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Crystalline Silica
Exposure Control Policy, Program & Procedure

Alfred University

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Part 1
Crystalline Silica Exposure Prevention & Control: Introduction and Definitions

Background

Silica is the second most common mineral on earth, found in the common form as "sand" and "rock". Silica is the compound formed from the elements silicon (Si) and oxygen (O) and has a molecular form of SiO_2. The three main forms or 'polymorphs' of silica are alpha quartz, cristobalite, and tridymite. The polymer most abundant and most hazardous to human health is alpha quartz, and is commonly referred to as crystalline silica.

Health Hazards Associated with Silica Exposure

The health hazards of crystalline silica come from breathing in the dust. If crystalline silica becomes airborne through industrial activities, exposures to fine crystalline silica dust *(specifically exposure to the size fraction that is considered to be respirable)* can lead to a disabling, sometimes fatal disease called silicosis. The fine particles are deposited in the lungs, causing thickening and scarring of the lung tissue. The scar tissue restricts the lungs' ability to extract oxygen from the air. This damage is permanent, but the symptoms of the diseases may not appear for many years. As noted in the following Figure, (respirable) crystalline silica dust is very small, and is not visible to the human eye.

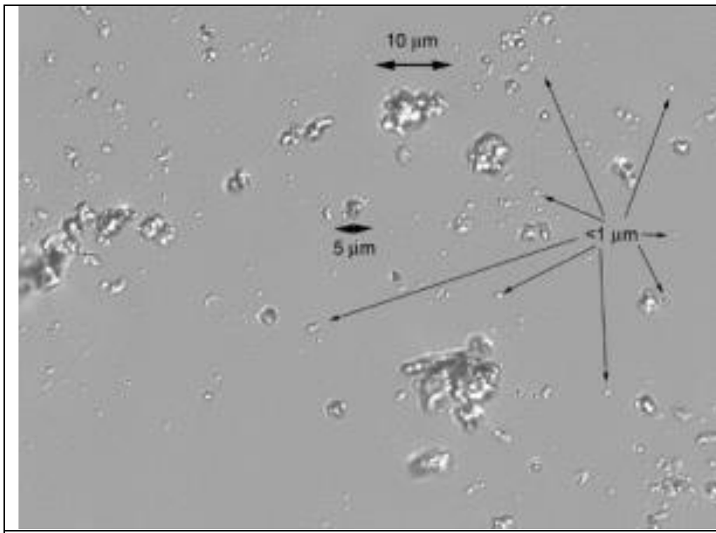

Figure 1: Crystalline silica up close. 1000 times magnification of sand dust. These particles are small enough to be trapped in lung tissue.

A worker may develop any of three types of silicosis, depending on the concentration of silica dust and the duration of the exposure:

- Chronic Silicosis: Develops after 10 or more years of exposure to crystalline silica and relatively low concentrations.
- Accelerated Silicosis: Develops 5 to 10 years after initial exposure to crystalline silica at high concentrations.
- Acute Silicosis: Develops within weeks, or 4 to 5 years, after exposure to very high concentrations of crystalline silica.

Initially, workers with silicosis may have no symptoms; however, as the disease progresses, workers may experience:

- Shortness of Breath.

- Severe Cough.
- Weakness.

These symptoms can worsen over time and lead to death. Exposure to silica has also been linked to kidney disease as well as other respiratory diseases, including: chronic obstructive pulmonary disease, bronchitis, tuberculosis, and lung cancer.

Potential Silica Exposures at Alfred University

Some activities performed at Alfred University may result in the creation/release of crystalline silica dust, thus exposing our employees. These activities include, but are not necessarily limited to:

- *Sweeping*
- *Jack-hammering / chip-hammering*
- *Saw-cutting*
- *Drilling (of concrete)*
- *Mixing of silica rich materials*
- *Grinding / sanding*
- *Milling*
- *Clean-up*

Definitions

The following definitions are provided to allow for a better understanding of Alfred University's written Crystalline Silica Exposure Control Policy, Program & Procedure.

Action level:	means a concentration of airborne respirable crystalline silica of 25 micrograms per cubic meter ($\mu g/m^3$), calculated as an 8-hour time weighted average (TWA).
Authorized person:	means an employee who has received proper training and exposure monitoring to safely work with silica containing materials.
Competent person:	means an individual who is capable of identifying existing and foreseeable respirable crystalline silica hazards in the workplace and who has authorization to take prompt corrective measures to eliminate or minimize them.
Crystalline silica:	means a naturally occurring component in earth soils, sand, granite and many other minerals resulting in many building materials and products containing silica.
Employee Exposure:	the exposure to airborne respirable crystalline silica that would occur if the employee were not using a respirator.
Exposure Assessment:	means the initial determination to find out if any employee may be exposed to crystalline silica at or above the permissible exposure level (PEL). Until the exposure assessment is completed, employees shall take all precautions necessary to maintain exposures below the PEL.

