

Respiratory Protection Programs Policy

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]

Relevant Standards:

Canadian Standards Association (CSA):

Z94.4-93 (R1997): Selection, Use, and Care of Respirators

Z180.1-M85: Compressed Breathing Air and Systems

Intent:

To outline University policy regarding the use of approved respiratory protection to protect employees from airborne hazardous contaminants.

Definitions:

ACGIH

American Conference of Governmental Industrial Hygienists.

aerosols

airborne solid or liquid particles.

air-line respirator

supplies breathing air along a hose to the wearer's face piece.

air-purifying respirator

removes contaminants from workplace air by passing it through a filter, a cartridge, or a combination of both, to provide protection from combinations of particulates, vapours, or gases. Types of air-purifying respirators include the full-facepiece (i.e. fit over the nose, mouth and eyes) and the half-facepiece (i.e. fits over the nose, mouth and chin) that have attachments for filters and/or cartridges. Air-purifying respirators will not provide adequate protection in oxygen deficient atmospheres or in contaminated atmospheres with poor sensory warning properties (e.g taste, odour, eye and/or respiratory irritation).

APF

assigned protection factor, the level of respiratory protection that would be provided by a properly functioning respirator worn by a properly fitted and trained individual; a multiplier of the permissible exposure limit of a contaminant that defines the highest air concentration of a workplace atmosphere where use of a specified respirator is permitted.

chemical cartridge

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removes specific gases or vapours from the workplace atmosphere. High concentrations of contaminants, high humidity and high breathing rates will shorten the breakthrough times and usefulness of chemical cartridges.

dusts

solid, mechanically produced particles or fibres; airborne solid particles caused by abrasive procedures such as grinding and cutting.

filter facepiece respirator

a respirator worn to protect the wearer from particulates and some atmospheric contaminants.

fit testing

exercises to ensure a good seal between the respirator facepiece and the face; may be qualitative (i.e. negative and positive pressure tests and those relying on personal sensory response) or quantitative (i.e. utilize a particle generator and particle counter).

fugitive emission

particulates (fumes, mists, dusts), gas or vapour that escapes from equipment, a process, or from a product.

fumes

occur when metal is heated and suddenly cooled; regarded as airborne condensation of solid particles from hot processes involving metals, e.g. welding, brazing.

gases

substances that are in the gaseous state at ambient temperature and pressure.

IDLH

immediately dangerous to life or health; a condition in a space where a hazardous atmosphere exists to such an extent that a person without appropriate respiratory protection could be fatally injured or suffer immediate, irreversible or incapacitating health effects.

mists

tiny liquid droplets caused by spraying or blowing operations; regarded as a particulate airborne hazard.

MOL

Ministry of Labour.

NIOSH

the American government agency *National Institute for Occupational Safety and Health* which sets safety performance standards that are world recognized.

olfactory fatigue

diminishing sense of smell; normally occurs with continued exposure to an airborne contaminant.

particulate filters

removes particulates (dusts, mists, fumes) from workplace air.

powered air-purifying respirator

contains a blower which passes air through a filter or cartridge and then supplies air to the facepiece; suitable for people who have beards or lung disorders.

respirator

a device designed to protect the wearer from inhaling hazardous atmospheric contaminants.

SCBA

self-contained breathing apparatus; backpack air tanks that supply breathing air; must conform with standard CSA Z180.1.M85.

smoke

atmospheric contaminants resulting from incomplete combustion.

sorbent

the active ingredient in a chemical cartridge that removes the contaminant until its capacity is exhausted or its catalyst is poisoned.

supplied-air breathing apparatus

an air-line breathing apparatus that supplies breathing air to the wearer in accordance with standard CSA Z180.1.M85.

vapours

substances that evaporate from a liquid or solid at ambient temperature and pressure.

Requirements of the *OHSA Regulation for Industrial Establishments, Section 138*

138.(1) Where a worker is likely to be exposed to an atmosphere at atmospheric pressure with an oxygen content of less than 18 percent, the worker shall be protected by mechanical ventilation so that the worker's safety and health is not endangered.

138.(2) Where the measures prescribed by subsection (1) are not practicable, the worker shall be protected by air supplied breathing equipment so that the worker's safety and health is not endangered.

