

RESPIRATORY PROTECTION PROGRAM FOR SILICA

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1.0 Introduction

Silica (SiO₂) is the second most common mineral in the earth's crust and is a major component of sand, rock and mineral ores. Silica exists in several forms, of which crystalline silica is of most concern. Other types of silica include amorphous silica which is the major concern in Lash Miller (LM) Chemistry Laboratories. Associated hazards are listed below:

Amorphous silica

- **Causes chronic bronchitis**
- **Causes chronic obstructive pulmonary disease**
- **May cause an allergic skin reaction**
- **May cause eye irritation**

Crystalline silica

- **Carcinogen to humans**
- **Causes silicosis**
- **Causes tuberculosis and other infections**
- **Causes chronic obstructive pulmonary disease**

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated. Therefore, amorphous silica should be handled as if possessing the same hazards as the crystalline form.

In the LM-Chemistry Laboratories, the silica used is mainly constituent of 99% amorphous silica and no more than 1% crystalline silica.

1.1 Purpose

The respirable silica protection program aims to protect the health and safety of lab personnel (researchers, staff and students) from silica exposure in the Lash Miller laboratories. It does so by assigning roles and responsibilities, providing guidance on best practices, the implementation of engineer controls, recommending change in common operations, conducting risk assessments, and implementing, if necessary, the use of fit-tested respirators with the associated training.

In chemistry laboratories, materials containing silica are commonly used for column chromatography practices, catalyst synthesis processes and reinforcement of elastomers. Work involving handling silica powder/gel (for example, dispensing silica powder into a smaller container, preparing silica columns or similar activities) can potentially lead to the release of respirable-sized silica particles which are potentially deleterious to the health of the individuals performing these activities on a regular bases. As such; these activities must be performed inside a functional and certified fume hood ONLY (never in the open)

There may be instances in which researchers may need to perform tasks with materials containing silica particles outside fume hoods. In those instances, they will require to request a risk assessment and

approval from the Environmental Health & Safety Office (EHS). If approved, they will have to ensure lab personnel is fit-tested, trained and provided with appropriate respirators and the associated training.

1.2 Scope

This program applies to anyone who works with silica at the Lash Miller Laboratories and is based upon the Canadian Standards Association (CSA) Standard Z94.4-11

2.0 Related Regulations

- 2.1 Ontario Occupational Health and Safety Act (O. Reg. 490/09: Designated Substances)
- 2.2 Ontario Industrial Establishments Regulation (O.Reg.851). "Selection, Use and Care of Respirators"
- 2.3 Canadian Standards Association (CSA)
 - 2.3.01 94.4-2011 Selection Use and Care of Respirators.
 - 2.3.02 Z108.1-00 Compresses Breathing Air and Systems.
- 2.4 National Institute for Occupational Safety and Health (NIOSH) Standard 42 CFR 84 (1995)\ for Non-Powered Particulate Filtering Respirators.
- 2.5 The Occupational Health and Safety Act Section 70(2) - Silica Regulation.

3.0 Roles and Responsibilities

3.1 Senior Managers (Chair/Director of Operations)

Senior Managers (Chair/Director of Operations) shall:

- Consult with the Office of Environmental Health and Safety (EHS), ensure that risk assessments (Designated Substance Assessments (DSAs)) are conducted where necessary.
- Provide the required resources and direction to support and maintain an effective respiratory protection program.
- Review the efficacy of the program and do site visits/inspections regularly.
- Ensure FHs are certified annually.
- Facilitate immediate FH repairs when applicable.
- Provide applicable training.

3.2 Supervisors/Principal Investigators (PI)

Supervisors/Principal Investigators and all others in authority shall:

- Ensure lab personnel receives training as per the [Working with Silica SOP](#) and sign the training-acknowledge form (see Appendix B) before working with silica.
- Ensure lab personnel compliance with the terms delineated in the silica work SOP.
- Contact the Chemistry Department to request a risk assessment and approval when there is a justified reason for which a procedure involving silica powder cannot be done inside a FH.
- Provide lab personnel with the appropriate respirators whenever applicable
- Ensure lab personnel is properly trained and follow all the terms delineated in the [respirator use SOP](#).