HEPA filter:	means a High-efficiency particulate air filter that is at least 99.97 percent efficient in removing mono-dispersed particles of 0.3 micrometers in diameter.
Objective data:	means information, such as air monitoring data from industry-wide surveys or calculations based on the composition of a substance, demonstrating employee exposure to respirable crystalline silica associated with a particular product or material or a specific process, task, or activity. The data must reflect workplace conditions closely resembling or with a higher exposure potential than the processes, types of material, control methods, work practices, and environmental conditions present in Alfred University's current operations.
OSHA:	means the Occupational Health and Safety Administration.
PEL:	means the Permissible Exposure Limit. The OSHA limit for silica dust exposure has been set at 50 $\mu g/m^3$, calculated as an 8-hour TWA.
Regulated area:	means an area, demarcated by the Alfred University, where an employee's exposure to airborne concentrations of respirable crystalline silica exceeds, or can reasonably be expected to exceed, the PEL.
Respirable crystalline Silica:	means quartz, cristobalite, and/or tridymite contained in airborne particles that are determined to be respirable by a sampling device designed to meet the characteristics for respirable-particle-size-selective samplers
Silica containing material:	means any material, which has the potential to contain silica at levels, which may pose a hazard to employees when the material is manipulated to create airborne particles.
Silicosis:	A lung disease caused by inhalation of silica dust. Silica dust can cause fluid buildup and scar tissue in the lungs that cuts down the ability for the lungs to fully function. The disease is not curable, but can be prevented through the use of protective systems.

Part 2

Crystalline Silica Exposure Prevention & Control: Statement of Purpose

Alfred University is committed to providing a safe and healthy workplace to our employees, recognizing the right of workers to work in a safe and healthy work environment and ensuring that Alfred University's activities do not adversely affect the health and safety of any other persons.

This commitment includes ensuring every reasonable precaution is taken to protect our employees (and others) from the adverse health effects associated with potential exposure to silica.

Alfred University's written Crystalline Silica Exposure Control Policy, Program & Procedure covers both the OSHA General Industry and Maritime Rule (29 CFR 1910.1053) and the OSHA Construction Rule (29 CFR 1926.1153) as employees may be involved in activities that are covered under either rule relative to potential crystalline silica exposure.

Part 3

Crystalline Silica Exposure Prevention & Control: Responsibilities

Due to the risk posed by respirable crystalline silica, it is critical that all personnel involved in activities that could potentially create silica dust take specific actions to ensure that, as much as practicable, a hazard is not created. In recognition of this, the following (Crystalline Silica-related) responsibilities have been established and must be adhered to:

Environmental Health and Safety is responsible for:

- Providing program oversight and consultation to *Alfred University* employees (i.e., Managers, Supervisors, and Workers) regarding potential risks, exposure prevention, and training relating to potential crystalline silica dust exposures.

- Regularly evaluating new equipment and technologies that become available, as able/appropriate, purchasing the "best available" equipment/technologies *(within Alfred Univeristy's capabilities)*. Equipment/technologies with (silica) dust suppression and/or capture technologies will generally be given preference over equipment/technologies that lack such.

- Implementing a suitable respirable crystalline silica exposure monitoring program, or otherwise ensuring representative exposure monitoring results are available. The purpose of the program will ensure that *(over time) Alfred University* has quantifiable crystalline silica exposure data available for all regularly occurring, as well as reasonably foreseeable, work activities that may occur on Alfred University (owned) properties.

- Designating a "competent person" and define/assign appropriate responsibilities.

- Ensuring project and/or task specific Exposure Control Plans (ECPs) are developed, communicated, and effectively implemented as appropriate.

- Ensuring that all *Alfred University* employees *(i.e. Managers, Supervisors and Workers)* receive the necessary education and training related to this Policy, as well as project/task specific ECPs.

- Maintaining applicable records *(i.e. exposure sampling, inspections, respirator fit tests, training records, etc.)* in accordance with *Alfred University's* record retention procedures/practices.

- Conducting a review of this Policy, as well as reviewing: (1) project/task specific ECP's, (2) available exposure monitoring data, (3) Industry/Regulatory information, (4) new/emerging equipment/technologies, and (5) evaluate the effectiveness of the written plan at least annually and update it as necessary.

