Silica:
dust to dust no more

Version 4

Five hundred and seventy Canadians will develop lung cancer each year as a result of exposure to crystalline silica at work, according to estimates by the Occupational Cancer Research Centre (OCRC) and CAREX Canada.

More than half of these cancers will strike workers in the construction sector. Though workers in many other sectors are exposed to this hazardous substance—sectors ranging from mining and manufacturing to oil and gas and transport.

CAREX Canada estimates 380,000 Canadians are exposed to silica in their workplaces, including more than 142,000 here in Ontario.

In addition to cancer, those exposed risk developing silicosis—a progressive, irreversible, debilitating and sometimes deadly lung disease.

What is crystalline silica?

Crystalline silica, also known as silicon dioxide (SiO_2), is one of the most abundant minerals on earth. It is a basic component of soil, sand and stone including quartzite, granite and sandstone. It is also a component of many other materials, including:

- concrete, concrete block, cement, mortar and asphalt;
- tiles, brick and refractory brick;
- abrasives used for blasting; and
- natural and engineered stone used for countertops.

There are many forms of crystalline silica with quartz being the most common. Other forms can include tripoli, cristobalite and tridymite.

Who is at risk of exposure?

Any process involving cutting, grinding, drilling, crushing, blasting and polishing of any natural or engineered material containing silica can produce airborne particulates that can be inhaled.

These harmful exposures are common for workers across various construction trades, including labourers, plasterers, drywallers and heavy equipment operators. Examples of specific activities that produce airborne silica include jackhammering, mixing concrete and any cutting or sawing of concrete, brick or asphalt.

Exposure also occurs in mining, quarrying, oil and gas, agriculture, rail industry and a variety of manufacturing industries, including foundries.

Other occupational activities where workers can be exposed include ceramics, clay and pottery work and glass-making. As well, workers who remove alumino-silicate based ceramic fibre insulation, commonly used in extreme high temperature industrial applications and processes, are also at risk.

Some work activities will generate significantly higher levels of airborne particulates increasing the risk of exposure. One such example is sandblasting. This activity is commonly used to remove rust, paint or other debris from various structures and surfaces. This process is also used to smooth or shape same.

Fabricating and finishing stone countertops, particularly engineered stone, can also generate significant airborne silica. Engineered stone often contains significantly higher levels of silica (more than 90 per cent) than natural stone such as granite (less than 45 per cent).

What are the health impacts?

Airborne silica dust is easily inhaled into the lungs. It can cause inflammation and scarring which block lung air passages. Over time, this can cause silicosis—an incurable and progressively disabling lung disease.

Early **symptoms** can include shortness of breath, minor fatigue especially with activity, cough, fever and loss of appetite. **Symptoms can progress** causing chronic shortness of breath and fatigue, persistent cough, chest pain, weight loss and bluish discolouration of the fingers and lips. Some will experience respiratory failure, even death.

Depending on the level of exposure and the duration, workers can develop one of three types of silicosis.

Chronic silicosis, the most common type, develops after many years of exposure to even moderate levels of airborne respirable silica. In fact, symptoms may not begin to appear until decades after initial exposure.

Accelerated silicosis can develop in those exposed to significant amounts of airborne silica. Often, symptoms will progress rapidly. Evidence of silicosis can be detected by x-rays as early as five years after initial exposure.

Symptoms of **acute silicosis** will present within weeks, months or a few short years after exposure to significant levels of airborne silica.

Again, exposure can also cause cancer. In fact, crystalline silica is classified as a known human carcinogen by many respected agencies, including the International Agency for Research on Cancer (IARC).

Exposure has also been linked with increased risk for lung infection, including tuberculosis, along with chronic obstructive pulmonary disease (COPD) and kidney disease.

How can exposure be eliminated or controlled?

Effective prevention efforts follow the hierarchy of controls beginning with the elimination or **substitution of silica** where possible. For instance, sandblasting used for cleaning and surface preparation can be replaced with less toxic blasting media including water, ice, dry ice, soda, laser and agricultural-based products such as cereal husks and nut shells (though new concerns, such as nut allergies must be considered). Another example would be replacing sandstone grinding wheels with less toxic abrasive material such as aluminum oxide.

Where the elimination or substitution of silica is not possible, **wet cutting, grinding and drilling operations** should be considered along with **enclosed processes** and well-maintained local exhaust ventilation, including effective dust filtering/collection systems. Isolating the silica producing task away from workers can also be considered.