Policy:

1. Environmental Health and Safety (EHS) shall provide a Workplace Respiratory Protection Program for all University workplaces.
2. Supervisors shall assess the need for respiratory protection in the workplace and shall provide Environmental Health and Safety with the names of personnel to be enrolled in the Workplace Respiratory Protection Program.
3. All employees required to wear supplied-air respiratory protection shall participate in the EHS Workplace Respiratory Protection Program and should undergo annual cardiorespiratory performance evaluations.
4. All employees required to wear air-purifying respiratory protection shall participate in the EHS Workplace Respiratory Protection Program that shall include, at the employee's option, annual cardiorespiratory performance evaluations.
5. Environmental Health and Safety shall provide advice and assistance to employees and supervisors concerning respiratory protection for personnel at the main campus and at remote University workplaces. Occupational Health Services shall provide advice and/or assistance to employees and supervisors concerning cardiorespiratory performance evaluations.
6. Fit testing instruction shall be provided to employees by competent persons (i.e. University employees or

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consultants) who are trained and qualified in fit testing procedures.

7. Supplied-air and air-purifying respirators provided for University personnel shall be NIOSH-approved.
8. No employee shall rely upon an air-purifying or supplied-air respirator without being enrolled in the EHS Workplace Respiratory Protection Program and without receiving the training required by that Program.
9. The Workplace Respiratory Protection Program shall be reviewed annually by the workplace Joint Health and Safety Committee. The names of employees requiring air-purifying or supplied-air respirators shall be up-dated and provided to EHS by workplace supervisors.
10. Employees shall report any condition that compromises respirator use to their supervisor and/or to Environmental Health and Safety or Occupational Health Services.

Guidelines:

Respirators are worn when the workplace atmosphere is known to be contaminated and protection is required for every breath. Respirators that don't fit provide no protection!

Respiratory hazards in the workplace must first be evaluated, assessed and controlled by engineered methods before relying on the use of air-purifying respirators. Atmospheric contaminant concentrations are usually expressed in mg/m³ for solids or particulates, and parts per million (ppm) for gases. The anticipated concentrations must be compared with MOL or ACGIH occupational exposure limits to determine potential for respiratory risk. Workplace contaminants can expose workers via inhalation, ingestion, and skin absorption. Accordingly, the need for personal protective clothing must also be assessed.

Employees who require air-purifying or supplied-air respiratory protection should be medically evaluated to ensure they are physically fit for the stresses associated with respirator use. (Cardiopulmonary function is age and health status dependent.) In order to provide adequate protection, a respirator must be suited to the hazard, properly fitted, worn correctly, and properly stored and maintained. A Workplace Respiratory Protection Program consolidates the required due diligence initiatives when reliance is placed on this critical piece of personal protective equipment.

Respirator Selection

Selection of the appropriate respirator will depend on the nature of the workplace atmospheric hazard, physical characteristics of the workplace, the physical demands of the task, and the capabilities and limitations of the respirators available.

The atmospheric hazard may be assessed by air sampling or by assessing the potential for exposure. Care is required when selecting respirators for contaminants that exist as particles and vapours. Generalizations about the contaminant phase are based on the ACGIH TLV listings. Low vapour pressure contaminants with a TLV listed only as mg/m³ are assumed to exist in the particle phase and would require a particle filter. Contaminants with TLV's listed in both ppm and mg/m³ are generally found in the vapour phase, and would require a chemical cartridge. Mixtures of contaminants in workplace air suggest that filters with aerosol and vapour removing capabilities would be required. Professional advice and assistance is essential for proper respirator selection and for correct, confident use of the recommended respiratory protection. A respirator filter and cartridge reference chart is available upon request from Environmental Health and Safety.

Assigned Protection Factors (APF's)

When a specific respirator is selected, the APF must be greater than the expected air contaminant concentration (C_{air}) divided by its exposure limit (TLV):

$$APF \geq \frac{C_{air}}{TLV}$$

For example, if the expected air concentration is 60 ppm and the exposure limit is 2 ppm, a respirator with an APF ≥ 30 must be used.

The following table illustrates values of assigned protection factors for various types of respirators based on workplace performance information:

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	Respirator Type	APF
Air-Purifying	half-facepiece	10
	full-facepiece	100
Powered Air Purifying	full-facepiece	100 (for dust/mists)
	hood or helmet	100 (for dust/mists)
Air-Line	full-facepiece pressure demand	1,000
SCBA	full-facepiece pressure demand	10,000

Canada's Respiratory Protection Standard, CSA Z94.4-93

Canada's respiratory protection standard, CSA Z94.4-93 (R1997) Selection Care and Use of Respirators is intended to promote the correct use of respiratory protection, not to specify performance criteria. In this regard, it defaults to NIOSH requirements. The NIOSH standards are important to respirator users because they help define selection criteria.