- Regularly consulting with the Safety Resources/Safety Managers from universities who perform similar work.

Department(s) (i.e., Facilities/Buildings & Grounds, etc…) are responsible for:

Ensuring the applicable elements of the Crystalline Silica Exposure Control Program is available to all affected employees.

- Providing applicable training to employees expected to work in, or with, building materials and/or products/materials where there is a potential risk for crystalline silica exposure.

Alfred University Supervisors are responsible for:

- Obtaining a copy of the project/task specific ECPs *(and/or other similar such information)*, and ensuring such are made available at each work area.

- Ensuring that all the tools, equipment, personal protective equipment (PPE) and materials *(including water)* necessary to implement the ECP is available *(and in good working order)* prior to allowing work activities to commence.

- Ensuring that all workers *(under the supervisor's direction and control)* have received the necessary education and training. As appropriate, each supervisor must ensure that workers are available to "demonstrate competency" for identified tasks.

- Ensuring that workers adhere to the project/task specific ECP, including PPE and personal hygiene *(i.e. including be clean shaven where the respirator seals to the user's face)* requirements.

- Coordinating work activities with the Owner/Prime Contractor as required, and/or otherwise implementing the controls necessary to protect others *(i.e. erecting of barricades and signage)* who could be adversely effected by *Alfred University's* acts *(or omissions).*

Employees (and subcontracted employees) are responsible for:

- Knowing the hazards of crystalline silica dust exposure.

- Using the assigned protective equipment in an effective and safe manner.

- Working in accordance with the project/task specific ECP.

- Reporting *(immediately)* to their supervisor, any hazards *(i.e. unsafe conditions, unsafe acts, improperly operating equipment, etc.).*

Part 4

Crystalline Silica Exposure Prevention & Control: Exposure Limits

Exposure Limits/Considerations: OSHA requires the employer (*Alfred University*) to assess the exposure of each employee who is or may reasonably be expected to be exposed to respirable crystalline silica at or above the **action level** in accordance with one of the following options:

- Performance option - assess the 8-hour TWA exposure for each employee on the basis of any combination of air monitoring data or objective data sufficient to accurately characterize employee exposures to respirable crystalline silica.

- Scheduled monitoring option - perform initial monitoring to assess the 8-hour TWA exposure for each employee on the basis of one or more personal breathing zone air samples that reflect the exposures of employees on each shift, for each job classification, in each work area. Where several employees perform the same tasks on the same shift and in the same work area, the employer may sample a representative fraction of these employees in order to meet this requirement. In representative sampling, the employer shall sample the employee(s) who are expected to have the highest exposure to respirable crystalline silica.

As defined in Part 1, the action level means a concentration of airborne respirable crystalline silica of 25 $\mu g/m^3$, calculated as an 8-hour TWA.

OHSA lists a **permissible exposure limit** (PEL) for respirable crystalline silica (including quartz) of 50 micrograms per cubic meter ($\mu g/m^3$), averaged over an 8-hour shift (TWA).

Part 5

Crystalline Silica Exposure Prevention & Control: Risk Identification

Risk Identification: Crystalline Silica is contained on many of the products used/encountered at Alfred University (i.e. the Bell & Mackenzie Safety Data Sheet (SDS) for Crystalline Silica reveals the potential for up to >90% crystalline silica, while the SDS from James Kent (Ceramic Materials) identifies the potential for between 60-100% silica quartz. Silica dust can be readily released through the various tasks/activities performed at Alfred University.

<u>The health hazards of silica come from breathing in the dust</u>. In addition to identifying the specific activities/areas where personnel could be exposed to silica dust, the "amount" of exposure and "duration" of exposure must also be considered. With consideration to these three factors, activities performed by Alfred University (or that are otherwise occurring in proximity to Alfred University's activities) that expose our employees (as well as members of the public and other workers) to the dust include, but are not necessarily limited to:

- Surface preparation activities such as: (1) the use of Blow-Packs, (2) the use of Bobcats with "sweeper" attachments, (3) the use of Sweeper trucks and (4) hand sweeping.
- Jack-hammering/chip-hammering *(of asphalt, concrete, and fibrous cement board)*.
- Saw-cutting *(of both asphalt and concrete)*.
- Drilling *(of concrete, asphalt, plaster).*
- Granular Surface Preparation activities *(i.e. grading and rolling).*
- Bulk mixing of materials containing silica (clay, concrete, grout, etc.).
- Machine and hand sanding of materials containing silica.
- Grinding.
- Abrasive blasting.
- Clean-up activities.

