentration/OEL
Where:
OEL = Occupational Exposure Limit.

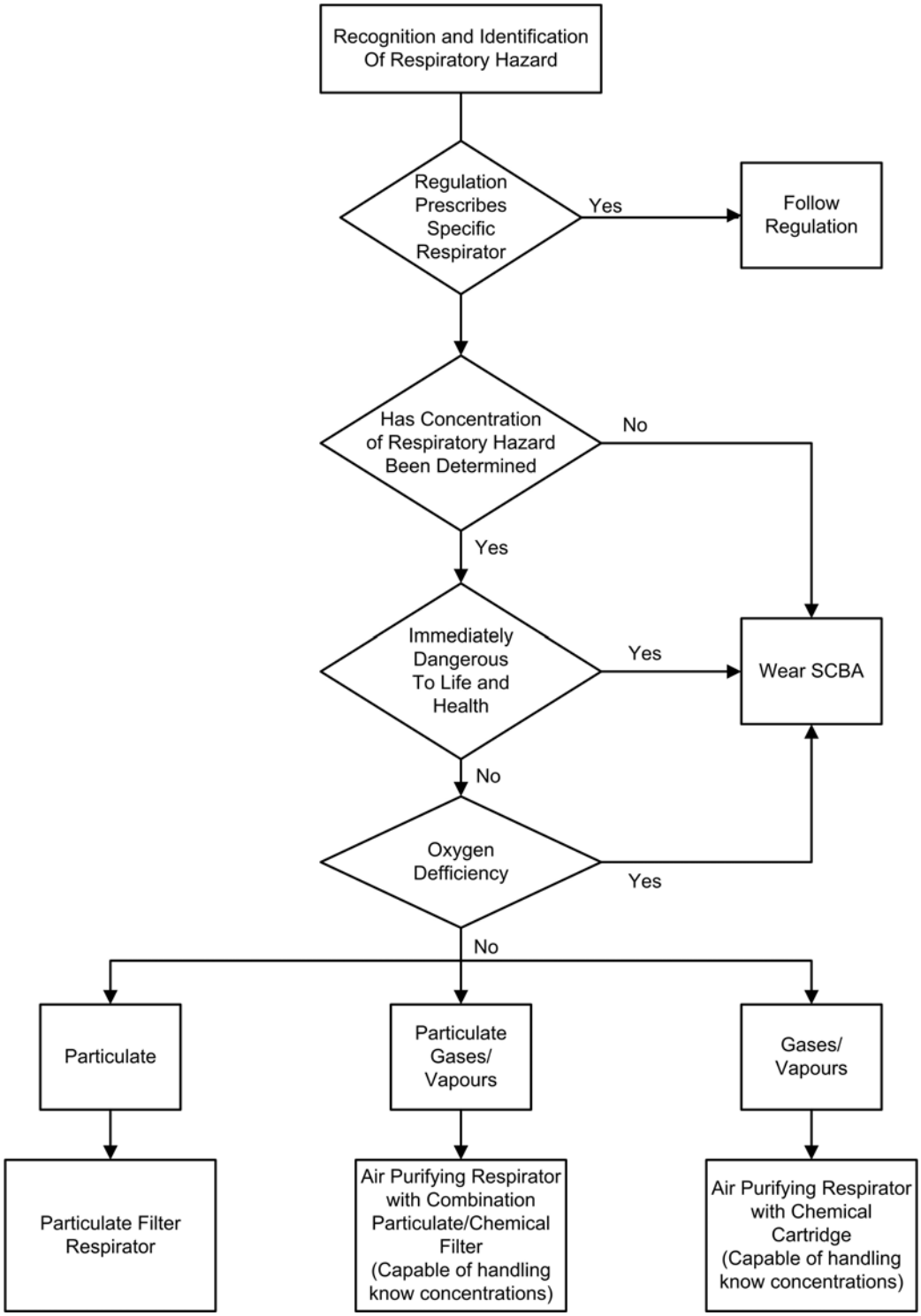
Select the highest hazard ratio (HHR) from all the hazard ratios of the individual components.

Select a respirator with an APF equal to or greater than the HHR.

	Respirator Style				
Respirator Class	Quarter Facepiece	Half Facepiece	Full Facepiece	Helmet/ Hood	Loose-Fitting Facepiece/Visor
Air Purifying (negative Pressure)	5	10	100 (10 if QLFT used)		
Powered air-purifying		50	1000	1000	25
Supplied-air (demand)		10	100 (10 if QLFT used)		
Supplied-air (pressure demand)		50	1000		
Supplied-air (continuous flow)		50	1000	1000	25
SCBA (demand)		10	100 (10 if QLFT used)		
SCBA (pressure demand)			**	**	

** Pressure-demand SCBA are currently regarded as providing the highest degree of protection. Limited simulated workplace studies have concluded that all users may not be able to achieve assigned protection factors of 10000. Therefore, based upon this limited data, a definitive APF could not be assigned for pressure-demand SCBA. When potential hazardous concentrations can be estimated, an APF of no greater than 10000 should be used.

Appendix C
Respiratory Protection Selection Chart



Appendix D
Respirator Cleaning and Maintenance

Cleaning and Disinfecting

1) Remove filters, cartridges, or canisters. Disassemble facepiece. Discard or repair any defective parts.

2) Wash components in warm (43°C maximum) water with mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle brush may be used to remove any dirt.

3) Rinse components thoroughly in clean, warm, preferably running water. Drain.

4) When the cleaner used to clean the respirator does not contain a disinfecting agent, respirator components should be fully immersed for 2 minutes in one of the following:
    a) sodium hypochlorite solution – 1mL of bleach to 1L of water
    b) aqueous solution of iodine – 0.8mL of tincture of iodine to 1L of water
    c) other commercially available cleaners of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer.

5) Rinse components thoroughly in clean, warm, preferably running water. Drain.

6) Components should be allowed to air dry or be hand dried with a clean, lint free cloth.

7) Reassemble the facepiece, replacing filters, cartridges, and canisters where necessary.

Disinfection (steps 4 &5) is not required for a respirator used by only one worker. For multiple users, however, the respirator must be cleaned and sanitized before it is transferred to another person for use.

The disinfecting solution must not damage the respirator and must not cause skin irritation to the respirator wearer. Proper rinsing of the respirator is important to ensure that this does not happen.

Inspecting

1) Check the condition of component parts:
    a) Check condition of the facepiece, looking for cracks, cuts, tears, holes and distortion of facepiece;
    b) Check head straps to ensure they are properly attached and have elasticity;
    c) Check head straps for broken buckles and breaks and tears;
    d) Check inhalation and exhalation valves to ensure that they are in place and are not damaged;

e) Check all rubber or flexible parts for cracks and pliability;
f) Check cartridges, canisters, and filters to ensure that they are not spent;
g) Check for cracks or damage to cartridge, filter, or canister;
h) Check the breathing tube (if present) for cracks, holes, missing or loose clamps, and broken or missing end connectors;
i) Check the hood, helmet or, suit (if present) for ripped or torn seams, and for cracks or breaks in the face shield.
j) Check the PAPR assembly (PAPR users only)

2) Check the tightness of connections between cartridges, filters and the respirator facepiece.

3) Check the end-of-service-life indicator (if present).

4) Check the expiration date on the side of the cartridge, filter, or canister.

5) Check proper functioning of regulators, alarms, and other warning systems (not required on air purifying respirators).

6) If using supplied air, check the air quality of the air supply.