2015

# Crystalline Silica
## Exposure Control Policy, Program & Procedure

**REMOVALL REMEDIATION SERVICES LTD**

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**Operating Improvements**

The continuous improvement of products used and services tendered is a policy of RemovAll Remediation Ltd. Moreover RemovAll Remediation Ltd takes steps to ensure that company literature and standard operating procedures are correct and in accordance with contemporary regulations. However in the event that errors occur and/or company literature and standard operating procedures are found to be non-compliant; RemovAll Remediation Ltd reserves the right to correct any such errors and update company literature and standard operating procedures as required.

# Part 1
# Silica Exposure Prevention & Control: Introduction

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 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) silica dust is very small, and is not visible to the human eye.

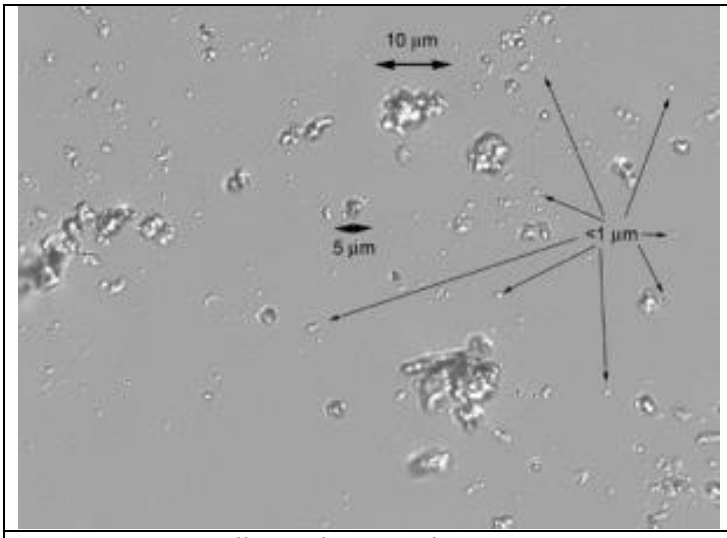



Figure 1: Crystalline silica up close. 1000 times magnification of sand dust. These particles are small enough to be trapped in lung tissue.

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 other diseases, including bronchitis, tuberculosis, and lung cancer.

## Silica Exposures at Removall Remediation Services Ltd

Many of the activities performed on Removall Remediation projects result in the creation/release of silica dust, thus exposing our employees. These activities include, but are not necessarily limited to:

- *Sweeping*
- *Jack-hammering*
- *Saw-cutting*
- *Drilling (of concrete)*
- *Excavating and Truck Loading activities.*

# Part 2
# Silica Exposure Prevention & Control: Statement of Purpose

Removall Remediation 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 Removall Remediation 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 exposure to silica.

# Part 3
# Silica Exposure Prevention & Control: Responsibilities

Due to the risk posed by respirable 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 (Silica related) responsibilities have been established and must be adhered to:

**Removall Remediation (I.e. Senior Management) is responsible for:**

- Regularly evaluating new equipment and technologies that become available, as able/appropriate, purchasing the "best available" equipment/technologies *(within Removall Remediation'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 silica exposure monitoring program, or otherwise ensuring representative exposure monitoring results are available. The purpose of the program will ensure that *(over time) Removall Remediation* has quantifiable silica exposure data available for all regularly occurring, as well as reasonably foreseeable, work activities.

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

- Ensuring that all 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 Removall Remedation*'s* record retention procedures/practices.

- *(In conjunction with the Removall Remediation Health & Safety Committee* Conducting a review of this Policy, as well as: (1) project/task specific ECP's, (2) available exposure monitoring data, (3) Industry/Regulatory information, and (4) new/emerging equipment/technologies on a regular *(i.e. annual)* basis.

- Reviewing this existing policy and ECP on an annual basis, and incorporating it into both new hire and refresher training programs.

**Removall Remediation Service Ltd Supervisors (i.e. Superintendents/Foreman) 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 site.

- Ensuring that all the tools, 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 *Removall Remediation's* acts *(or omissions).*

**Removall Remediation Service Ltd Employees (and subcontracted employees) are responsible for:**

- Knowing the hazards of 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
# Silica Exposure Prevention & Control: Exposure Limits

**Exposure Limits/Considerations:** The Occupational Health & Safety Regulation (OHSR) lists an occupational exposure limit (OEL) for respirable crystalline silica (including quartz) of 0.025 milligrams per cubic metre ($mg/m^3$). This is a concentration to which nearly all workers could be exposed for eight hours a day, five days a week, without adverse health effects. However, as a suspected carcinogen, crystalline silica is also an ALARA substance, and exposures must be reduced to levels **A**s **L**ow **A**s **R**easonably **A**chievable below the OEL.