Part 6

Crystalline Silica Exposure Prevention & Control: Risk Assessment

Risk Assessment: Alfred University will use a variety of methods to assist with the "assessment" of *(possible and actual)* crystalline silica exposures. These methods will include, but may not necessarily be limited to:

- Reviewing data/reports available in the public domain *(i.e. Information available through regulatory agencies and industry associations)*.

- Regularly consulting with the Safety Resources/Safety Managers from universities who perform similar work.

- Implementing a suitable respirable crystalline silica exposure monitoring program. This program will ensure that *(over time)* Alfred University has quantifiable crystalline silica exposure data available that is representative of all regularly occurring, as well as reasonably foreseeable work activities that may occur on Alfred University owned properties. Exposure monitoring will generally be conducted "in-house", although assistance *(i.e. actual monitoring and/or interpretation of results)* may be obtained through outside consultants/hygienists.

Part 7

Crystalline Silica Exposure Prevention & Control: Risk Control

Control Methods: When determining measures to reduce or eliminate worker exposure to crystalline silica dust, Alfred University will generally select a combination of controls, listed in order of preference:

- Elimination and Substitution.
- Engineering.
- Administrative.
- Personnel Protection Equipment (PPE).

Substitution and Elimination: Whenever possible, Alfred University will substitute products containing crystalline silica with products that do not contain *(or contain a lower percentage of)* crystalline silica. While there have historically been few "substitution" options available, Alfred University recognizes the importance of planning work in order to minimize the amount of crystalline silica dust generated. During the planning phases of a project, Alfred University will advocate for the use of methods that reduce the need for cutting, grinding, or drilling of concrete surfaces and other materials/products that may contain crystalline silica.

Engineering Controls: Engineering controls are those controls which aim to control or otherwise minimize the release of crystalline silica. Two "common" engineering control options are available to Alfred University in many circumstances. These include the **Local Exhaust Ventilation (LEV)** and **Wet Dust Suppression (WDS) systems.**

LEV Systems: Tools/appliance specific LEV systems are available on some tools/appliances. Such LEV systems are generally comprised of a shroud assembly, a hose attachment, and a vacuum system. Dust-laden air is collected within the shroud, drawn into the hose attachment, and conveyed to the vacuum, where it is filtered and discharged. "Large scale" LEV systems, such those available on some Vacuum Trucks and Mobile Sweepers, may also be employed (at times) during Alfred University projects.

When/if LEV systems are used, Alfred University will employ the following systems and safe work practices:

- Vacuum attachment systems that capture and control dust at its source whenever possible.
- Dust control systems will be maintained in optimal working condition.
- Grinding wheels will be operated at the manufacturer's recommended RPM *(operating in excess of this can generate significantly higher airborne dust levels as well as, pose other safety concerns)*.
- HEPA or good quality, multi-stage vacuum units *(approved for use with crystalline silica dust)* will be used in accordance with the manufacturer's instructions.
- Whenever possible, concrete grinding will be completed when the concrete is wet *(thus crystalline silica dust release will be significantly reduced).*

WDS Systems: Unlike LEV systems, many tools/appliances at Alfred University are equipped with WDS systems *(i.e. on the Milling equipment, sweeper equipped Bobcats, as well as attachments on various hand held/portable, abrasive/cutting equipment)*. When WDS Systems are not available, *(as a standard or retrofitted part of a tool/appliance)*, similar effects can also be achieved by manually wetting the surface *(i.e. with a mister or with a hose).*

When WDS systems are used, Alfred University will employ the following systems and safe work practices:

- If water is not readily available during the specific Alfred University project, the project supervisor will arrange to have a water tank delivered to the site for use.
- Pneumatic or fuel *(i.e. gasoline)* powered equipment will generally be used instead of electrically powered equipment if water is the method of dust control, unless the electrical equipment is specifically designed to be used in such circumstances.
- Pressure and flow rate will be controlled in accordance with the tool manufacturer's specifications.
- When sawing concrete (and other crystalline silica containing materials/products), tools that provide water directly to the blade will be used if possible.
- Wet slurry will be cleaned from work surfaces when the work is complete, if/when necessary.

Administrative Controls: Administrative controls are those that aim to control or otherwise minimize the release of silica through the use of work procedure and work methods, rather than by affecting the actual physical work. Common examples of administrative controls include, but are not limited to:

- Posting of warning signs.
- Rescheduling of work as to avoid the activities of others.
- Relocating unprotected workers away from dusty areas.