Further down the hierarchy are administrative policies and personal protective equipment, including respirators. Policies may include scheduling certain tasks to reduce the number of workers exposed and the removal of contaminated clothing at the worksite at the end of a shift (and adequate laundering) as well as the provision of shower facilities. Housekeeping efforts should involve wet sweeping and dusting and the use of vacuums with proper filters (HEPA) and maintenance.

Is the use of silica regulated?

Respirable crystalline silica is regulated under Ontario's *Occupational Health and Safety Act* (OHSA) through Regulation 490—Designated Substances. Employers are required to take all necessary precautions to ensure that a worker's airborne exposure to silica is reduced to the lowest practical level and does not

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exceed the occupational exposure limit (TWA) of:

- 0.10 milligrams per cubic metre of air by volume for quartz and tripoli; and
- 0.05 milligrams per cubic metre of air by volume for cristobalite.

These exposure levels must be achieved without requiring workers to use respiratory protection, except during emergency or other special circumstances. A worker exposed to any level of silica can request a respirator and the employer must provide it. When provided, the employer must meet the many obligations specifically outlined in Regulation 490 including the provision of training on respirator care and use before the worker first uses it.

Silica assessment and control program: Regulation 490 also requires employers to carry out an assessment of the exposure. or likelihood of exposure. If found that workers are likely to be exposed and their health may be affected, the employer is required to develop an exposure control program. The control program must include:

- engineering controls, work practices along with hygiene practices and facilities;
- respiratory protection program;
- methods and procedures to monitor concentration of airborne silica and worker exposure;
- records of worker exposure;
- medical examinations (pre-placement, periodic, acute exposure and exit) and clinical tests of a worker (paid for by the employer);
- records of examinations and tests must be maintained by physician who examined the worker or under whose direction the examinations and tests have been performed; and
- training program for supervisors and workers on the health effects and required measures and procedures.

Joint Health and Safety Committee (JHSC): Where a designated substance, including silica, is present in a workplace, the OHSA requires the establishment of a JHSC—regardless of the size of the workforce. The assessment of the likelihood of exposure to silica and development of the control program must be done in consultation with the JHSC. In fact, Regulation 490 specifically calls for JHSC members to make recommendations. Each member of the JHSC must be given a copy of the assessment and control program.

WHMIS: Canada's Workplace Hazardous Materials Information System, commonly known as WHMIS, is designed to provide workers, and others with critical health and safety information about hazardous products used, stored, handled or disposed of in the workplace. This includes products and materials containing silica. Provincial and territorial law establish employer obligations to obtain this information, including safety data sheets, and ensure workers can access and understand the information. General and workplace-specific WHMIS training are primary vehicles to ensure these obligations are met.

Related legal issues: In addition to protecting their own workers, Designated Substances Regulation requires employers to take reasonable precautions to protect "third party workers", including contractors at the workplace, who are exposed to silica. Ontario's construction sector though, is exempt from this regulation. Considering the significant exposure in this sector, health and safety advocates would like to see this exemption end.

Like employers in all other sectors though, construction sector employers must meet extensive obligations under Ontario Regulation 833, which establishes allowable occupational exposure limits (OELs) for a host of substances, including silica. They must take all reasonable measures to protect workers including substitution, engineering controls, work and hygiene practices and personal protective equipment.

Furthermore, the OHSA requires employers to take "every precaution reasonable in the circumstances for the protection of a worker."

Needed regulatory improvements: Many continue to call on the Ontario government to join other Canadian jurisdictions and lower the OEL for crystalline silica to 0.025 mg/m^3

—the level currently recommended by the American Conference of Governmental Industrial Hygienists (ACGIH). In fact, the globally-recognized and Canadian-based OccupationalCancer Research Centre recommends adopting and enforcing this OEL in all workplaces across Canada to "reduce the risk of occupational cancer and silicosis."

NOTE: Workers Health & Safety Centre (WHSC) offers related training, including Globally-Harmonized WHMIS training and JHSC Certification training. All WHSC programs apply adult learning principles to ensure learning is engaging, relevant and achieved.

For additional information about silica, the health hazard it poses, employer obligations and worker rights, call 1-888-869-7950 and ask to speak to a WHSC training service representative nearest you.

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675 Cochrane Drive, Suite 710
East Tower, Markham,
Ontario L3R 0B8

416-441-1939
Toll free: **1-888-869-7950**

whsc.on.ca

contactus@whsc.on.ca

Executive Director: **Andrew Mudge**

Director, Policy and Programs: **Loretta Michaud**

Editor: **Marty White**

Submissions are encouraged.

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