# Part 5
# Silica Exposure Prevention & Control: Risk Identification

**Risk Identification:** Silica is contained on many of the products used/encountered on *Removall Remediation* Projects *(i.e. the Lafarge Materials Safety Data Sheet (MSDS) for concrete reveals the potential for up to 90% crystalline silica, Identifies the potential for between 50-77% Silica in aggregate)*, and (silica) dust can be readily released through the various tasks performed by Removall Remediation.

The health hazards of silica come from breathing in the dust. 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 Removall Remediation *(or that are otherwise occurring in proximity to* Removall Remedation*'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 *(of both asphalt and concrete)*.
- Saw-cutting *(of both asphalt and concrete)*.
- Drilling *(of concrete).*
- Granular Surface Preparation activities *(i.e. grading and rolling)*, and
- Operation and use of milling equipment/machinery *(i.e. milling and conveyance/discharge of milled materials on conveyor)*.

# Part 6
# Silica Exposure Prevention & Control: Risk Assessment

**Risk Assessment:** Removall Remediation will use a variety of methods to assist with the "assessment" of *(possible and actual)* 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 (including WorkSafeBC) and industry associations (including the BC Construction Safety Alliance)*.

- Regularly consulting with the Safety Resources/Safety Managers from firms who perform similar work *(i.e. through ATAC (Asphalt Technical Advisory Committee).*

- Implementing a suitable silica exposure monitoring program. This program will ensure that *(over time)* Removall Remediation has quantifiable silica exposure data available that is representative of all regularly occurring, as well as reasonably foreseeable work activities. 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
# Silica Exposure Prevention & Control: Risk Control

**Control Methods:** When determining measures to reduce or eliminate worker exposure to silica dust, Removall Remediation 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, Removall Remediation will substitute products containing silica with products that do not contain *(or contain a lower percentage of)* crystalline silica. While there have historically been few "substitution" options available, Removall Remediation recognizes the importance of planning work in order to minimize the amount of silica dust generated. During the planning phases of a project, Removall Remediation will advocate for the use of methods that reduce the need for cutting, grinding, or drilling of concrete surfaces.

**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 Removall Remediation 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) on Removall Remediation projects.

When/if LEV systems are used, Removall Remediation 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)*.
- HEPA or good quality, multi-stage vacuum units *(approved for use with 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 dust release will be significantly reduced).*

**WDS Systems:** Unlike LEV systems, many tools/appliances at Removall Remediation 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, Removall Remediation will employ the following systems and safe work practices:

- If water is not readily available on the specific Removall Remediation 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, 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, Removall Remediation will employ the following systems and safe work practices:

- In conjunction with the Owner/Prime Contractor, suitable exposure control strategies *(both within and outside* Removall Remediation*'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 on Removall Remediation projects.

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

- As able, work activities will be scheduled to minimize the 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 silica dust.

An air purifying respirator fitted with HEPA cartridges is the most common piece of PPE that would be used by Removall Remediation to minimize exposure to 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. When working indoors or in other areas with poor ventilation, a full face respirator may be required)*. 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.

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
# 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 silica dust, Removall Remediation will ensure that personnel receive suitable education and training. As necessary, personnel will be trained to a level of "demonstrated competency". While not necessarily an exhaustive list, education and training may include:

- The hazards and risks associated with exposure to silica dust.
- The signs and symptoms of silica related diseases.
- General and specific 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 silica dust exposure)*, and
- How to report items of the concern *(i.e. those related to silica dust)*.

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

- New Employee Orientations.
- Project/Site Orientations.
- Equipment/task specific training *(in accordance with* Removall Remediation Services LTD *Policy, all personnel must be trained to a level of "demonstrated competency" prior to using required tools, equipment and appliances).*
- 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
# Silica Exposure Prevention & Control: Safe Work Procedures

Removall Remediation Service Ltd will ensure that suitable written procedures for controlling the risk of silica exposure are developed. This document/table below represents an example of how these procedures can be presented. This document and any supplemental work procedures/ECPs will be made readily available for review by all affected workers.

**INSERT COMPANY SPECIFIC WRITTEN INSTRUCTIONS**

**EXAMPLE**

| Division/Task | | Control Methods | Personal Protection Equipment | Comments |
|---|---|---|---|---|
| "Company Operations" | 1. Use of flusher truck | No specific engineering/administrative controls required. | No specific PPE controls required | The use of a flusher truck to remove debris/sediment from a surface to prepare it for driving in operations desirable/preferred, as the activity will generally generate little/no silica dust, and will improve drive aisles within the operations.<br><br>The use of a flusher truck is not always practical/possible for reasons including: (1) increased costs and (2) the availability of such equipment, scheduling of staff at exact moments when the flusher truck required. The service will be included in general operator daily duties. Use of recycled water, availability is preferred. |