When administrative controls are used, Alfred University will employ the following systems and safe work practices:

- In conjunction with the Owner/Prime Contractor, suitable exposure control strategies *(both within and outside* Alfred University *'s capabilities/responsibilities)* will be discussed and determined. As necessary/appropriate, supplemental (to this policy/procedure) project and task specific Exposure Control Plans will be developed.

- Suitable housekeeping, restricted work area, hygiene practices, training and supervision procedures/standards will be determined and implemented at Alfred University.

- As appropriate, barriers will be erected around known crystalline silica dust generating activities, and/or warning signs will be posted.

- Signs should be posted at all entrances to regulated areas that bear the following legend:
    - DANGER
    - RESPIRABLE CRYSTALLINE SILICA
    - MAY CAUSE CANCER
    - CAUSES DAMAGE TO LUNGS
    - WEAR RESPIRATORY PROTECTION IN THIS AREA
    - AUTHORIZED PERSONNEL ONLY

- As able, work activities will be scheduled to minimize the crystalline silica related effect on, and from, others.

Personal Protective Equipment Controls: When used in conjunction with the other *(i.e. Engineering and Administrative)* controls elsewhere identified, personal protective equipment and clothing can help further reduce our employee's exposure to crystalline silica dust.

An air purifying respirator fitted with HEPA cartridges is the most common piece of PPE that would be used by Alfred University to minimize exposure to crystalline silica dust. Dependent on the effectiveness of the other *(i.e. engineering)* control measures employed, either a "full face piece" or "1/2 face piece" respirator would be used by personnel *(In the majority of situations a ½ face respirator will be used).* Both of these respirators are "seal dependent", and thus the users must be "fit tested" and clean shaven where the respirator seals to the face. Note: Only employees that are properly trained, fit-tested, and approved to use a respirator under Alfred University's Respiratory Protection Plan are allowed to use respirators.

In addition to respiratory PPE, protective clothing *(i.e. disposable/washable coveralls)* may be used and/or required to help prevent the contamination of the worker's personnel clothing.

Part 8

Crystalline Silica Exposure Prevention & Control: Education and Training

Education and Training: Prior to performing activities, or working on project sites where personnel could be exposed to crystalline silica dust, Alfred University will ensure that personnel receive suitable education and training from the Environmental Health and Safety Department. As necessary, personnel will be trained to a level of "demonstrated competency". While not necessarily an exhaustive list, education and training may include:

- The health hazards and risks associated with exposure to crystalline silica dust.
- The signs and symptoms of crystalline silica related diseases.
- Specific tasks/activities at Alfred University that could result in potential exposure to respirable crystalline silica.
- General and specific crystalline silica exposure reduction methods/strategies *(i.e. as detailed in the general/specific exposure control plans)*.
- The use of specific pieces of equipment and control systems *(i.e. LEV and WDS systems)*.
- The use and care of respiratory (and other) personal protective equipment.
- How to seek first aid *(i.e. for respiratory related concerns, including those that may be caused/associated with crystalline silica dust exposure)*, and
- How to report items of the concern *(i.e. those related to crystalline silica dust)*.

The education and training detailed will be delivered to Alfred University employees through a variety of forums, including but not necessarily limited to:

- New Employee Orientations.
- Project/Site Orientations.
- Equipment/task specific training.
- Start of shift "tool box talks."
- Regularly scheduled crew "Tailgate Meetings."
- Notifications and Bulletins *(those developed in house and those acquired from other reputable sources).*

Part 9

Crystalline Silica Exposure Prevention & Control: Medical Surveillance

Medical Surveillance: Employees exposed to crystalline silica levels above the Permissible Exposure Limit (50 µg/m3), or any employee working with crystalline silica who develops signs/symptoms of excessive exposure, should be enrolled in the Medical Surveillance Program.

- The medical surveillance program consists of:
  - a baseline physical examination with special emphasis on the respiratory system;
  - a chest X-ray;
  - a pulmonary function test;
  - testing for latent tuberculosis infection; and
  - any other tests deemed appropriate by the Physician or other licensed health care professional legally permitted to provide these types of medical surveillances and procedures.

- Employees enrolled in the medical surveillance program should be examined annually to track any changes as a result to exposure to crystalline silica dust.

- Medical exams including chest X-rays and lung function tests should be performed every three years for workers exposed at or above the action level for 30 or more days per year and/or for workers who are required by the OSHA Rule to wear a respirator for 30 or more days per year.

