# Construction Exposure Profiles Crystalline Silica

Crystalline silica is a natural component of sand, rock, concrete, brick, stone, mortar, and many mineral ores. It is one of the most common health hazards in construction and building trades. CAREX Canada estimates that 380,000 Canadian workers have been

Workers are exposed to crystalline silica when they breathe in silica dust. Respirable crystalline silica (RCS) is silica dust that is very small and can potentially reach the deepest part of the lungs.

## **Health Effects**

exposed to crystalline silica at work.

- Silicosis
- Lung Cancer
- COPD (i.e., emphysema and chronic bronchitis)

Symptoms of silicosis include coughing, wheezing and difficulty breathing. Silicosis can be acute (i.e., high exposure over short period of time) or chronic (i.e., exposure over long period of time). Exposure may also increase the risk of developing end-stage kidney disease and an array of autoimmune diseases.





## **Exposure Sources and Construction Trades**

There are many activities in construction that produce dust from silica-containing materials (SCM). Work activities in construction that may generate dust include excavating, cutting, drilling, chipping, sanding, or grinding of silicacontaining materials.

Trades Exposed in Construction	Exposure Sources and Activities
Operating engineers, and	<ul><li>Excavating and road construction</li><li>Large trucks, motor vehicles and</li></ul>
heavy equipment mechanics and	heavy equipment generating dust clouds
operators	<ul> <li>Crushing, loading, hauling, and dumping of SCM</li> </ul>
	<ul> <li>Tunnelling, and earth moving of soils with high silica content</li> </ul>
Operative	Mixing or cutting of concrete,
plasterers, cement	aggregate, and cement
masons, bricklayers,	<ul> <li>Breakdown down of SCM using</li> </ul>
and allied craft workers	abrasives or abrasive blasting
General and	Demolition or blasting of structures
specialized	Regular maintenance and cleaning,
construction	such as dry sweeping, pressurized air
labourers	blowing, or dismantling equipment

Breaking down rock, concrete, or other SCM during construction by chipping, hammering, sawing, drilling, or grinding also generates significant amounts of airborne dust, creating a possible exposure source for all workers in proximity.



### **Increased Risk**

The Burden of Occupational Cancer Project estimates that almost 200 lung cancers diagnosed each year among Ontario construction workers are caused by exposure to crystalline silica. The risk of silicosis for workers in the construction industry is 1.20 times higher and the risk of lung cancer is 1.09 times higher when compared to the general population in Ontario. Also, labouring and other elemental occupations in the construction trades have a 1.45 times higher risk of COPD, compared to the general population in Ontario.

The Occupational Disease Surveillance System (ODSS) has identified specific construction trades in Ontario as having the highest risks for lung cancer and silicosis, when compared to all other workers in the ODSS, as shown in the following table.

### Prevention

Ontario and Quebec have established RCS legal occupational exposure limit of 0.10 mg/m3. Control strategies that may be effective in construction include:

Trade	Lung Cancer	COPD	Silicosis
Welding and flame cutting operations	13%	<b>18%</b>	<b>26</b> %
Other Construction Trades Occupations	14%	<b>39%</b>	124%
Labouring and other elemental work: excavating, grading, and paving	55%	75%	-
Excavating, grading and related occupations	37%	38%	-
Plasterers and related occupations	20%	<b>7</b> %	-
Brick and stone masons and tile setters	10%	<b>16%</b>	-
Paving, surfacing and related occupations	22%	33%	-
Foremen/women: Excavating, grading, paving and related occupations	36%	10%	-

ective	ELIMINATION	SUBSTITUTION	ENGINEERING CONTROLS	ADMINISTRATIVE CONTROLS	PPE effe
F	Pre-process silica re-treat silica to make it less rystalline and more amorphous rior to use.	Source lower silicon dioxide materials Source products with lower silicon dioxide content, to reduce the health impact.	Local exhaust ventilation LEV captures silica dust close to the source, and exhausts it to a safe area away from workers. LEV Examples of LEV include tool shrouds and hollow point drills. Reductions depend on how effectively the dust is captured.		PROACTIVE CONTROLS Reduce or eliminate silica dust before it enters the workplace air
More effective	More hopeful than realistic?) Eliminate dust Ormation Liminate the need to cut, grind, or Irill silica-containing materials, e.g. by improving concrete forms.	Substitute with other materials Replace silica-containing materials, such as concrete, brick, wallboard, and tile, with other materials, such as wood. Choose non-silica abrasives for abrasive blasting.	Reduce dust by using water-spray systems. Water can be sprayed onto the working area to prevent dust from becoming airborne, especially dusty tasks such as grinding, drilling, or cutting. Dust can also be suppressed by spraying any dust clouds that form.		
Hierarchy of Cont effective Elimination		Controls on Physically remove the hazard	General ventilation General ventilation dilutes emissions by bringing clean air into enclosed or areas. Examples include fans and open windows. Where possible, work can also be done outside to improve ventilation. The reductions	Separate work areas Use barriers to block access to work areas where silica dust is present. Proper clean up Use wet cleaning methods or vacuums fitted with HEPA filters	Respirators PPE should be used as a last resort, and is not a replacement for other controls. Respirators should be fit-tested, and training should be provided to wearers.
+	Substitut Engineer Control Administra Control	n Replace the hazard Isolate people from the hazard ive Change the way people work	vary depending on the volume of air provided. Containment Seal off or enclose areas where silica dust is present. This includes equipment such as automatic blast cleaning machines, or cabinets that allow workers to perform tasks from	to clean up silica dust. Avoid dry sweeping and compressed air. Post warning signs Post warning signs around areas wear silica dust is present, to keep non-essential and unprotected personnel out of the area.	Protective clothing Disposable or washable workclothes can be provided to the worker. Workers should change out of their protective clothing at the end of their shift, and the clothing should be disposed of or laundered.
Least effective		Protect the worker with Personal Protective Equipment	outside the containment, using gloved armholes.	Personal hygiene Provide showers and changerooms for workers to use after their shifts. Prohibit eating, drinking, chewing, or smoking where silica is present. Education and training	<b>REACTIVE CONTROLS</b> Remove silica dust from the workplace air, or reduce the

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