3.3 Lab Personnel (Faculty, Staff and Students)

Lab Personnel (Faculty, Staff and Students) at the Lash Miller Laboratories shall:

- Review the [Working with Silica SOP](#) and sign the training-acknowledgement form before working with silica.
- Follow the procedures described in the Standard Operating Procedure (SOP).
- Ensure use appropriate PPE, ensure compliance and safety training.

4.0 Engineering Controls

- The snorkels located in some laboratories at LM shall not be used to contain silica hazards as their effectiveness cannot be certified, and the suction provided by them may not be appropriate to contain.
- Conversely, a Fume hood will offer the proper containment for particles and volatiles. opposite to the case of FHs).
- A FH that has been designated for silica work is required for dispensing/handling silica dust.
- The FH is required to be annually certified and operational.

5.0 General Procedures

5.1 Working with Silica Standard Operating Procedures (SOP)

Please follow the [Working with Silica SOP](#).

5.2 Respirator Use

- Lab personnel could be fit tested for the use of respirators if:
- There is a justified reason for which a procedure involving silica powder (or other particulate or volatile hazards) cannot be done inside a FH.
- A risk assessment and pre-approval process (done by EHS) is mandatory **before** lab personnel can proceed to be fit tested and trained in the use of respirators.

If **approved**, lab personnel must be fit tested, trained and provided with proper respirators. Please use the following the [SOP of Respirator Use](#).

6.0 Program Evaluation

6.1 Inspections

As part of the annual JHSC inspection, evaluation of the silica program will be conducted.

6.2 Audits

The Chemistry Department shall evaluate the use of respiratory protection for laboratories and lab personnel. The purpose of the audit is to identify deficiencies and issues that require correction or action. The EHS office can assist supervisors with appropriate guidance when requested. At a minimum, the following should be evaluated:

- Lab personnel work with silica in LM laboratories following the SOP.
- Procedures involving silica that cannot be done inside a fume hood have been approved.
- After approval, respirators are being properly used, maintained, and stored.
- Procedures for site-specific respiratory use as stated in the Respiratory Protection Program is current and has been approved by the EHS office.

7.0 Recordkeeping

- The Chemistry Department shall document and retain the records associated with this program (JHSC inspection, audits, and fit testing records).
- The EHS office shall maintain the medical records for the lab personnel that have undergone medical evaluations. These records shall be treated as medically confidential.
- Principal Investigators must maintain records of training in the propose handling of silica (SOP). If approved for silica work outside a FH, then they must maintain records of lab-personnel's respirator's fit-testing, and respirator's use training.

References

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3. Centers for Disease Control and Prevention. (2011, September 28). *1988 OSHA PEL Project - Silica, Amorphous*. Centers for Disease Control and Prevention. <https://www.cdc.gov/niosh/pel88/silicagl.html>.
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5. *Standard Operating Procedures and Forms*. Department of Chemistry. (2019, November 6). <https://www.chemistry.utoronto.ca/chemistry-standard-operating-procedures-sops/chemistry-sops>.
6. Government of Canada, C. C. for O. H. and S. (2020, August 5). Canadian Centre for Occupational Health and Safety. <https://www.ccohs.ca/>.
7. *Respiratory Protection Training and Fit-Testing*. Environmental Health & Safety. (2020, March 17). <https://ehs.utoronto.ca/training/respiratory-protection-training-fit-testing/>.
8. *MSDS Request*. Sigma. <https://www.sigmaaldrich.com/MSDS/MSDS/DisplayMSDSPage.do?country=CA>.
9. *Home*. Environmental Health & Safety. (2015, November 16). <https://ehs.utoronto.ca/>.

Appendix 1:

Silica Work-Training-Acknowledgment Form

This form is to be completed by the employee/student intending to work with silica.

I have read the “Working with Silica Procedure”. I understand the hazards of working with Silica and how to minimize the risks by following the safe work procedures and wearing appropriate PPE at all times.

YES

NO

PRINT NAME & LAST NAME	SIGNATURE	DATE