- Alfred University is required to maintain records of workers' crystalline silica exposure and medical exams.

APPENDIX A

Project/Task Specific Exposure Control Plan

Task		Control methods	Personal protective equipment	Comments
Grinding/ Sanding	Concrete interior/exterior walls, ceilings, and other flat surfaces	• Barrier or enclosure systems are required to restrict access to the work area. • Local exhaust ventilation (LEV)—use concrete grinders with HEPA vacuum attachments. • Grinding using wet method of dust control may be an option for specific circumstances. These circumstances must be listed on the site workplan. • Personal protective equipment.	• Half-mask air purifying respirator equipped with 100 series HEPA filters. • Full-face air purifying respirator or powered air purifying respirator (PAPR) with P100 series HEPA filters, when heavy work and poor dilution ventilation in work area. • Disposable coveralls are recommended for all grinding work and are required for stairwell and similar work. • Eye protection should be worn when using a half-face respirator.	• Vacuum systems equipped with HEPA filtration are the best control options for flat surface grinding. Ensure they are well designed for this type of work. A variety of suitable systems are readily available. • Very little visible dust should be present in the air. • Inspect the LEV unit frequently to ensure it is operating properly and the filters are not overloaded. • Hearing protection should be worn when using powered equipment. • When LEV and wet grinding systems cannot be used, dry grinding is permitted, provided a full enclosure system is constructed. Workers should wear full-face respirators and disposable coveralls.
	Window casements and other working areas with space or other constraints	• Barrier or enclosure systems are required to restrict access to and contain the work area. • Local exhaust ventilation (LEV) should be used when practical and effective. • Wetting methods of control can be used to supplement LEV or when LEV methods are not practical or effective. • Personal protective equipment.	• Half-face or full-face air purifying respirator or powered air purifying respirator (PAPR) with P100 series HEPA filters. • Eye protection should be worn when using a half-face respirator.	• Due to space constraints, it may not be possible to use an LEV-equipped grinder. • Water flow and the rpm of the grinder should be properly adjusted for the material being worked on. • Caution—water may produce a slipping hazard. • Hearing protection should be worn when using powered equipment. • Electric shock hazards need to be assessed and controlled when using wet methods (pneumatic grinders may be a another option).

Task		**Control methods**	**Personal protective equipment**	**Comments**
Grinding/ Sanding	Tuck point grinding	• Barrier or enclosure systems are required to restrict access to and contain the work area. • Local exhaust ventilation (LEV)—use specially designed tuck point grinders with HEPA vacuum attachments. • A specially designed oscillating tool is available for mortar removal. The tool can be purchased with an LEV attachment. • When LEV cannot be used, construct an enclosure including a negative air unit for dilution ventilation. • Personal protective equipment.	• Full-face air purifying respirator equipped with 100 series HEPA filters. • For challenging jobs where LEV or wetting control cannot be used, full-facepiece supplied-air respirators operated in pressure-demand mode or full-facepiece supplied air respirators operated in continuous-flow mode will be required. • Disposable coveralls should be worn for tuck point grinding work.	• Hearing protection should be worn.
	Enclosed areas (e.g., stairwells, elevator shafts)	• Full enclosure systems are required to restrict access to and contain the work area. • LEV—use concrete grinders with HEPA vacuum attachments. • Have dedicated grinders available with corner and flat-end shrouds. • Some wet grinding may be acceptable—the approved tasks must be listed on the site workplan. • Personal protective equipment.	• Full-face air purifying respirator or powered air purifying respirator (PAPR) with P100 series HEPA filters. • If effective dilution ventilation within the work area enclosure cannot be established, then full-facepiece supplied-air respirators operated in pressure-demand mode or full-facepiece supplied air respirators operated in continuous-flow mode will be required. • Disposable coveralls must be worn • Hearing protection should be worn.	• LEV attachments for concrete grinders are not effective for certain non-flat grinding surfaces; therefore, full-facepiece supplied-air respirators operated in pressure-demand mode or full-facepiece supplied air respirators operated in continuous-flow mode will be required. • HEPA filters should be checked routinely throughout the work shift to ensure they are not clogged with silica dust.
	Floor grinding	• Barrier or enclosure systems are required to restrict access to and contain the work area. • Local exhaust ventilation—a variety of specially designed floor grinding systems are available equipped with HEPA filtration. These systems should be used when practical. • Wet grinding may be an option, provided acceptable slurry cleanup procedures are documented and followed. • Personal protective equipment.	• Half-face air purifying respirator equipped with P100 series HEPA filters. • Full-face air purifying respirator or powered air purifying respirator (PAPR) with P100 series HEPA filters, when working in an enclosed area and visible dust is observed. • Disposable coveralls should be considered. • Eye protection should be worn when using a half-face respirator. • Hearing protection should be considered when using powered equipment.	• Portable shot blaster (floor smoothing) systems equipped with dust controls are available for floor grinding. • When large amounts of concrete are to be removed, filter systems should be more substantial (e.g., two vacuums connected in series—one large course filter system followed by a finer filter system). This will improve efficiency of the overall unit. • Vacuum systems will likely need to be cleaned and inspected frequently.

