

Silica: dust to dust no more

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. Others exposed to silica, work in sectors ranging from mining and manufacturing to oil and gas extraction and transportation.

Crystalline silica remains a common health hazard in many workplaces. According to CAREX Canada, 380,000 Canadian workers are exposed to silica, including 142,000 in Ontario.

For years, workers and their representatives concerned with the significant health risks associated with silica have been demanding preventive action. Since 1983, silica has been regulated as a designated substance under Ontario's *Occupational Health and Safety Act* and yet, many workers continue to be exposed and develop disease.

What is crystalline silica?

Crystalline silica, also known as silicon dioxide (SiO₂), is one of the most abundant minerals on earth. It is a basic component of soil, sand and stone including quartz and granite, and a common component in concrete, brick, mortar and other construction materials.

There are several forms of crystalline silica with quartz being the most common. Others forms found in occupational environments are tripoli, cristobalite and tridymite.

Who is at risk of exposure?

Any work process that involves drilling, cutting, grinding or breaking quartz, granite and other materials containing silica can create airborne respirable dust that is inhaled.

Significant exposure can occur in a range of industries where abrasive blasting is used. This is done to smooth rough surfaces, roughen smooth surfaces, shape a surface, or remove contaminants on foundry castings, molds, tombstones, etched or frosted glass and jewelry. This process is also common in the removal of paint, oil, rust, or dirt from buildings, bridges, ships, tanks and other surfaces needing to be repainted or treated.

Other industries and work activities that pose significant potential risk for exposure include:

- Construction: sandblasting, rock drilling, masonry work, jack hammering, tunneling and plastering/drywalling;
- Mining and quarrying: cutting, drilling and crushing sandstone and granite;
- Foundry work: grinding and molding and working in shakeout and core room;
- Stone cutting: sawing, abrasive blasting, clipping and grinding;
- Railroad: setting and laying track.

Other activities where workers can be exposed to silica include ceramics, clay and pottery work; manufacturing of glass, cement, soap, detergents and abrasives. 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.

What are the health impacts?

Crystalline silica dust is classified by the International Agency for Research on Cancer as a known human carcinogen (Group 1).

Silicosis, a disabling, irreversible and sometimes fatal lung disease can occur when respirable silica dust enters the lungs and forms scar tissue. In severe cases, the dust and scar tissue can block air passages resulting in difficult or laboured breathing (dyspnea) and ultimately suffocation.

Symptoms of early stage silicosis include shortness of breath following activity, cough, minor fatigue and loss of appetite. Symptoms will progress causing chronic shortness of breath, persistent cough, constant fatigue, weight loss, fever and bluish skin in the fingers and other extremities (known as cyanosis).

Depending on the level of airborne concentration of crystalline silica and the duration of exposure, silicosis can be chronic, accelerated or acute.

Chronic silicosis is the most common form and develops after many years of exposure to even low levels of airborne respirable silica. Symptoms are not always obvious and may go undetected for decades until symptoms worsen. Silica-exposed workers should have chest x-rays to identify early signs of the disease before the disease progresses. Affected workers may also experience cardiac and respiratory failure. The body's ability to fight infections may also be compromised making workers more susceptible to certain illnesses such as tuberculosis and other recurrent lung infections.



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Accelerated silicosis results from exposure to even higher concentrations of airborne silica and progresses quicker than chronic silicosis. Detection through symptoms or a chest x-ray can occur within five to 10 years after initial exposure.

Acute silicosis occurs when workers are exposed to relatively high amounts of respirable silica. Symptoms can develop in just a few weeks or up to five years from initial exposure. In some cases, rapid progression of respiratory failure can lead to death.

Crystalline silica exposure is also linked to chronic obstructive pulmonary disease (COPD), rheumatoid arthritis and tuberculosis.

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 example, in sand-blasting work, silica can be replaced by garnet, alumina, cereal husks and/or high pressure water. Aluminum oxide wheels can replace sandstone grinding wheels. Where substitution is not possible the next preferable method involves engineering controls. These might include local exhaust ventilation, wet drilling and sawing, process enclosures (e.g. sand blasting of small parts), and isolation of workers in positive pressure cabs with air conditioning and filtered air supplies.

Administrative controls and personal protective equipment may be appropriate in some cases where engineering controls cannot be implemented or prove ineffective. This said, should respirators be used they must be suited to the hazard, well maintained and workers trained in proper use. Administrative controls may include policies calling for the removal of contaminated clothing at work (and adequate laundering before use) as well as the provision of shower facilities on-site.

Is the use of silica regulated?

Respirable crystalline silica is regulated under Ontario's *Occupational Health and Safety Act* through Regulation 490/09—Designated Substances. This regulation calls on employers to take all necessary measures

and procedures by means of engineering controls, work practices and hygiene facilities and practices to ensure that a worker's airborne exposure to silica is reduced to the lowest practical level and does not exceed the occupational exposure limit (OEL) of:

- 0.05 milligrams per cubic metre (mg/m³) of air by volume for cristobalite; and
- 0.10 milligrams per cubic metre (mg/m³) of air by volume for quartz and tripoli.

Employers must achieve this without requiring workers to wear and use respiratory equipment, except during emergency or other special circumstances. Workers exposed to any level of silica can request, and the employer must provide, respiratory equipment. When provided it must be appropriate in the circumstances and the employer must provide the worker with training on its care and use.

The Regulation also requires employers to conduct an assessment to determine the extent to which workers are exposed. If the assessment finds that workers are likely to be exposed and will place their health at risk, the employer is then obliged to develop a Silica Control Program that must include:

- engineering controls, work practices and hygiene practices and facilities to control worker exposure;
- methods and procedures to monitor the concentrations of airborne silica in the workplace and worker exposure;
- personal records of worker exposure in the workplace;
- medical examination and clinical test of a worker;
- records of medical examination and clinical tests must be maintained by a physician who has examined the worker or under whose direction the examination and tests have been performed; and
- a training program for supervisors and workers on the required measures and procedures.

Where a designated substance is present in a workplace, *the Act* also requires the establishment of a joint health and safety committee (JHSC) regardless of the workforce size. The assessment and development of the control program must be done in consultation with the JHSC.

Members of the JHSC can make recommendations and must be given copies of the assessment and the control program.

Ontario's construction sector is exempt from the Designated Substance Regulations, an exemption health and safety advocates would like to see end. Since 2017 however, construction worksites are now covered under O. Reg. 833 (*Control of Exposure to Biological or Chemical Agents*) which sets out OEL's for a host of substances, including silica. Regardless, employers still have a general duty under section 25(2)(h) of *the Act* to take "every precaution reasonable in the circumstances for the protection of a worker."

Many continue to call on Ontario's Ministry of Labour (MOL) to lower the OEL for crystalline silica to 0.025 mg/m³—the level currently recommended by the American Conference of Governmental Industrial Hygienists and adopted by six other Canadian provinces.

NOTE: For additional information about silica, the risk to worker health and the governing regulations, please contact a Workers Health & Safety Centre near you.



Published by the
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