NIOSH Standard 42 CFR 84 (1995) for Non-Powered Particulate Filtering Respirators

After July 1998, all non-powered particulate filtering respirators used in Canada must comply with one of the nine classes of NIOSH-approved respirators. There are three basic series of filters: N, R, and P, and each series comes in three filtration efficiencies: 95%, 99%, and 99.97% at 0.3 microns where particle capture processes are least efficient. The respirator series are defined as follows:

N Series: Non-oil, for any dust, mist, or fume that is not an oil;

R Series: oil-Resistant, can be used for up to eight hours in an atmosphere containing a particulate oil or oil-based substance (e.g. lubricants, cutting fluids, glycerine);

P Series: oil-Proof, can be used indefinitely in an atmosphere containing oil-based contaminants.

The previous NIOSH respirator standard, 30 CFR 11 (1972), still applies to respirators worn to protect against gases (e.g. ammonia) and vapours (e.g. from evaporated fuel or solvent).

For further information about NIOSH Standards, see the web site: www.cdc.gov/niosh [1]

Tips for Selecting an Air-Purifying Respirator

- Seek professional advice about respiratory protection and respirator selection.
- Seek employee input regarding comfort and fit, difficulty in breathing, and interferences with vision, communication and with other headwear or eyewear.
- Consider the ease of respirator maintenance and repair.
- Always purchase a NIOSH-approved product.

A simple filtering facepiece respirator that has no replaceable parts should be discarded when it becomes damaged, when breathing resistance increases, or when it becomes dirty or shows dirt on the inside.

Supplied-Air Respirators and SCBA's

Powered air-purifying respirators and supplied-air respirators are subject to different standards than those for particulate or gas filtering respirators; e.g. CSA Z180.1-00. Supplied-air respirators and SCBA's provide protection against oxygen deficiency and toxic atmospheres. Positive-pressure demand units protect against the inward leakage of contaminants. Extensive training is mandatory for personnel who must rely on this type of respiratory protection. Exercises with SCBA's must be conducted every three months.

Air line respirators provide no protection if the air supply fails. These respirators are therefore limited to use in places from which the wearer can escape unharmed.

Supplied-air respirators used in high and low air temperature environments may undergo serious functional changes that affect performance and safety. Users must be aware of such limitations and are urged to seek professional assistance.

Elements of a Workplace Respiratory Protection Program

The following information will be documented for the Workplace Respiratory Protection Program co-ordinator in EHS:

1. the name of the workplace that requires employees to wear respiratory protection.
2. the names of all employees requiring air-purifying or supplied-air respirators and nature of the workplace atmospheric hazards (e.g. dusts, fumes, mists, vapours, gases, oxygen deficiency);
3. the names of employees requiring/requesting annual medical reviews (i.e. cardiorespiratory performance evaluations to assess fitness for respiratory usage);
4. the NIOSH-approved respirators selected in accordance with the applicable CSA standard and the dates of formal fit testing initiatives. (Note: fit tests must be conducted while all pieces of on-the-job head and face protection are worn to ensure that there are no interferences with the face-to-facepiece seal.)
5. initial training and annual retraining for respirator users about:
 - workplace hazards;
 - the atmospheric concentrations of workplace contaminants;
 - MOL or ACGIH occupational exposure limits (e.g. TWAEV, STEV);
 - type of respiratory protection specific for the hazards;
 - limitations of the type and size of personal respiratory protection selected;
 - instructions concerning inspections of the respirator;
 - instructions concerning donning the respirator;
 - instructions about positive and negative fit testing by the user;
 - wearing the respirator, breathing resistance, and sensory indications;
 - instructions concerning removing the respirator and cleaning it;
 - procedures for maintenance, repair, and storage of personal respirators;
 - emergency instructions should respirators malfunction.
6. precautions concerning personal factors that can influence the safe and confident use of air-purifying respirators (e.g. you change or begin wearing eyeglasses, you grow a beard or sideburns or shave them off);
7. the schedule for program evaluations by supervisors, affected employees and workplace joint health and safety committee personnel.

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[1] <http://www.cdc.gov/niosh>

[2] <https://www.uoguelph.ca/hr/page-category/policy>