Task		Control methods	Personal protective equipment	Comments
Drilling	Walls, floors, and ceilings	• Barriers to restrict access to the work area. • Dust capture tool (e.g., a dust cap, LEV, or wetting method). • Personal protective equipment.	• Half-mask air purifying respirator equipped with P100 series HEPA filters. • Eye protection should be worn when using a half-face respirator. • Waterproof equipment where appropriate. • Hearing protection should be considered when using powered equipment.	• Hammer drills (variety of sizes) are available. Some units are equipped with local exhaust ventilation attachments (with HEPA filters). • A "dust cap" is a dust-capturing device that fits between the drill and the working surface (on the end of the drill). This is useful for overhead ceiling and wall drilling. A few different types are available. • When water is used as a dust control, the slipping hazard must be considered and managed. • Large concrete drills can be purchased that are equipped with a water spray attachment. Any wet slurry must be cleaned up when the work is completed.
Chip hammer-ing and jackham-mering	Walls, floors, and ceilings	• Barriers must routinely be established to restrict access to these work areas. Enclosure systems must be constructed when controls are not effective at reducing visible airborne dust. • Local exhaust ventilation (see comment) when practical. • Wet methods can be used and are often very effective for floor hammering. • Personal protective equipment.	• Half-face or full-face air purifying respirator or powered air purifying respirator (PAPR) with P100 series HEPA filters, depending on the effectiveness of the controls. • Disposable coveralls should be worn when using full-face respirators. Waterproof PPE (and clothing) required when wetting methods are used. • Eye protection should be worn when using a half-face respirator. • Hearing protection should be considered when using powered equipment.	• LEV could include a negative air unit or HEPA vacuum positioned near the working surface. These controls may be practical when chip hammering walls or other vertical surfaces or locations where water cannot be used. • Wet methods could include a portable airless sprayer, air mister, or hose sprayer. Slurry should be cleaned up when the work is completed to avoid secondary dust exposure hazard. • Caution—water may produce electrocution and slipping hazards.

Task		Control methods	Personal protective equipment	Comments
Cutting of concrete slab and concrete masonry products		• Barrier or enclosure systems are required to restrict access to and contain the work area. • Wetting methods of control can be very effective and should be used as a first choice when saw cutting concrete or concrete products (see comment). • LEV systems for concrete saws must be considered as a dust control when wet methods cannot be used. • Personal protective equipment.	• Half-face or full-face air purifying respirator with 100 series HEPA filters when wet or LEV controls used. • Disposable coveralls should be worn when using full-face respirators. • Eye protection should be worn when using a half-face respirator. • Hearing protection should be considered when using powered equipment.	• A water flow rate of 2.3 litres per minute (0.5 gallons/minute) is the recommended minimum for saws equipped with wetting controls. • Caution—water may produce electrocution and slipping hazards. • Slurry cleanup of interior surfaces must be part of the workplan.
Abrasive blasting of concrete surfaces	Exterior and interior concrete surfaces	• Barrier systems are required when dust can be controlled at the source. • Full enclosure system required when source control of dust cannot be established • Blasting units that capture the dust (e.g., shot recycle systems) should be used when practical. • Blast systems that discharge a wet slurry shot should be used when practical. • Personal protective equipment.	• Full-face supplied-air helmet or hood respirator with a neck shroud, operated in continuous-flow mode. • Heavy waterproof protective clothing should be worn. • Hearing protection should be considered when using powered equipment.	• Caution—water may produce electrocution and slipping hazards. • Slurry cleanup of interior surfaces must be part of the workplan.

Cleanup	General cleanup	• Barrier to restrict access to and contain the work area. • Full enclosure systems can be used in dust-sensitive areas or when unprotected workers cannot be restricted from entering cleanup work areas. • Use vacuum (HEPA-equipped) when practical. • Wetting of dust prior to sweeping/scooping to be used when practical. • Planning for bulk/coarse debris cleanup followed by fine-dust cleanup can reduce the amount of dry sweeping. • Dust suppressants should be used if dry sweeping is the only practical option.	• Half-face air purifying respirator when vacuum systems or wet sweeping methods are used. • Full-face or powered air purifying respirator (PAPR) with P100 series HEPA filters for all other cleanup. • Eye protection should be worn when using a half-face respirator. • Hearing protection should be considered when using powered equipment.	• Dust-suppressing agents or absorbents are only marginally effective in minimizing airborne dust during sweeping. • Safe work procedures must be followed. • Rolling a seam of dust suppressant into fine, settled dust is reported to work better than a wide-spread scattering.

Task		**Control methods**	**Personal protective equipment**	**Comments**
Cleanup	Vacuum bag/filter changing and maintenance of LEV	• Barrier to restrict access to the work area. Signage marking an area removed from other workers may be adequate.	• Half-face air purifying respirator with P100 series HEPA filters. • Eye protection should be worn when using a half-face respirator.	• Safe work procedures must be established and followed. • Many vacuums are designed to collect the dust in a bag (rather than loose in the canister) that can be tied and disposed without generating airborne dust. Any new vacuum systems purchased should have this design feature.
Cutting fibrous cement board		• A variety of dust control options are acceptable: ○ Fibre cement shears ○ Score and snap knife ○ Dust-reducing saws (circular and jig) equipped with HEPA vacuum ○ Wetting method if practical	• Half-face air-purifying respirator with N100 series HEPA filters when using saws. • N95 dust mask when using fibre cement shears indoors.	• A number of equipment manufacturers make saws (and saw blades) specially designed for cutting fibre cement board that can be purchased with HEPA. • Carbide score and snap knives have been shown to be an efficient and productive means of cutting fibrous cement board.

Task		Control methods	Personal protective equipment	Comments
Mixing	Mixing of silica rich material	• Barrier to restrict access to the work area. Signage marking an area removed from other workers may be adequate. • Full enclosure system required when source control of dust cannot be established • Local exhaust ventilation (LEV) should be used when practical and effective. • Personal protective equipment.	• Half-face air-purifying respirator with N100 series HEPA filters • Eye protection should be worn when using a half-face respirator.	• Safe work procedures must be established and followed.

APPENDIX B
Sample site-specific exposure control plan forms

Site-specific silica exposure control plan

Operator/Contractor (Name and Phone #):______________________________

Location: ______________________________ **Date:** ____________________

Work description:

Primary crystalline silica control options (check those options used and explain use if needed)

- Substitution controls (using procedures or products that do not create silica; must review SDS's)
  Other means of demo: ______________________________
  Different products: ______________________________
  Other substitutions: ______________________________

- Engineering controls (when using ventilation, draw air out and don't expose others to exhaust dusts)
  Vacuuming: ______________________________
  Wetting: ______________________________
  Ventilation: ______________________________
  Isolation: ______________________________
  Other means: ______________________________

- Administration controls (reducing exposure by work schedules, timing, or planning options)
  Control points: ______________________________
  Work schedule: ______________________________
  Sign(s) posted: ______________________________
  Other means: ______________________________

Secondary crystalline silica control options (check those options used and explain use if needed)

- Personal protective equipment
  Half-mask respirators: ________ Cartridge type: ____________ Fit tests confirmed: ________
  Full-face respirators: ________ Cartridge type: ____________ Fit tests confirmed: ________
  Supplied air units: ______________________________
  Coveralls required: ______________________________

- Hygiene and decontamination options (reducing exposures after work has stopped or during breaks)
  Water or washing facilities on site: ______________________________
  Vacuuming clothing/self: ______________________________

  Safe work procedures and other details: ....

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Ventilation plan (sketch)

Show direction of airflow including makeup air locations and discharge air outlets

Area/location in building of ventilation plan (e.g., floor #, wing)

Date plan was reviewed by workers and posted for workers to see

Types of neg. air fans & no.'s *

* Indicate on plan by number the location of the negative air fans

Ventilation safety checklist

- ☐ Makeup air free of possible contaminants
- ☐ Exhaust fan operation has failure warning
- ☐ Dilution fans not stirring up dust
- ☐ Wetting of materials used to keep dust down
- ☐ Workers not placed between contaminants created and exhaust inlet ports
- ☐ Discharge air not affecting others
- ☐ All workers equipped with approved respirators

Note: Attach additional sheets if needed or other documents if required due to hazards or work conditions.

Print supervisor's name

Supervisor's signature